CERDI, *Etudes et Documents*, E.2010.08

Document de travail de la série

Etudes et Documents

E 2010.08

How Remittances Contribute to Poverty Reduction: a Stabilizing Effect

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Janvier 2010

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Abstract

We argue in this paper that migrants remittances contribute significantly to poverty reduction in developing countries and that their effect is all the more important that they are sent to countries which are more vulnerable.

Since migrants remittances represent an important source of income for households living in home countries, these flows may have an effect on poverty in developing countries. Several microeconomic studies have shown that remittances often play an insurance role for migrants' families, but no analysis studied the stabilizing role played by remittances at the macroeconomic level. This specificity could be all the more determinant for developing countries that they are characterised by macroeconomic instability, especially trade instability based on their dependency on basic products. While the negative effect of instability on development is largely recognized, to our knowledge, instability has not been taken into account at the macroeconomic level in the debate on the role played by remittances in development of home countries.

Using a panel sample of 65 developing countries over the period 1980-2005, we first find that remittances have a significant and positive effect on poverty reduction in countries of origin. Furthermore, the effect of macroeconomic instability, and more precisely of trade instability and of climatic instability on poverty in home countries, is all the more attenuated that remittances are important. This result about the stabilizing role of remittances in developing countries confirms the microeconomic theory according to which remittances can play an insurance role for migrants' families.

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Introduction

Recent economic research examined the determinants of the aid efficiency in terms of growth or in terms of poverty reduction. A main purpose of this research was to define criteria for the geographic allocation of aid. Some works supported that to maximise the aid effectiveness in terms of growth, it would be necessary to favour countries with high levels of poverty, low per capita incomes and sound policy regimes (Burnside and Dollar 1997, 2000; Collier and Dollar 2000). However other economists brought to light other determinants of aid efficiency, and thus other possible criteria for the geographic aid allocation. In particular, L. Chauvet and P. Guillaumont (2001, 2004, 2008) argued that aid effectiveness depends on economic vulnerability, that is to say, on the shocks developing countries have to face. According to these studies, aid could soften the adverse effects of the shocks on growth. Then aid would be more efficient in more vulnerable countries.

Whereas the literature about the macroeconomic efficiency of aid is very abundant, the one about that of remittances is almost nonexistent. Nevertheless, for many developing countries, the magnitude of remittances has considerably amplified in recent years, what made them gain more and more attention from the international community. Indeed, migrants remittances are more important than public aid flows (more than twice as large as the official aid received by developing countries, according to the World Bank "Global Economic Prospects 2006") and represent a significant part of their GNI. According to World Bank estimates, developing countries received USD 240 billion in official remittances in 2007 (80\% of the remittances amount to the developing world). It is thus interesting to study the macroeconomic efficiency of migrants remittances as well as that of aid, and the factors on which this efficiency depends. We decide to do it with regard to poverty reduction, the first of the Millennium Development Goals.

A major factor we consider is economic vulnerability, what by now has not been done at the macroeconomic level in the debate about the role played by remittances in poverty reduction. The specificity of our study consists then in bringing closer two strands of the migration literature: the first which studies the effect of remittances on the development of home countries, and the other which is interested in the relationship between migrants remittances and instability in recipient countries, as it was already done for the case of foreign public aid. Indeed, whereas some papers enlightened the distinct effect of remittances and of instability on poverty, still now no one has studied the combined effect of these two variables. And, given the relationship which seems to exist between remittances and instability, it appears reasonable to think that the effect of one of these two factors can be modified by the presence of the other variable. As much as migrants remittances often follow a purpose of co-insurance, they constitute an answer to shocks of income affecting countries of origin. Thus, it seems reasonable to envisage that these latest allow to cushion the effects of shocks on poverty in these countries. If remittances allow to stabilize the economy of origin countries (by attenuating the adverse effects of the shocks), and

if the stability favours poverty reduction, so we are right to think that remittances can have an effect on poverty reduction in the origin countries through their stabilizing character.

Before exposing our results, we are going to remind the main empirical results concerning the link between migrant remittances and poverty reduction, between remittances and instability, and finally we will present the mixing approach we propose us to have in this paper.

1 Remittances, poverty and instability: overview of the literature

1.1 Remittances and poverty

Given that migrants remittances constitute a supplement of income for households, it is logical to consider that these flows can have a direct negative effect on poverty in countries of origin. For example, the macroeconomic studies of Adams and Page (2005), of Spatafora (2005), or the more recent one of Gupta and al. on sub-Saharan Africa (2009), show the positive role played by migrant remittances on poverty reduction. Similar results have been obtained by country case studies: Egypt (Adams 1991), Lesotho (Gustafsson and Makonnen 1993), Burkina Faso (Lachaud 2004), or Ghana (Adams, Cuecuecha and Page 2008).

Many researchers examined the channels through which migrants remittances can affect poverty in origin countries. The main channel enlightened is growth. The effect of remittances on growth may pass through the balance of payments, the exchange rate, the private investment (by alleviating the credit constraint of households), or through the "multiplier effect" they can have on the households which do not receive remittances.

Adelman and Taylor (1990)found that each dollar sent by Mexican migrants increases the Mexican GNP by about 3 dollars. Duran, Parrado and Massey (1996) noted too that an increase of remittances by 2 billions dollars draws away a production growth of 6,5 billions dollars. But concerning cross-sectional studies, results are not so convergent. Whereas Stark and Lucas (1988) or Taylor (1992) enlightened a positive relation between remittances and growth in the origin countries, Spatafora (2005) did not find any relation between the real GDP per capita growth and migrants remittances. Chami and al. (2003) even showed that remittances have a negative influence on the labour supply or on the saving effort (phenomenon of moral hazard). But if remittances are mainly used to finance basic consumption, they may have an effect on poverty even though their effect on growth is negligible.

The second channel brought into light in the literature is income inequality. Ahlburg (1996) and Taylor and Wyatt (1996) confirmed the hypothesis according to which remittances have an adjustment effect on the income distribution

in Tonga and in Mexico. For Tongan households for example, Gini index of total revenue would have diminished from 0,37 to 0,34 thanks to remittances received. Nevertheless, other studies showed that remittances flows accentuate income inequality. This is the case of the Adams' work on Egypt (1991) or of the one of Rodriguez on Philippines (1998). One of the main explications is that only richer families can afford the costs of migration (Stahl 1982, Lipton 1980). So later these rich families will also receive remittances flows. In this case, migrants remittances would worsen income inequality and consequently the poverty level in the countries of origin too.

Even if the channels through which migrants remittances can affect poverty reduction have been much examined, to our knowledge, just few papers focused on which factors depends the remittances effectiveness in terms of poverty reduction. Moreover, no one studied the role of instability occurring in the origin countries on the remittances effectiveness at the macroeconomic level.

In 2005, Ruiz-Arranz and Giuliano examined the role played by the financial development in the effect of remittances on the growth of home countries. Given the difficulty for borrowing money in developing countries, the authors argue that migrants remittances can represent a substitute for the lack of credit access in these countries, and thus favour growth in countries where the financial system is not enough developed. That is why they study the interaction between migrants remittances and financial development, but also the effect of this interaction on growth. Finally, Ruiz-Arranz and Giuliano find that remittances can more promote growth in countries where the financial system is less developed.

In 2006, Faini studies the effect of the political situation in the origin countries (measured by the inflation level) on the remittances effectiveness. He finds that the interactive term *remittances*political situation* is negative and significant. So the effect of remittances on growth would be all the more improved that the political situation is bad. Furthermore, when this interactive term is included in the regression, the effect of remittances remains significant. But when the author took into account the endogeneity of remittances and of the political situation by using an instrumental variables procedure, the multiplicative term is no more significant. In other words, the results of Faini seem to be not very robust. Besides, the theoretical arguments for this relation are not really developed in his paper or more generally in the literature. Indeed, remittances flows do not pass through the State, so it is not realistic to think that the political situation of the origin countries can have a significant effect on the remittances effectiveness. Furthermore, even if the role played by the financial development in the remittances effectiveness seems to be more consistent, it would be also relevant to imagine that the effectiveness of remittances in terms of poverty reduction could be amplified when the economic instability is important. Indeed, many studies, above all at the microeconomic level, showed that migrant remittances can play an insurance role, particularly in small economies which are very disturbed by shocks.

1.2 Remittances and instability: lessons of microeconomic studies for a macroeconomic analysis

The effect of instability on poverty

Developing countries face numerous and various shocks: natural or climatic disasters (earthquakes, dryness, inundations, etc.) which can be measured by agricultural value added instability or rainfall instability, financial shocks evaluated by interest rates instability, or trade shocks measured by export instability, or in some studies by terms of trade instability. Many studies examined the harmful effet of this instability on poverty, whether it is indirectly through its effect on growth or directly by its asymetrical effects on poor people.

The most abundant stream of literature refers to the negative effect of export instability on growth (Bleaney and Greenaway 2001, Dawe 1996, Guillaumont and al. 1999, Combes and Guillaumont 2001 or Mendoza 2000). But other studies examined too the negative effect of agricultural value added instability (Guillaumont and Chauvet 2001), of climatic instability (Miguel, Satyanath and Sergenti 2004), or even of growth instability like Ramey and Ramey in 1995 (for an overview see Guillaumont 2006). Furthermore, several works examine the factors influencing the impact of instabilities on growth through interactive variables (Hnatkovska and Loayza 2005 for institutions quality, financial depth and trade openness, Combes and Guillaumont 2002 for openness policy).

Instability may also have a direct harmful effect on poverty through its asymmetrical effects on the living conditions of poor people. Indeed, negative shocks can push people in poverty traps. That is to say that their income falls so low that they can not invest anymore in human capital and thus, they can not get out of this difficult situation, even when positive shocks occur. They are so placed in a no reversible situation (see Guillaumont and Korachais 2006).

The insurance effect of remittances at the microeconomic level

However, households have at their disposal some mechanisms aiming at smoothing income fluctuations generated by shocks. They can for example reallocate their resources in time by borrowing on formal financial markets (Rosenzweig and Wolpin 1993, Udry 1994). But in developing countries formal institutions for managing risks are imperfect or absent, and lots of people do not have access to financial markets. Remittances can thus play an essential role by allowing households living in developing countries to diversify their income sources and therefore can be viewed as a self-insurance mechanism. Indeed, one of the strategies which is available for households in order to diminish risks they face, consists in sending one of its members in an other region or another country where it will not be confronted to the same shocks at the same time.

This possible role of remittances led some economists, for whom the basic unit of analysis is not the migrant but the household and for whom remittances

are endogenous to the migration process, to consider emigration as a strategy for households which have aversion to risk, to minimise the effect of the negative shocks they can face (Stark and Lehvari 1982, Schrieder and Knerr 2000, Azam and Gubert 2005).

The co-insurance argument leads to an empirically testable hypothesis: the amounts of remittances received would be more important for the households really confronted to risks or when risks are more important (Azam and Gubert 2005). Although the recent study of Burguess and Haksar (2005) did not manage to show the insurance role of remittances in the case of Philippines, the great majority of microeconomic studies (Lucas and Stark for the Botswana in 1985, or Gubert for the Mali in 2002) admitted that remittances play a prevention role against risks. In 2003, Wallsten and Clarke went further: they tried to estimate to which extent remittances allow to insure the households against the shocks. By using panel estimates based on Jamaican households, they measured how remittances answered to the occurrence of hurricane Gilbert in 1988. They finally found that remittances can play an insurance role against natural disasters, but only partly (remittances increase just by 25\% for every additional dollar of damages). Moreover, Yang and Choi (2006) tested if the risks sharing permitted by remittances flows is complete or not. They so observed how remittances sent by Philippine migrants react to the shocks of revenue which occur in Philippines households. They found that for the households among which one of the members has migrated, remittances can compensate 60\% of the domestic income losses. Finally, some studies explored the reaction of remittances to the income country variation. In 2005, Mishra showed for example that remittances sent to the Caribbean tended to increase after a negative shock of product, but with delay (a decrease of GDP by 1\% is followed two years after by an increase of remittances flows by 3\%). In 2005, Kapur and McHale examined remittances reaction in the years preceding and following an economic crisis, defined by the authors as a decline in GDP by 2 percent in a given year. They found too that remittances flows increase when a country suffers a macroeconomic shock.

By now, Quartey (2005) is the only author who has examined the remittances' effectiveness in presence of instability. But his study deals only with the case of Ghana. He wants to know if migrants remittances received by the Ghanaian households allow them to dampen the economic shocks they endure. He uses inflation as a measure of economic instability, and multiplies this variable with that of remittances. By estimating an equation of consumption expenses with random effects and temporal dummies, he finds that the coefficient of the interaction term is positive but not significant (this term appears to be only significant for agricultural households). So, remittances would cushion the adverse effect of the shocks but not by a significant way.

Nevertheless, we have to keep in mind that the insurance role of remittances showed in some microeconomic studies, could be mitigated by moral hazard problems. Indeed, if migrants remittances represent an answer to income shocks

submitted by families left behind, recipient families might not be encouraged to participate hardly to the labor market (Chami, Azam and Gubert) but also to subscribe to more formal insurance systems.

The need to examine the insurance effect at the macroeconomic level

Migrants remittances seem to constitute an external source of income which is really less variable than the others. According to the economic theory, saving is a stable function of the income, but the investment evolution depends on the interest rate variations and profit expectations. Given that remittances belong to the current flows which are a function of the income, we expect that they are less variable than the other private capital flows. Furthermore, the other capital flows depend on the decisions of foreign investors who search a profitable economic environment for their investments, whereas remittances are only dependant on the migrants decisions who have still a link with their family members stayed in their origin country. It is then rational to think that migrants remittances represent a source of income more stable than the other capital flows. Using panel data over the period 1970-2000, Buch and Kuckulenz (2004) confirmed this result. They showed that remittances instability is less important than that of the other private capital flows and than that of foreign public capitals (except for Asia). Over this period, remittances have had on average a variation coefficient of 0,6 against 1,18 for private capitals flows. The difference is more important when only the 87 developing countries are taken in consideration (0,66 against 2,52). 107 countries of 135 considered have had a variability of remittances less high than that of the other private capitals flows, 70 countries have had an average remittances variation weaker than that of the official capital flows and for 62 countries, the remittances instability was weaker than the whole other capitals flows. In 2003, Ratha (in Global Development Finance 2003) showed also that remittances flows react less violently to the economic situation of the origin country.

Given that remittances often answer to shocks occurring in origin countries in an inverse manner, these flows could favour the households consumption smoothing. This stability (or this countercyclicality) lets us think that remittances exercise a stabilizing role over origin economies of the migrants, and thus are likely to favour the poverty reduction in these countries. But whereas some studies examined the effect of migrants remittances on poverty and others the relationship between remittances and instability, no one examined at the macroeconomic level the combined effect of remittances and instability on poverty in countries of origin.

Here we want to go further than the Quartey's work by studying the efficiency of remittances in terms of poverty reduction in presence of instability at the macro-economic level and on a cross-country basis. Indeed, given one of remittances particularity is to arrive directly in the households pockets, we find more interesting to study if these flows can more reduce poverty when the origin

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country is unstable (in place of studying their effectiveness in terms of growth). We will so introduce in our poverty function the variables of remittances and of instability at the same time (what has never been done at the macro-economical level), in order to know if remittances have an effect on poverty and if this effect passes through instability (in other words through their insurance role). We are also going to test this hypothesis with three types of instability (trade, climatic and production instability), because it is relevant to think that remittances can react differently according to the type of shocks which occur in the country of origin.

2 Econometric analysis

We test the hypothesis according to which where macroeconomic instability is larger, migrants remittances tend to be more efficient in terms of poverty reduction. Indeed, it is possible that the effect of instability on poverty can be alleviated in presence of remittances: remittances represent a contribution to the households' income which can prevent them to fall in poverty traps when shocks occur. The positive effect of remittances on poverty could so be amplified thanks to their stabilizing character which dampens the negative effect of instability on poverty. We can nevertheless imagine the opposite effect, that is to say that remittances can perhaps accentuate the undesirable effects of the shocks on poverty. Indeed, households which use to receiving money from migrants are perhaps not encouraged to develop other strategies to protect them against risks. It so now a question of identifying which of these two effects is the most important.

2.1 The empirical model

From the recent empirical works (Dollar and Kraay, 2002; Berg and Krueger, 2003; but also Ravallion 1997; and Ravallion and Chen, 1997) and from the mathematical model proposed above, we can construct the poverty level as a function of the mean income per capita and of the distribution of this income (according to Adams and Bourguigon, the poverty level depends arithmetically on inequality and on the level of income). Inequality affects poverty levels by hampering growth, and by reducing the marginal impact of growth on poverty abatement (De Ferranti and al. 2003). Given that remittances allow to improve the income level and perhaps also to diminish inequality, they may contribute to poverty reduction in the countries of origin. Then, following Adams and Page (2005) and Patillo et al. (2009), we express poverty as a function of mean income per capita, a variable of income distribution (the Gini index) and finally workers remittances per capita. We so first estimate the following specification:

$$Log(P_{it}) = \alpha_i + \beta_1 log(Y_{it}) + \beta_2 log(G_{it}) + \beta_3 log(Rem_{it}) + \varepsilon_{it} \qquad (1)$$

Where α_i and ε_{it} are respectively a coutry specific effect and an i.i.d error term. GDP per capita is expected to have a negative effect on poverty, whereas

the income inequality variable is expected to have a positive effect on the poverty level.

We suppose that the effect of remittances on poverty passes mainly through income inequality, contained or not by the Gini coefficient, and through the average income. Then this regression allows us to examine the residual effect of remittances. Given that we want to estimate the structural effect of remittances on poverty, we use the poverty level rather than the poverty variation. By representing an income contribution, and perhaps by dampening inequality, we expect that the remittances variable has a negative effect on poverty.

This equation has already been tested by researchers, notably by Adams and Page (2005). But our innovation in this study is to introduce in this equation two other variables: a variable measuring the macro-economic instability and an interactive term between remittances per capita and this instability. This term allows us to capture the likely decreasing effect of instability with remittances. We suppose that the effect of instability on poverty decreases with remittances amounts per capita.

$$Log(P_{it}) = \rho_i + \zeta_1 log(Y_{it}) + \zeta_2 log(G_{it}) + \zeta_3 log(Rem_{it}) + \zeta_4(Inst_{it}) + \zeta_5(Inst_{it} * logRem_{it}) + \nu_{it}$$
(2)

This equation gives us the possibility to estimate the specific effect of remittances and of instability on poverty but also their joined effect (through the interaction term).

But as mentioned before, we suppose that the effect of remittances on poverty passes mainly trough the Gini index and the income per capita. So, if a change in Gini coefficient is influenced by remittances, we can write:

$$Log(G_{it}) = \sigma_i + \delta log(Rem_{it}) + net(G)$$
(3)

Where net(Gini) is the part of the coefficient which is not affected by the effect of remittances.

We do the same for the income per capita:

$$Log(Y_{it}) = \phi_i + \gamma log(Rem_{it}) + net(Y)$$
(4)

We then introduce (3) and (4) in the equation(2):

$$Log(P_{it}) = \rho_i + \zeta_1(\phi_i + \gamma log(Rem_{it}) + net(Y)) + \zeta_2(\sigma_i + \delta log(Rem_{it}) + net(G)) +$$
(5)

$$\zeta_3 log(Rem_{it}) + \zeta_4 Inst_{it} + \zeta_5(Inst_{it} * logRem_{it}) + \nu_{it}$$

Which gives us the model to estimate:

$$Log(P_{it}) = \eta_{0i} + \eta_1 net(Y_{it}) + \eta_2 net(G_{it}) + \eta_4 log(Rem_{it}) + \eta_5 Inst_{it}$$
(6)

$$+\eta_6(Inst_{it} * logRem_{it}) + \tau_{it}$$

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In this last specification the coefficient associated with remittances is expected to be higher than in the equation (), since $\eta_4$captures the total effect (direct and indirect) of remittances. We obviously have to correct the standards errors of the coefficients associated with the net variables by a bootstrap method.

The marginal effect of remittances and instability on poverty are so given by:

$$\frac{\delta P_{it}}{\delta Rem_{it}} = \eta_4 + \eta_6(Inst_{it}) \tag{7}$$

$$\frac{\delta P_{it}}{\delta Inst} = \eta_5 + \eta_6(Rem_{it}) \tag{8}$$

We expect that η_4 be negative, η_5 positive, and we suppose that the marginal effect of remittances (instability) depends on instability (remittances) value. It is from the significance, the sign and the magnitude of η_4, η_5 and η_6 coefficients that we will draw conclusions about relationships between remittances, instability and poverty reduction in countries of origin.

2.2 Estimation strategy

We can meet a problem of endogeneity concerning the remittances variable. This problem, which can bias our results, can have three sources: a reverse causality (whereas we can think that remittances affect growth and poverty of home countries, the insurance goal of these flows let us envisage that they constitute also an answer to growth and poverty), the existence of omitted variables (we can imagine a variable not included in our estimates which influences at the same time poverty and remittances like risk aversion for example) and finally errors of measure (which would not be surprising when we deal with remittances because data understate the full extent of remittances[1]). It is so necessary to test the existence of endogeneity, and if any, to use an instrumental variables method.

We also have to test for the significance of fixed effects (which take into account the unvariable specificities of countries) and the eventual correlation between the explanatory variables and the fixed effects (by an Hausman test).

2.3 Variables and data

Our estimate of the specific and joined effects of remittances and instability on poverty is based on a panel of 65 developing countries over the periods 1980-1985, 1986-1990, 1991-1995, 1996-2000 and 2001-2005. The panel is not balanced.

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[1]Freund and Spatafora (2005)estimate that remittances sent to developing countries through unofficial channels amount to about 35-75 percent of the official ones

The dependant variables

As a measure of poverty we use the poverty headcount index, set at one dollar per person per day. This variable represents the percentage of population living with one dollar or less per day in a country i in the period t. These variables were collected from the *Povcalnet* database (World Bank). Like Adams and Page (2005) we also test our hypothesis with the poverty gap (at one dollar a day). This variable measures the amount by which the average income of the poor fall short of the poverty line. It represents in fact the "depth" of poverty.

The control variables

To measure income inequality we use the Gini coefficient. This measure was also drawn from *Povcalnet*. The average income is measured by the GDP per capita expressed in constant dollars base year 2000 (WDI 2005).

The interest variables

All remittances data come from the IMF's *Balance of Payments Statistics*. Remittances variable is the result of the sum of three items: "Compensation of Employess", "Workers' Remittances", and "Migrants' Transfers". But by discussing with IMF country desks and national authorities, Spatafora et al. (World Economic Outlook 2005) observed that in fact, all countries do not calculate remittances as the same way. For example, some countries like Argentina, Brazil, Cape Verde or Senegal, do not include the item "Compensation of Employees" in their remittances variable. Furthermore, for some countries, remittances are in fact recorded under an other item ("Other Current Transfers"), like in Kenya or in Malaysia. So, by collecting informations from IMF country desks and then by proceding to adjustments, Spatafora et al., obtained more precised remittances data. It is their dataset that we use in this study. Obviously these data do not include the large amount of remittance monies which are sent home through unofficial channels.

We are going to test three types of instabilities: macro-economical instability strictly speaking (instability of GDP per capita), trade instability (terms of trade instability) and climatic instability (agricultural production instability). The trade and GDP instabilities have been calculated by the CERDI. Each instability variable is measure to a reference value. Instability can be measured by the standard deviation to the growth rate, but it is preferable to measure the deviation from the trend. We suppose that series can not be purely deterministic or purely stochastic, that is why the reference value has been calculated from a mixed trend (with a stochastic element and a deterministic one).Then, we take the average of the quadratic deviation relative to the mixed trend. Trends have been calculated by a time limited-based global adjustment(period 1960-2006).The income instability is measured from the GDP per capita data drawn from the WDI. The terms of trade instability is measured from the CNUCED

database.

$$Inst = 100\sqrt{\frac{1}{n+1}\Sigma(\frac{Y_t - \widehat{Y_t}}{\widehat{Y_t}})^2}$$

Where n coressponds to the number of years during the period on which instability is calculated and Where $\widehat{Y_{it}} = exp(ln(\widehat{Y_t}))$ and $ln(\widehat{Y_t}) = \widehat{a} + \widehat{b}ln(Y_{t-1}) + \widehat{c_t}$.

As a proxy of the climatic instability (the main source of instability in developing countries), we use the variable of agricultural production instability included in the calculation of the Economic Vulnerability Index (EVI) used for LDCs identification. This specific measure of instability coorresponds also to the variance of agricultural production along its trend (and in percentage of this one). By supposing that the trend of agricultural production is mainly dependant on the economic policy and on permanent factors, the variations around the trend may reflect the occurence and severity of natural shocks.

Variable	Definition	Expected sign
Poverty	The poverty headcount in the origin country	
GDP	GDP per capita, based in PPP,	
	constant international dollars base year 2000	-
Gini	The Gini coefficient in the home country	+
Remittances	The amount of remittances per capita	-
TT Instability	Instability of terms of trade	+
GDP Instability	Instability of per capita income, constant dollars,	
	base year 2000	+
AGRI instability	Instability of the agricultural production	+
Interaction	Instability*Remittances	-

(These variables are more detailed in the appendix 1)

2.4 Results

The endogeneity of remittances

Recent studies examining the effect of remittances on poverty reduction took into account the remittances endogeneity by proceeding to an instrumental variables method.

Spatafora (2005) controled for the endogeneity problem between remittances and growth by using two instrumental variables which are constant in time: a geographic variable (the distance between the sender country and its main recipient country) and a cultural variable (the existence of a common language between the two countries).

Adams and Page (2005), as for them, studied the determinants of migrations and remittances. If these determinants do not have a direct effect on poverty,

they could represent good instruments for us. The main determinant they find is the geographic distance, which can constitute a proxy of the migration costs. They make the reasonable hypothesis that the more the destination country is far, the more costs of migration will be expensive. But by representing too a proxy of remitting costs, the geographic distance can be a direct determinant of remittances monies.

To test the effect of remittances on poverty, Patillo and al. (2007) use three instrumental variables: the geographic distance too, a dummy equal to one for a dual exchange market and the lagged remittances variable.

The problem in all these papers is that they use some instrumental variables which seems to be significant determinants of remittances, but which do not vary in time, as geographic or cultural distance. So these variables can not constitute valid instruments for panel regressions.

By leaning on the more classical litterature relative to the migration decision, we know that the income gap between the sender country and the recipient country plays a significant role in the decision to migrate and consequently on the future remittances received by the origin country. The "probabilistic" models (Todaro 1960, Harris and Todaro 1970, or Bowles 1970) describe the migration process as a research of financial opportunities aiming at exploiting a wage differential between two more or less distant regions. Indeed, because a same skill can be differently promoted according to countries (accordind to its relative rarity), the decision to migrate is made in the hope to picking up this benefit. Thus in 1969, Todaro explains that what causes mainly the internal emigration from rural regions to urban regions is the wages differential. More recently, from a panel sample of many african countries over the period 1977-1995, Hatton and Williamson (1998) find that the more the income gap between the origin country and the destination country is high, the more the emigration rate will be important. We approximate in our study this wages differential by the income per capita gap between the origin country and the main recipient country. The main recipient country of each country in our sample and the income gap between them have beeen reported in the appendix 3.

In order to take into account the costs of migration (which remains a significant determinant of remittances flows) which can be mitigated by network effects, we balance the distance between the sending country i and the six main OCDE countries by an Herfindhal index of the number of migrants from i who have settled in the 6 OCDE countries. We suppose that if this ratio decreases (when network of migrants is expanding), the emigration rate will increase, what will have a positive effect on the remittances flows received by the origin country. We also use the variable suggered by Chami and al. (2008) which captures the trend of remittances in the world at the time t. This variable measures the amount of remittances received by all sending countries composing the sample except the country i considered. Finallly, we introduce the lagged remittances variable as an instrument. The interest rate gap would be also a good instrument but the lack of data prevents us of using it. The correlation matrix between

these instrumental variable and our dependant variable has been reported in the appendix 2.

Instrument	Definition
Rem_{t-1}	Remittance per capita lagged
ΔGDP	Income gap between the sender country i and
	the main recipient country
Distance/N	Distance between i and the 6 main OCDE countries
	divided by network in each OCDE country
Chami	Remittances received by all countries except the country i

The auxiliary equation shows us the force of our instruments: they all are significant. Moreover we can also observe their large explanation power (by looking at the F-test corresponding to our external instruments).We can say that our instruments represent significant determinants of remittances. We can notice that the estimated coefficient on the income gap is negative and significant. This result confirms the idea that a main motivation of remittances is to compensate their families for bad economic outcomes. When we introduce in the second equation the residual we get from the first, this one does not appear with a significant way. Then we can conclude that the remittances variable is not endogenous in the poverty function. As a robustness test we also proceed to the hausman test which confrontes the OLS model against the instrumental procedure. We obtain a probability of Chi(2) equal to 0,44 which implies that we have to prefere the OLS method to the instrumental variables method. As a conclusion, it is not necessary to use an instrumental variables methodology.

The direct effect of remittances on the poverty level: fixed-effects estimates

Given that there not seems to be an endogeneity problem concerning the remittances variable, we do not use an instrumental variable method but just an estimate with fixed-effects. Then, after having made sure of the significance of the fixed effects (by an hausman test) we estimate the basic poverty model (table 2, equation(3)). The predictions concerning the expected signs are quite verified. Indeed, whereas inequality increase the poverty headcount level, the average income per capita has a significant and positive effect on poverty reduction. In the second regression we just add remittances per capita. This factor appears significant at a threshold of 10\% and is negatively correlated with the poverty level. Since all of the variables are estimated in log terms, the results can be interpreted as elasticities of poverty with respect to the relevant variable. Then, a 10\% increase in the inflow of remittances is associated with a 1,7\% fall in headcount poverty. Nevertheless, the average income and the Gini coefficient are themselves likely to be influenced by remittances. So, the real effect of remittances on the poverty headcount may be underestimated. By removing the income variable, the significance and the coefficient (the absolute value) of the remittances variable increase. So, remittances appear to have a

Table 1: Test of the remittances' endogeneity

	Remittances per capita	Poverty headcount
	(1)	(2)
Gini	1.4O*	2.97***
	(1.83)	(3.94)
GDP	1.19*	-1.754***
	(1.82)	(-2.97)
Rem_t		0.206
		(0.11)
Rem_{t-1}	0.271***	
	(3.16)	
Δ GDP	1.50**	
	(2.44)	
Distance/N	0.185**	
	(3.35)	
Chami	1.63	
	(1.23)	
Residual		-0.048
		(-0.31)
Observations	122	120
Countries	58	58
R^2	0.60	0.25
F-statistic excluded instruments	8.55	
p-value	0.0001	

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively. All variables are expressed in logarithms.

positive effect on income. But they also seem to have a positive effect on the Gini coefficient, which is in accordance to the results of Adams (1991) and to the hypothesis that there are important emigration costs. Although remittances alleviate poverty, paradoxically they also contribute to incrase the Gini coefficient. Nevertheless, we do not find that the residual effect of remittances on the poverty gap is significant. Given that the effect of remittances on poverty may pass mainly through the average income and the Gini coefficient, the effect of remittances can be underestimated. So we purge the average income and the Gini coefficient of the effect remittances have on each variable.

	Poverty headcount level			Poverty gap		
	(1)	(2)	(3)	(4)	(5)	(6)
Gini	2.981***	2.41***		4.684***	3.252***	
	(4.38)	(4.87)		(6.95)	(5.81)	
GDP	-1.972***		-1.785***	-2.958***		-1.646***
	(-4.64)		(-3.69)	(-8.33)		(-7.11)
Rem	-0.174*	-0.271***	-0.143	-0.150**	-0.346***	-0.126*
	(-1.82)	(-4.18)	(-1.36)	(-2.45)	(-5.82)	(-1.97)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	156	197	156	155	196	155
Countries	63	65	63	63	65	63
R^2	0.35	0.21	0.22	0.42	0.23	0.22
F-statistic	14.15	22.05	10.25	16.56	27.44	9.34

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively. All variables are expressed in logarithms.

Table 2: The effect of remittances on income and inequality

	GDP	Gini
	(1)	(2)
Rem	0.039	0.014
	(2.87)***	(1.66)*
Fixed effects	Yes	Yes
Observations	223	200
Countries	65	65
R^2	0.06	0.02
F-statistic	8.23	2.77

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively. All variables are expressed in logarithms.

We then proceed to the same estimates but we take now into account the effect remittances can have on income per capita and on the Gini coefficient.

Table 3: The effect of remittances on the poverty level by taking into account the effect of remittances on income and inequality

	Poverty headcount level	Poverty gap
	(1)	(2)
net Gini	2.981***	4.684***
	(3.17)	(4.00)
net GDP	-1.972***	-2.958***
	(-3.78)	(-3.77)
Rem	-0.209***	-0.232***
	(-2.26)	(-3.10)
Fixed effects	Yes	Yes
Observations	156	155
Countries	63	63
R^2	0.36	0.42
F-statistic	14.15	16.56

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively. All variables are expressed in logarithms.

As expected, by taking into account the effect remittances have on the average income and on income inequality, the significance of the remittances variable raises. In all the following estimates, we use the income per capita and the Gini coefficient net of the effect of remittances.

We then add each by each the different variables of instability to the second equation (table 5, 6 and 7). First of all, the terms of trade instability seems to have a positive and quiet significant effect on poverty (equation (1)). In the following equation we introduce simultaneously the remittances and the terms of trade instability variables. We thus have the specific effect of each variable. By adding the instability variable, the remittances one wins some significance. The effect of remittances on poverty reduction seems so to be amplified in presence of terms of trade instability.

Finally, we include the interactive term *TT instability*Remittances* next to the specific variables of remittances and of instability. We observe that this variable appears significant. Even if the remittances variable looses some significance we can conclude that, in presence of terms of trade instability in the origin country, the negative effect of remittances on poverty would be amplified. So, it seems that remittances can cushion the harmful effect of instability on the poverty headcount, and that on the contrary, instability increases the remittances effectiveness in terms of poverty reduction.

From this estimate we can calculate the marginal effect of remittances (instability) on poverty, which depends on instability (remittances) value. At the mean value of terms of trade instability, which is 9.07, the marginal effect of

Table 4: Specific and joined effects of remittances and trade instablity on poverty

	Poverty headcount level		
	(1)	(2)	(3)
Gini	3.214***	3.706***	3.907***
	(4.18)	(2.80)	(3.45)
GDP	-2.015***	-1.870***	-1.993***
	(-5.15)	(-3.33)	(-3.55)
Rem		-0.145***	-0.067
		(-2.75)	(-0.78)
TT Inst	0.017	0.012	0.027*
	(1.40)	(1.03)	(1.81)
Interaction			-0.006*
			(-1.66)
Fixed Effects	Yes	Yes	Yes
Observations	123	113	113
Countries	54	51	51
R^2	0.37	0.45	0.47
F-statistic	11.31	11.16	10.96

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively.
All variables are expressed in logarithms except instability.

remittances on poverty is about -0.067-0.006(9.07)=-0,12. At the same time, at the mean value of remittances per capita (in log terms), the marginal effect of the terms of trade instability is about 0,027-0,006(2,179)=0,014. This results illustrate the fact the effect of remittances on poverty is all the more important that the terms of trade instability is high, or that the terms of trade instability is dampened by remittances.

Then we carried out the same type of estimates but this time we used a variable of climatic instability instead of trade instability. We can observe in the equation(3) that the interaction term has the expected sign and is significant. As the same time the remittances coefficient remains significant. So, remittances seem to dampen the nefast effect of natural instability. Finally, we tested our hypothesis with a more general measure of instability: the income per capita instability. But the results were so not convincing that we do not present them here. As a conclusion, remittances seem to have a softening effect on the nefast influence exercices by instability on poverty. Nevertheless, our hypothesis appears to be above all verified in the case of terms of trade and climatic instability.

Table 5: Specific and joined effects of remittances and agricultural instablity on poverty

	Poverty headcount level		
	(1)	(2)	(3)
Gini purged	2.605***	2.853***	2.823***
	(3.67)	(2.56)	(3.16)
GDP purged	-2.454***	-2.220***	-2.102***
	(-5.44)	(-4.53)	(-4.37)
Remittances		-0.144**	-0.419**
		(-2.08)	(-2.48)
AGRI Instability	0.005	0.009	0.012
	(1.09)	(1.20)	(0.92)
AGRI Interaction			-0.008**
			(-2.00)
Fixed effects	Yes	Yes	Yes
Observations	162	150	150
Countries	63	60	60
R^2	0.36	0.39	0.42
F-statistic	11.83	9.68	8.63

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively. All variables are expressed in logarithms except instability.

In order to verify the validity of our results we perform robustness checks by proceeding to the same estimates on the period 1980-2000 by using the average

of the variables on each decade (1980-1990 and 1991-2000). It seems that our results are rather confirmed on this sample too (see appendix 4).

The direct effect of remittances on the depth of poverty

we also tried to test our hypothesis on the depth of poverty. We do these tests with the terms of trade instability and the climatic instability because we obtained the best results with these variables in the last part.

We can note that the interaction term has the expected sign and is significant. So, even if the remittances variable looses its significance with the inclusion of the multiplicative term, it appears that remittances dampen partly the nefast effect of trade instability on poverty depth. Concerning the agricultural production instability, we notice first that the significance of remittances raises in presence of the climatic instability. Furthermore, by adding the interaction term, which has a negative and significant effect, the remittances variable remains significant. So, remittances seem to be all the more efficient in terms of poverty gap reduction that the climatic instability in the origin country is high.

Table 6: The specific and joined effects of remittances and of commercial instability on the depth of poverty

	The poverty gap			
	(1)	(2)	(3)	(4)
Gini	5.695***	4.684***	5.954***	6.231***
	(4.00)	(5.62)	(3.58)	(3.96)
GDP	-2.937***	-2.958***	-2.884***	-3.022***
	(-3.77)	(-5.36)	(-3.70)	(-4.08)
Remittances	-0.232***		-0.218***	-0.147
	(-3.10)		(-2.98)	(-1.43)
TT Instability		0.029*	0.029*	0.044**
		(1.82)	(1.94)	(2.32)
TT Interaction				-0.009*
				(-1.90)
Fixed effects	Yes	Yes	Yes	Yes
Observations	155	155	113	113
Countries	63	63	51	51
R^2	0.42	0.42	0.51	0.52
F-statistic	16.56	16.96	8.19	8.74

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively. All variables are expressed in logarithms except instability.

Table 7: The specific and joined effects of remittances and of climatic instability on the depth of poverty

	The poverty gap			
	(1)	(2)	(3)	(4)
Gini	4.332***	4.684***	4.357***	4.560***
	(4.00)	(5.62)	(3.08)	(3.59)
GDP	-3.351***	-2.958***	-3.210***	-2.975***
	(-3.77)	(-5.36)	(-4.72)	(-4.43)
Remittances		-0.232***	-0.219***	-0.406**
		(-3.10)	(-3.34)	(-2.46)
AGRI Instability	0.019**		0.024***	-0.012
	(2.26)		(2.81)	(0.84)
AGRI Interaction				-0.008**
				(-2.05)
Fixed effects	Yes	Yes	Yes	Yes
Observations	150	150	150	150
Countries	60	60	60	60
R^2	0.42	0.43	0.43	0.46
F-statistic	15.27	16.56	8.19	10.10

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively. All variables are expressed in logarithms except instability.

Concluding remarks

This study aims at showing the effect of remittances on the poverty level in the origin countries of the migrants. Indeed, we show that at the macro-economic level, by having controlled for the unobserved heterogeneity between countries and the effect remittances have on the average income and on the Gini coefficient, and after having tested for the remittances endogeneity, remittances play a positive and effective role in reducing the poverty headcount and the poverty gap in the migrants' origin countries.

Moreover, The results concerning the sign and the significance of the multiplicative term (above all in the case of trade and climatic instability) let us envisage that migrants remittances play a role in mitigating the poverty-increasing effect of macroeconomic shocks. In other words, the remittances effect on poverty reduction would be all the more important that the macroeconomic instability in the countries of origin is great.

Given that remittances exercise a smoothing effect on shocks in often very vulnerable economies, it is easy to understand the importance of migrants remittances for poverty reduction in developing countries. Remittances can allow them to fill up partly the imperfections or even sometimes the lack of insurance markets in their origin countries. So, these flows become necessary for households in countries where incomes are subject to frequent and important fluctuations. Given that this instability of income is particularly harmful for the most deprivate fringes of the population, by softening its effect, remittances play a not negligible role in the poverty reduction.

To complete this study, the newt step will be to add the ODA variable in our model, in order to examine the substitutability or the complementary relation between the public foreign aid and the private foreign aid.

References

Appendix1- Descriptive Statitics

Variable	Obs	Average	St. error	Min	Max	Unit of measure
Poverty	221	20,32	21,74	0	90,26	Percent
Poverty gap	221	7,55	10,39	0	52,72	Percent
Rem/capita	293	36,32	69,79	0,010	478,6	Constant US $
Gini	221	43,90	9,25	22,76	74,33	From 0 to 100
GDP/capita	253	3459	2474	462,8	11167	Constant US $
TT instability	230	9,43	6,03	0,17	30,47	Distance to the trend
GDP instability	329	4,45	3,09	0,40	31,27	Distance to the trend
Agri instability	330	27,09	21,45	0	100	Distance to the trend
Distance	339	2821,7	1681	185,9	7190	Miles
Income gap	332	3,50e+12	3,59e+12	5,16e+10	1,44e+13	Constant US $

Appendix2 - The correlation matrix instruments-remittances

	Rem_t	Rem_{t-1}	Δ GDP	Distance/N	Chami
Rem_t	1.00				
Rem_{t-1}	0.899***	1.00			
Δ GDP	0.112*	0.039	1.00		
Distance/N	0.141**	0.096	-0.049	1.00	
Chami	0.185***	0.119*	0.145**	0.018	1.00

Notes: ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively.

Appendix 3 - The income gap between the origin countries and their principal destination country

Origin country	Principal destination country	Average income gap between 1980 and 2005
Algeria		1,12E+12
Burkina Faso		1,16E+12
Cameroon		1,15E+12
Central Africa		1,16E+12
Ivorian Coast		1,15E+12
Madagascar		1,16E+12
Mali	France	1,16E+12
Mauritanie		1,16E+12
Morocco		1,13E+12
Niger		1,16E+12
Senegal		1,15E+12
Tunisia		1,14E+12
Vietnam		1,14E+12
Bangladesh		5,06E+11
Cambodia		6,02E+11
Egypt		4,85E+11
Ethiopia		5,37E+11
India		2,09E+11
Indonesia		3,81E+11
Iran		4,58E+11
Jordan	Saudi Arabia	5,37E+11
Malaysia		4,67E+11
Pakistan		4,89E+11
Sri Lanka		5,31E+11
Thailand		4,14E+11
Yemen		5,63E+11
Lesotho		5,52E+11
Namibia	South Africa	5,49E+11
Swaziland		5,52E+11
Burundi	Belgium	2,08E+11
Rwanda		2,07E+11

Turkey	Germany	1,48E+12
Argentina		7,55E+12
Bolivia		7,78E+12
Brazil		7,13E+12
Chile		7,73E+12
China		7,16E+12
Colombia		7,71E+12
Costa Rica		7,78E+12
Dominican Republic		7,78E+12
El Ecuador		7,78E+12
El Salvador		7,78E+12
The Gambia		8,09E+11
Guatemala		7,78E+12
Guyane	United States	7,79E+12
Honduras		7,78E+12
Jamaica		7,78E+12
Mexico		7,50E+12
Nicaragua		8,65E+12
Panama		7,78E+12
Paraguay		7,78E+12
Peru		7,75E+12
Tninidad and Tobago		7,78E+12
Uruguay		7,78E+12
Venezuela		7,73E+12
Botswana		8,04E+11
Ghana		8,03E+11
Kenya		8,01E+11
Nigeria		7,83E+11
South Africa	United Kingdom	6,57E+11
Tanzania		8,53E+11
Uganda		6,70E+11
Zambia		8,06E+11
Zimbabwe		8,02E+11
Nepal	India	9,28E+12

Appendix 4 - Poverty dataset details

Country	Survey year
Algeria	1988, 1995
Argentina	1986, 1992, 1996, 1998, 2002, 2005
Bangladesh	1991, 1995, 2000, 2005
Belarus	1988, 1993, 1997, 1998, 2000, 2002, 2005
Bolivia	1990, 1997, 1999, 2002, 2005
Botswana	1985, 1993
Brazil	1981, 1984, 1987, 1990, 1993, 1996, 1999, 2002, 2005
Burkina Faso	1994, 1998, 2003
Cambodia	1994, 2004
Cameroon	1996, 2001
Central African Rep.	1993, 2003
Chile	1987, 1990, 1994, 1996, 1998, 2000, 2003
China	1981, 1984, 1987, 1990, 1993, 1996, 1999, 2002, 2005
Colombia	1980, 1988, 1991, 1995, 1996, 1999, 2000, 2003
Costa Rica	1981, 1986, 1990, 1993, 1996, 1998, 2000, 2001, 2003, 2005
Cote d'Ivoire	1985, 1987, 1990, 1993, 1995, 1998, 2002
Dominican Republic	1986, 1989, 1992, 1996, 2000, 2003, 2005
Ecuador	1987, 1994, 1998, 2003, 2005
Egypt	1990, 1995, 1999, 2004
El Salvador	1989, 1995, 1996, 1998, 2000, 2002, 2003
Ethiopia	1981, 1995, 1999, 2005
Gambia, The	1998, 2003
Ghana	1987, 1988, 1991, 1998, 2005
Guatemala	1987, 1989, 1998, 2000, 2002
Guyana	1992, 1998
Honduras	1990, 1992, 1994, 1997, 1999, 2003, 2005
India	1983, 1987, 1993, 2004
Indonesia	1984, 1987, 1990, 1993, 1996, 1999, 2002, 2005
Iran	1986, 1990, 1994, 1998, 2005
Jamaica	1988, 1990, 1993, 1996, 1999, 2002, 2004
Jordan	1986, 1992, 1997, 2002
Kazakhstan	1988, 1993, 1996, 2001, 2002, 2003

Country	Survey year
Kenya	1992, 1994, 1997, 2005
Kyrgyz Republic	1988, 1993, 1998, 1999, 2002, 2004
Laos	1992, 1997, 2002
Lesotho	1986, 1993, 1995, 2002
Madagascar	1980, 1993, 1999, 2001, 2005
Malaysia	1984, 1987, 1989, 1992, 1995, 1997, 2004
Mali	1994, 2001, 2006
Mauritania	1987, 1993, 1995, 2000
Mexico	1984, 1989, 1992, 1994, 1996, 1998, 2000, 2002, 2004
Mongolia	1995, 1998, 2002, 2005
Morocco	1984, 1990, 1998, 2000
Mozambique	1996, 2002
Namibia	1993
Nepal	1995, 2003
Nicaragua	1993, 1998, 2001, 2005
Niger	1992, 1994, 2005
Nigeria	1985, 1992, 1996, 2003
Pakistan	1987, 1990, 1992, 1996, 1998, 2001, 2004
Panama	1991, 1995, 1996, 1997, 2000, 2002, 2004
Paraguay	1990, 1995, 1997, 1999, 2002, 2005
Peru	1985, 1990, 1994, 1996, 2002, 2005
Rwanda	1984, 2000
Senegal	1991, 1994, 2001, 2005
South Africa	1993, 1995, 2000
Sri Lanka	1985, 1990, 1995, 2002
Swaziland	1994, 2000
Tanzania	1991, 2000
Thailand	1981, 1988, 1992, 1996, 1999, 2002, 2004
Trinidad and Tobago	1988, 1992
Tunisia	1985, 1990, 1995, 2000
Turkey	1987, 1994, 2002, 2005
Uganda	1989, 1992, 1996, 1999, 2002, 2005
Uruguay	1981, 1989
Venezuela	1981, 1987, 1989, 1993, 1996, 1998, 2003
Vietnam	1992, 1998, 2002, 2004, 2006
Yemen	1992, 1998, 2005
Zimbabwe	1990, 1995

Appendix 5 - The robustness test

	Poverty headcount level	
Gini	2.930***	2.929***
	(5.02)	(4.70)
GDP	-1.496***	-1.460***
	(-8.41)	(-7.53)
Rem	-0.194***	-0.114*
	(-2.95)	(-1.77)
TT Instability		0.028
		(1.08)
Interaction		-0.037*
		(-1.74)
Observations	107	90
R2	0.19	0.29

Notes: Robust t-student in parentheses; ***, ** , * represent statistical significance at the 1, 5, and 10 percent, respectively.
All variables are expressed in logarithms except instability.