The causal relationship between remittances and poverty reduction in developing country: using a non-stationary dynamic panel data

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Abstract

The aim of this article is to investigate the causal relationship between remittances and poverty reduction for 14 emerging and developing countries over the period 1980-2012. We proposed a cointegration analysis, using the method of non-stationary dynamic panel data. Our estimation results reveal that causality nexus of poverty and remittances is bi-directional. We also find that the causal impact of poverty reduction on remittance is stronger than the reverse impact. Indeed, despite of its weak impact on the poverty, remittances should be taken seriously, and this by taking measures by developed countries to facilitate the access of immigrants to their territories. Such an initiative could reduce to some extent the inequalities within developing countries.

Resumen

El objetivo de este artículo es investigar la relación causal entre las remesas y la reducción de la pobreza para 14 emergentes y los países en desarrollo durante el período 1980-2012. Hemos propuesto un análisis de cointegración, utilizando el método de datos de panel dinámico no estacionarios. Nuestra estimación de resultados revelan ese nexo de causalidad de la pobreza y de las remesas es bidireccional. También encontramos que el impacto de la reducción de la pobreza en remesas causal es más fuerte que el efecto inverso. En efecto, a pesar de su débil impacto en la pobreza, las remesas deben tomarse en serio, y esta tomando las medidas adoptadas por los países desarrollados a facilitar el acceso de inmigrantes a sus territorios. Tal iniciativa podría reducir en cierta medida las desigualdades dentro de los países en desarrollo.

KeyWords: remittances, poverty, developing countries, cointégration, dynamic panel, causality.

Jel Classification: I32, J15, C51, C01, C23, C33

1.- Introduction

International migration is one of the most important factors affecting economic relations between developed and developing countries in the 21st Century. According to the United Nations (UN), the stock of international migrants estimated is more than 215 million people in 2009, meaning that 3,1% of the world's people were living outside their country of birth (WB, 2011). In 2012, the flow of international remittances to developing countries stood at $401 billion, a figure which was much higher than total official aid flows to the developing world (WB, 2013). Certainly, the size of these flows relative to the size of the recipient economies, the likelihood that these flows will continue unabated into the future through continued globalization trends, and the fact that these flows are quite distinct from those of official aid or private capital (IMF,2008), these features suggest that remittances' macroeconomic effects are likely to be substantial and sustained over time, and may have implications for policymakers in recipient countries.

Admittedly, the remittances sent back home by migrant workers have a profound impact on the living standards of people in the developing countries of Asia, Africa, Latin America and the Middle East (Acosta and al., 2008, Semyonov and Gorodzeisky, 2008 , Cox-Edwards and Rodríguez-Oreggia, 2009, Quisumbing and McNiven, 2010, Adams, 2011, Taylor, 1999). Their potential economic impact have attracted the attention of policymakers and researchers in recent years, as evidenced by a growing literature aimed at analyzing remittances and their consequences for individual countries. Indeed, remittances reduce poverty through increased incomes, allow for greater investment in physical assets and in education and health, and also enable access to a larger pool of knowledge (Adams, 2011). Previous studies examine the effect of international migration and remittances on poverty of a village or individual country with specific parameters (McKenzie and Rapoport , 2010 , Duval and Wolff, 201 , Akay and al., 2012) , De Brauw, 2013) . Indeed, we are not aware of any studies that examine the impact of the phenomenon of migration on poverty of a set of developing countries. Generally, the pannel studies provide more credible results. It is for this reason that the article proposes to examine the impact of remittances on poverty reduction , and this by using a data set consisting of 14 developing countries. Indeed, using dynamic pannel technique , we can obtain reliable results on the potential impact of remittances on poverty reduction .

2. Remittances: The empirical evidence

The empirical evidence points toward a negative relationship between poverty and remittances (Lucas, 2004). International migration can have a positive impact on poverty reduction through the generation of migrant remittances (Skeldon, 1997, 2002, Kothari, 2002, Wets, 2004, De Haas, 2005, Adams and Page, 2005, and Adams, 2006a,b). Adams and Page (2003) however show that a 10 percent rise in the number of international migrants results in a 1.6 percent decline in the poverty headcount at national level. Adams (1991) found that in rural Egypt, the number of poor households declines by 9.8 percent when household income includes international remittances, and that remittances account for 14.7 percent of total income of poor households. Adams and Page (2003) concluded that international remittances -- defined as the share of remittances in country GDP – has a strong, statistical impact on reducing poverty. On average, a 10 percent increase in the share of international remittances in a country's GDP will lead to a 1.6 percent decline in the share of people living in poverty.

Jongwanich (2007) showed that, while remittances do have a significant impact on poverty reduction through increasing income, smoothing consumption and easing capital constraints of the poor, they have only a marginal impact on growth operating through domestic investment and human capital development. Bouchachen (2000) argues that remittances allow a large number of households to achieve a decent income. Other localized studies have concluded that remittances tend to improve the welfare of poorer rural households (Stark and Taylor, 1989). Sorensen (2004) found that remittances reduced the number Moroccans living in poverty by 1.2 million. Lachaud (1999) looked at

remittances to Burkina Faso in 1994-1995 and found that they went mostly to rural households headed by farmers or inactive people. They reduced rural poverty by 7.2 percentage points and urban poverty by 3.2 percentage points. Leliveld (1997) and Gustafsson and Makonnen (1993) concluded that in Lesotho remittances play a very important role in giving households the means to achieve at least minimum food requirements.

Quartey and Blankson (2004) have concluded that migrant remittances to Ghana are in fact countercyclical and are effective in helping smooth household consumption and welfare over time, especially for food crop farmers, who are typically the most disadvantaged socioeconomic group. Similarly, Adams (2006a,b) found that international remittances significantly relived poverty among the "poorest of poor households". Study by Gupta et al (2007) has found that remittances tend to lower poverty. Ratha (2003) had suggested that remittances that raise the consumption levels of rural households might have substantial multiplier effects because they are more likely to be spent on domestically produced goods. Also Maimbo and Ratha (2005) found that, in terms of poverty reduction, rural areas tend to benefit the most because much of the world's migrants are drawn from these areas. The results suggested by the above studies depict the vital role of remittances in reducing poverty. However, there are few studies which use modern estimation techniques.

3. Remittances and Poverty: Data sources and Econometric model

Our evaluation of the impact of remittances in developing countries is based on an empirical data set that includes data on remittances and poverty for as many developing countries and time periods as possible. The paper uses data from 14 emerging and developing countries[3] covering the period 1980-2012. Remittance data were obtained from IMF, Balance of Payments Statistics Yearbook Indeed. The International Monetary Fund (IMF) keeps annual records of the amount of worker remittances received by each labor-exporting country. However, the IMF only reports data on official worker remittance flows, that is, remittance monies which are transmitted through official banking channels. Since a large (and unknown) proportion of remittance monies is transmitted through private, unofficial channels, the level of remittances recorded by the IMF underestimates the actual flow of remittance monies returning to labor-exporting countries. For the poverty data were derived from World Bank, more precisely from Global Poverty Monitoring database. In our study, we will use the basic growth-poverty model suggested by Ravallion (1997) and Ravallion and Chen (1997). We propose a four-step analysis with the study of stationarity, cointegration, causality and finally decomposition of the variance of the forecast error.

The relationship that they want to estimate can be written as:

$$\log(P_{it}) = \alpha_i + \beta_1 \log(Y_{it}) + \beta_2 \log(G_{it}) + \beta_3 \log(RM_{it}) + \varepsilon_{it} \quad (1)$$

Where:

P_{it}: is the measure of poverty in country *i* at time *t*,

Y_{it} : is the per capita real GDP

G_{it}: is the Gini coefficient, it is a measure of the degree of inequality of income distribution in a given society

RM_{it}: are the remittances to GDP ratio

ε_{it}: is an error term that includes errors in the poverty measure.

To examine the nature of the association between variables, while avoiding any spurious correlation, empirical research in this part follow this four steps: We begin by determining the non-stationarity for all variables. Then we decide the existence of unit root time series and test the long-term cointegration relationship between the variables in the second stage. Granted the ratio of long-

[3] Country of Central and Eastern Europe "ECO" and some countries of the MENA region (Middle East and North Africa): Lithuania (LTU), Hungary (HUN), Czech Republic (CZE), romania, bulgaria (BGR) poland (POL), Algeria (DZE), Tunisia (TUN), Egypt (EGY), Saudi Arabia (SAU), Syria (SYR), Morocco (MAR), iran (IRN) and Lybia (LYB).

term, we explore the causal relationship between the variables after determining Granger causality in the third step. In the end, we will study the decomposition of variance.

4. Econometric modeling and results:

The results, shown in table 1, of the unit root tests in panel are consistent and prove that all variables are integrated of order one. All series are non-stationary, and it is possible to model through a VAR process. For the four variables, the null hypothesis of no unit root could not be rejected in level. But, in first difference, this hypothesis is rejected for all the variables. Indeed, Fisher's test confirms the most of these results, while Levin and Lin's test come to mixed results. In conclusion, the series in the panel are all integrated of order 1. On the other hand, if we take the two test cases for which the null hypothesis is that of stationnarity, we can actually draw the same conclusions as earlier, about the integration of variables from the first difference. Indeed, the null hypothesis of the Hadri's test could not be accepted in level, but it is, in first differences for the variables $\log(P_{it})$ and $\log((_1it)$, and in second difference for the other two variables ($\log(g_{it})$ and $\log(RM_{it})$). This allows us to conclude that, according to Hadri, these two variables are integrated of order 2: I (2).

Table 1: Panel unit root test

Exogenous variables: Individual effects

Variable	$\log(P_{it})$	$\Delta\log(P_{it})$	$\log((_1it)$	$\Delta\log((_1it$	$\log(g_{it})$	$\Delta\log(g_{it})$	$\log(RM_{it})$	$\Delta\log(RM_{it})$
Null: Unit root (assumes common unit root process)								
Levin, Lin & Chu t*	0.7303	3.67379	-0.3417	-5.4783	4.98460	12. 5567	-3.6327	-11.5975
	(0.8510)	(0.0001)	(0.9314)	(0.0000)	(0.0432)	(0.0021)	(0.0701)	(0.0000)
Null: Unit root (assumes individual unit root process)								
Im, Pesaran and Shin W-stat	1.53306	1.21116	-1.00442	-3.3212	0.45077	3.43309	-2.00987	-6.44089
	(0.8927)	(0.0013)	(0.8780)	(0.0001)	(0.3261)	(0.0003)	(0.3324)	(0.0000)
ADF - Fisher Chi-square	10. 5401	45.0353	5.1117	33.1233	10.4201	40.6004	30.9984	117.002
	(0.9797)	(0.0006)	(0.6605)	(0.0044)	(0.2506)	(0.0001)	(0.0056)	(0.0000)
PP - Fisher Chi-square	1.0872	11.3371	1.0083	25.5544	13.0004	57.868	4.1470	77.015
	(0.9987)	0.0077	(0.9998)	(0.0006)	(0.3922)	(0.0000)	(0.0052)	(0.0000)
Null Hypothesis: Stationarity								
Hadri Z-stat	5.55545	0.31129	24.7510	0.22434	8.8334	0.99834	17.0310	2.03325
	(0.0000)	(0.4760)	(0.0000)	(0.4440)	(0.0000)	(0.0361)	(0.0000)	(0.0551)
Heteroscedastic Consistent Z-stat	15.3441	1.0105	19.3381	3.0744	9.40693	1.96228	15.0266	9.0229
	(0.0000)	(0.4574)	(0.0000)	(0.4411)	(0.0000)	(0.0566)	(0.0000)	(0.0431)

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution.
All other tests assume asymptotic normality.

Indeed, since the series are all integrated of order 1, it can be modeled according to a correction error model "VECM (p)". To this end, and to determine the number of lags in our analysis, we estimated various process "VAR" for levels of lags (p) from 1 to 3. For each model, we calculated the Akaike information criteria (AIC), the Schwarz criterion (SIC) as well as the log-likelihood (LV).

Certainly, the results obtained and shown in the table (2) prove that the process to remember is a process with a single lag.

Table 2: Nombre of lags

	1	2	3
Akaike Info Criterion	**-4,114**	-4,1581	-4,0619
Schwarz Info Criterion	**-4,778**	-4,0147	-2,843
Log Likelihood	**448,58**	440,61	411,542

The variables that showed the same order of integration will be used to estimate the cointegrating regression, which justifies the use of cointegration test of Pedroni. The null hypothesis of cointegration test of Pedroni [1999] is the absence of cointegration. The rejection of this hypothesis allows us to conclude the existence of a cointegration relationship between the variables. It should be noted that for small samples, the ADF-Stat built from the "between" model is the most robust. It is this statistic that we use to test the cointegrating relationship between aggregate governance and economic growth. Indeed, under the alternative hypothesis (H_1: $\rho_i < 1$, for all *i*), the value of the Group-ADF tends to -∞, the null hypothesis of no cointegration is rejected for values that tend toward the left tail of the Gaussian distribution. Thus, to 5%, we accept the existence of a cointegration relationship when the Group-ADF statistic is less than -1.645. On the other hand, there are, among the six other statistics, those that tend to +∞ under the alternative hypothesis and we use the positive tail of the normal distribution to reject the null hypothesis. Therefore, these statistics are to be compared to 1.645 at the error threshold of 5%. In conclusion, if the statistics are greater than 1.645 or less than -1.645, then we reject the null hypothesis and accept the fact of existence of cointegration between the variables studied.

The results of the cointegration tests of Pedroni [1999] are shown in Table (3). As can be seen in the overall sample, the seven tests determine the existence of a cointegration relationship between Poverty (P_{it}) and the explanatory variables. Indeed, the results of the Group-ADF statistic seem to confirm the existence of a cointegrating relationship between remittances and poverty reduction. These results were confirmed also by the test Kao, since the probability of the test is less than 5% and therefore we can conclude on the rejection of the hypothesis of no cointegration.

Table 3: Panel Cointegration tests

Pedroni Residual Cointegration Test

Series:

$\log(P_{it})$, $\log((_{it})$, $\log(g_{it})$, $\log([RM])$

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-140.5657	0.8799	-0. 254351	0.7744
Panel rho-Statistic	1.811566	0.6687	1.481106	0.6626
Panel PP-Statistic	-0.963335	0.2336	0.213050	0.1453
Panel ADF-Statistic	-1.023420	0.0013	-2.778401	0.0046

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	9.667691	0.9993
Group PP-Statistic	0.222037	0.2307
Group ADF-Statistic	-1.259900	0.0002

Kao Residual Cointegration Test

ADF	*t-Statistic*	*Prob.*
	-3.321613	0.0000

Source: Author's calculation

At this stage, given that the hypothesis of cointegration is adopted, it is important to determine the number of cointegrating equations using the trace test (Johansen test). In this test, the null hypothesis of no cointegration has been denied in level 2. Table (4) presents the results of this test shows that there are two cointegrating relationships.

Table 4: trace test of Johansen

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.
None	443.8	0.0000
At most 1	166.4	0.0000
At most 2	**17.5**	**0.4384**
At most 3	97.2	0.0000

Therefore, for each country in our sample, there are more than one cointegration relationships not necessarily the same for all. Therefore, it is necessary to apply a method of estimating effective. In this context, we will use the FMOLS method (Full Modified Ordinary Least Square) used by Pedroni to clearly specify the long-term relationship that connects poverty reduction in our basic variables and essentially remittances.

Estimation of the cointegrating relationship by fully modified ordinary least square method for different countries in our sample is presented in Table (5) below:

Table 5: Estimation by Fully Modified Least Squares model (FMOLS)

Pays	$\log((_{\mu}lt)$	$\log(g_{lt})$	$\log(RM_{lt})$	C
LTU	-1.005***	0.972***	-0.0492	14.698
HUN	-0.959**	1.0018***	-0.0433	-13.7731
CZE	-0.9736	0.959***	-0.21803***	-41.7403**
BGR	-1.0122	0.977***	-0.305387*	12.06455
POL	-0.947	1.0025***	-0.138623	-13.294
ROU	-0.9754**	0.989***	-0.034390	0.241209
DZE	-0.941**	0.975***	-0.022825	-2.784636
TUN	1.094447	0.486692*	-0.03298	-8. 7894**
EGY	-0.932**	0.9727***	-0.08877**	-14.53***
SYR	-0.9439***	0.9932***	-0.064265	0.264
SAU	-1.0013***	0.965***	-0.25648***	-0.737227
MAR	-1.0045***	1.00391***	-0.092470	-10.72636*
IRN	-0.9922***	0.927821***	-0.045009	3.56510***
LYB	-0.946751***	1.015***	-0.250286	-2.354582
PANEL	-1.026108***	0.92661***	-0.09345***	1.2139***

(***), (**) et (*) show that the corresponding null hypothesis can be rejected respectively at 1%, 5% or 10%.

Source: Author's calculation

The above results show that remittances has a negative effect on poverty reduction in all countries and it is more significant pros the following countries: the Czech Republic, Bulgaria, Egypt, and Saudi Arabia. Other countries in the sample have negative but insignificant coefficients. The coefficient in panel of remittances is -0.09345 with a Student's statistic equal to 6,22 which implies that

the impact of remittances is significantly negative. The coefficients of per capita GDP (income) and Gini coefficient are consistent with other recent analyses of poverty reduction (Adams, 2003a; Ravallion, 1997) and have expected signs.

At this stage, it is essential to estimate the error correction model that will highlight the common cointegrating relationship (common trend) and deduce the interactions between variables. Table (8) summarizes the results for the estimation of equation (2) for poverty reduction.

$$\Delta \log(P_i it) = \delta_i 11i + \alpha_i 1i \log(P_i(it-1)) + \beta_i 11i \log((_i(it-1)) + \beta_i 12i \log(g_i(it-1)) + \beta_i 13i \log(RM_i(it-$$

Table 6: Estimation du modèle à correction d'erreur pour l'équation (2)

Dependent Variable: $\Delta \log(P_{it})$
Method: Panel Least Squares

	Coefficient	Std. Error	t-Statistic	Prob.
C	3.941662	0.770998	2.070902	0.0198
$\Delta \log((_i it)$	-0.443684	0.037529	-7.452545	0.0000
$\Delta \log(g_{it})$	0.718276	0.216257	1.795439	0.0443
$\Delta \log(RM_{it})$	-0.002062	0.019936	-0.103446	0.9007
$\log(P_{it-1})$	-0.300183	0.054715	-5.665355	0.0000
$\log((_i(it-1))$	0.355245	0.031695	3.856846	0.0002
$\log(g_{it-1})$	-0.433607	0.097006	-2.614357	0.0077
$\log(RM_{it\ 1})$	0.001515	0.014859	-1.707668	0.0981

Source : Calcul de l'auteur

According to the spreadsheet, the error term (TCE = α_{1i}) is negative and significant which validates our use of the error correction model. Indeed, the significance of the error correction term validates the existence of a long-term relationship in the process of cointegration, and the movements between different variables are considered permanent. The long-term imbalances between the poverty reduction, the per capita reel GDP, the gini coefficient and remittances are offset so that the series have similar trends. The value of R^2 = 72.03% shows a good explanatory power of the model. The "TCE" is the speed at which an imbalance between actual and desired levels of poverty is absorbed in the year following any shock. In other words, it corresponds to the automatic stabilizers in the economy. It adjusts 30,01% of the imbalance between the desired and actual level. This percentage is good to stabilize fluctuations in poverty. In case of shocks on remittances and macroeconomic variables, the stabilization process continues and tends to the long term. This explains the volatility of the main aggregates. These aggregates significantly influence the reduction of poverty, both in the short and long term. Moreover, the long-run elasticity's show statistical significances amounting to 1%, 1% and 10% respectively for per capita GDP, Gini coefficient and remittances. While in the short term, the remittances are not significant.

Moreover, the estimated coefficients for per capita GDP and remittances are significantly negative, implying that growth in these factors probably involve a reduction in the poverty especially in the long term in the case of remittances.

In fact, the poverty elasticity's with respect to the per capita GDP (income) and Gini coefficient variables are consistent with other recent analyses of poverty reduction (Adams, 2003a; Ravallion, 1997). The results for the basic specification show that countries with higher income inequality have higher poverty. Indeed, the estimates suggest that, on average, a 1% increase in the income inequality will lead to a 0,443% decline in the poverty headcount in the short term. By cons, any increase of 1% of Gini coefficient causes an increase in the poor population of 0,718%. For the remittances variable, it has been found that it has a small impact on poverty reduction. In other words,

any increases in remittances from immigrants leads to a reduction of 0.0015% of the poverty headcount in the recipient country in the long term.

Thus, we can confirm that remittances have a role in the reduction of poverty in beneficiary's developing countries, but it's still relatively a small-scale compared to the other traditional factors. Indeed, remittances are considered as manna falling from the sky for developing countries, because it represents a free source of income. In this context, with a view to reducing poverty in developing countries, the developed ones should facilitate access of immigrants to their territory. By such a strategy, the recipient country of funds could reduce the burden of poverty on its population without resorting to international aid.

These results have been confirmed by a test of inhomogeneous granger causality on panel data. Indeed, the Fisher test confirmed the rejection of the null hypothesis of homogeneity of non bidirectional cointegration between remittances and poverty reduction. So there is at least one of the countries in our sample for which there is really a bi-causal relationship between these two factors.

Table 7: Homogeneous Non Causality test in panel

Pairwise Granger Causality Tests
Sample: 1980-2010
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
$log(RM_{it})$ does not Granger Cause $log(P_{it})$	462	15.0032	0.0022
$log(P_{it})$ does not Granger Cause $log(RM_{it})$		4.66761	0.0246

Source: Author's calculation

5. Conclusion

Remittances represent a key source of finances for individual families. The question of the effect of the transfer of funds on poverty reduction is generally evoked to the country level. Few studies have examined this relationship on a set of countries, especially in developing countries. For this reason, by using modern techniques, we have focused our study on a sample of 14 developing countries and on which, we have attempted to test the possible relationship of remittances with the poverty headcount.

Indeed, applying the cointegration analysis, and using the method of non-stationary dynamic panel data, the analysis confirmed the reducing effect of remittances on level of the poverty rate of the recipient country. We find that causality nexus of poverty and remittances is bi-directional. We also find that the causal impact of poverty reduction on remittance is stronger than the reverse impact.In this case, despite the weak impact of this source of income on reducing inequalities within the recipient country, it represents a way to avoid the dependence of the international aid of the emerging and developing countries.

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