

# THE EFFECT OF PERSONAL REMITTANCE ON POVERTY REDUCTION IN SUB SAHARAN AFRICA

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**ABSTRACT:** *The objective of this study was to analyze the macroeconomic effects of personal remittance in 29 countries located in the Western and Eastern African regions on poverty alleviation using a panel data of 2000-2014. For poverty reduction effects estimation, random effects model was found to be the appropriate when both regions are pooled together by applying the Hausman model specification test and Breusch-Pagan Lagrangian Multiplier (LM) test. But for separate estimation of West and East regions, random effects for the Eastern and fixed effects for the Western become the appropriate estimation models. Based on the estimation result, remittance has negative significant effect on poverty head count. When remittance receipt increases by 1%, poverty in these countries declines by 2.55%. Thus, the poverty alleviation impact of remittance is significantly higher because of its multiplier effect. When the result is compared in the two regions, the effect in the East is greater than in the west. Governments in Sub-Saharan Africa should work towards smoothing the flow by reducing cost of transfer, to promote saving by the recipient households so that remittance will be made more productive and tackle problems of transfer to bring the informal flow to the formal way.*

**Key Words:** *personal remittance, poverty reduction, macroeconomic effect, remittance in Africa.*

## I. Introduction

### 1.1. BACKGROUND OF THE STUDY

Labor mobility crossing international borders is an increasing phenomenon more than ever before (Ratha, 2013). The growth rate of remittances is greater than the growth rate of FDI and official development assistance (Fayissa and Nsiah, 2008). According to Bannga and Sahu (2010) remittance scored an annual growth rate of 17.7% between 2004 and 2008. Moreover, Sub-Saharan Africa had the second highest growth rate during the same period (29.3%) next to Europe and central Asia (32.5%). The number of worldwide migrant workers increased from 84 million in 1970 to 194 million in 2005 (Naude and Bezuidenhout, 2012). Around 3% world population are considered as migrant (Adams JR. and Page 2005; Hagen-Zanker, 2010; Yaseen, 2012). The cause and way (legally or else) of migration differs from country to country (Hagen-Zanker, 2010). Whatever reason is for migration, workers send a certain portion of their income back to origin (home) countries. The amount remitted has increased from \$2 billion in 1970 to more than \$433 billion in 2008 (Naude and Bezuidenhout, 2012). Developing countries take the largest share of remittances (75%) out of the international total remittance (Emerta et al., 2010).

According to Anderson (2014), approximately 30 million Africans are found in other continents. This represents about 3% of the continent's population (Ratha, et al., 2011). Arising from altruism behavior (i.e. attachment to family members left behind) they send remittances to their respective families. Workers' remittance represents a larger source of hard currency to some of the Sub Saharan nations (Singh, 2009). The amount of the financial flow showed an increasing trend because of increased migrants particularly to rich nations and reduction in transaction cost of remittance flow (Kapur, 2003; Ncube and Brixiova, 2013; Siddique, 2010). For instance, it was estimated to be about \$40 billion during 2010 which is about 2.5% of the continent's GDP. It served as a source of financial resource to reduce the level and severity of poverty in the developing hemisphere of the globe (Ratha, 2013). The concern of this paper is to examine the impact of personal remittance on improving the current accounts balance, growth in nominal GDP & per capita GDP and poverty reduction.

### 1.2. STATEMENT OF THE PROBLEM

Opong (2012) stated that when people consider international financial flow, specially to poor nations, the source that comes first in to their mind is either foreign direct investment or portfolio investment or development assistance (ignoring the role of remittance). However, taking the 2011 data Ratha (2013)

confirmed that recorded remittance flow to developing economies is estimated to be 3 fold more than official development assistance and it was about half of FDI in such nations.

Remittance is found to be less volatile (more stable) relative to FDI and it acts as counter-cyclical, i.e. migrant workers send more during hardship times even if the host economy is not functioning well (Kapur, 2003; Naudé and Bezuidenhout, 2012; Pradhan, et al. 2012; Ratha, 2013). As an example, during the world financial crisis remittance decreased by 5.27% whereas FDI declined by 32.94%. Even after relief of the crisis FDI responded very slowly as compared to remittance. This is seen from data between 2009 and 2011 while remittance increased by 25.29% and FDI increased only by 0.59% (Ratha, 2013).

Migration and remittance have attracted the attention of researchers and policy makers because of its size and economic effects in recipient countries. Despite this growing essence in worldwide financial flow, its relationship with economic growth in SSA has not been studied well (Fayissa and Nsiah, 2008). Migration is considered as a household mechanism to solve the challenges they face due to imperfect market such as credit, insurance and investment limitations (Anderson 2014). There is gap in research findings regarding the positive effects of remittances in general and its effect on economic growth in particular (Ratha, 2013).

Though there are several research findings on the effect of remittances on micro and macroeconomic outcomes in Africa, they could not reach to the same conclusion, i.e. several studies show mixed results regarding the relationship between economic growth and remittance receipt (Ncube and Brixiova, 2013; Singh et al., 2009; Yaseen, 2012; Ratha, 2013; UNCTAD, 2011). That mean that the results are not consistent in that some assert that remittance flow has negative impact on economic growth in the continent (Chami, et al. 2003, Singh, et al., 2009; Spatafora, 2005) and others confirm that it has positive influence (Faini 2002, 2003 in Bangan and Sahu, 2010; Afaha, 2013). Moreover, few researches have been conducted so far in relation to the effects of remittance and poverty reduction (Spatafora, 2005; UNCTAD, 2011) So this paper tries to contribute some empirical findings based on panel data analysis from two major regions of Africa (Eastern and Western). Moreover, studies considered different number of countries in Sub-Saharan Africa. However, there is a tendency for economic integration in African regions, considering region wise effect may give better understanding the effect as well as designing appropriate policy towards migrant remittance inflow. The two regions are selected because of two reasons. First, majority of the remittance sent to Sub-Saharan Africa goes to West Africa (for instance Nigeria takes about 66.7% or about \$21 billion) and East Africa contains economies among the ten top receivers of remittances and some of East African countries registered rapid growth in terms of remittance as percentage of their respective GDP. Second, the two economic regions are the largest with respect to the number of countries and population size. This shows that when one studies about these regions, she/he studies much of the issues in Africa.

The general objective of the study is to analyze the effects of personal remittances in Eastern and Western African countries on poverty alleviation. Aiming specifically to address:

- To analyze the effect of remittance on poverty reduction in both regions.
- To compare the effect of personal remittances in Eastern and Western African countries

The rest of this paper is organized as follows. Section two contains the theoretical and empirical frameworks from the available related literature. It is followed by section three which is devoted for the methodology under which descriptive of study regions, types and sources the data to be employed and the techniques of data analysis are included. Section four is focuses on dealing with the analysis, results and interpretations (discussions). The fifth one is dealt with the conclusions that are derived from the analysis and policy implications.

## 2. RELATED LITERATURE REVIEW

This section is devoted for reviewing the related literature both from theoretical including the concepts and empirical viewpoints. It started with some definitions and concepts of terminologies, proceeds with theoretical explanations and empirical findings.

### 1.3. DEFINITIONS AND CONCEPTS

According to Hagen-Zanker (2010), migration is defined as:

*“The temporary or permanent move of individuals or groups of people from one geographical location to another for various reasons ranging from better employment possibilities to persecution”.*

Arsol et al. (2003) in Adamnesh (2008) defined migration as it refers to:

*“achange of the usual place of dwelling”. “A migrant is a person who comes to an economy and stays or is expected to stay for one year or more”* (Singh et al., 2009).

Remittance is defined as the sum of 3 items in the balance of payments yearbook of IMF (2006) namely workers’ remittances, compensation of employees and migrant transfers (Paderanga, 2010; Afrin, et al. 2012).

Workers' remittance belongs to current transfers by migrants who are employed in new economies and considered residents there. Compensation of employees is composed of wages, salaries and other benefits earned by individuals (in economies other than those in which they are residents) for work performed for and paid for by residents of those economies. Thus, compensation is similar to workers' remittances except in that migrants' duration of stay is less than a year. Migrants' transfers are change in financial items that arise from the migration (change of residence for at least 1 year) of individuals from one nation to another. Personal remittances comprise personal transfers and compensation of employees. So, personal remittance is a component of the current account balance of payments (Paderanga, 2010; Afrin, et al. 2012).

#### **1.4. THEORETICAL FRAMEWORK**

Remittance has influence on various macroeconomic variables such as long run economic growth, consumption, income distribution, real exchange rate, external balance, debt reduction via widening the tax base, poverty reduction and absorbing shocks. According to several economic scholars, remittance affects the economy via enhancing saving, creating fund for investment, initiating growth, consumption, poverty reduction and improving income distribution (Addison, 2004; Ghosh, 2006; Goschin, 2014). There are 2 theoretical approaches to address the question that why migrants send a portion of their respective earnings back home. The first one is family (altruism or attachment with family and relatives) reasons that motivate migrants to remit money to their family living at home. The second is the portfolio approach arising from the desire by migrants to spend their income on investment at home (Goschin, 2014).

#### **1.5. Remittance and Its Multiplier Effect**

Remittance inflow has not only just poverty reduction effect but also it generate a multiple of impact on income. For instance, Banga and Sahu (2010) found that a unit of USD sent to Mexico has an estimated minimum size of \$2.76. To show multiplier effects, Glytsos (2002) used a model which reflects the comparative impact of remittances on macroeconomic variables and the variation of such effects over time (i.e. a dynamic form of Keynesian view) with 3 behavioral equations namely: consumption function, investment function and national income identity. He tried to determine the short and long run effects of remittance by considering it as exogenous shock on the endogenous variables (i.e. to see the induced effects of remittance on economic growth). According to this research, the multipliers of remittance (i.e. its short run effect) range from 0.95 in Egypt to 4.06 for Greece. In case of the long run multipliers, the range goes through 1.5 for Egypt to 4.06 in Greece.

##### **1.5.1. Remittance Vs Poverty Reduction**

Adams and Page (2005) stated that the impact of migration and remittance on poverty alleviation, there is not yet conclusive and sufficient information in the available literature. According to them various researchers forwarded different arguments on the issue whether remittance flow resulted from migration will benefit the poor get out of poverty or deteriorate their living. Findings from household survey show that remittances are allotted for essential consumption, which is expected to reduce poverty (Gupta, et al., 2007; Ncube and Brixiova, 2013). According to Imi et al (2012) from 24 Asian nations using panel data (1980-2009) remittance has positively contribute not only to economic growth but also to poverty reduction. Remittance inflow reduces poverty by increasing income to households, increasing investment on both physical and human capital (i.e. education and health) as well as knowledge transfer. The increased access to financial resources investment depends on the marginal propensity to consume by recipient economies. Remittances helped to reduce poverty in Uganda by 11%, in Bangladesh by 6% and Ghana by 5% (Emerta et al. 2010). How remittances reduce poverty? It does so via improving the access of financial resources to households' savings as well as investments (Simplicio, 2015).

Banga and Sahu (2010) studied the impact of remittances on poverty reduction at two levels. Initially by considering 77 developing economies and then 29 developing plus 21 Asian developing nations that receive remittance greater than or equal to 5% of their respective GDP. Findings showed that the poverty reduction impact of remittance was significant and particularly more on those which receive more or equal to 5% their GDP. The researchers used panel data (1980-2008) involving the impact of remittance on poverty head count ratios at USD 1.25 per day and poverty gap at USD 2 per day.

Emerta, Getachew, Kassahun and Tewodros (2010), have analyzed the effect of remittance on poverty reduction in Ethiopia and have stated that there are 3 options to see the effect namely: first if there is available data on poverty level (but the fact is that poverty survey data are limited), cross country panel data and using elasticity of growth on poverty reduction.

The impact of personal remittance on poverty can be estimated from elasticity estimates of research findings regarding the relationship between economic growth and poverty reduction. It shows the output effect of personal remittance. They used research results from Emerta A. (2009) -0.58 elasticity for the Sub

Saharan Africa, de Janvry (1999) -0.6 (rural) to -1.08 (urban) for Latin America and Wodon (1999) -1.29 (upper poverty line) to -1.98 (lower poverty line) for Bangladesh. Jongwanich (2007) found that when remittance raises by 10% the incidence of poverty declines by 2.8% in the developing countries of Asia and the Pacific. Anyanwu and Erhijakpor (2009), on the other hand, came up with a finding that shows a 10% increment remittance to GDP ratio leads to a reduction of 2.9% in “the share of the people living in poverty” in Africa (Emerta, et al., 2010).

Among the mechanisms that remittance can play in reducing poverty (such as increasing enrolment rate and reducing dropout rate, enhancing investment spending particularly on housing and consumption by raising purchasing capacity of receiver families etc), the income contribution is more direct effect (Emerta, et al., 2010).

In El Salvador, arising from remittances inflow, poverty reduced by 4.2% and Gini coefficient (a measure of income inequality) declined from 0.55 to 0.53 (Banga and Sahu,2010 ). They applied 3SLS adopted from IMF (2007) so as to tackle the potential endogeneity problem.

Adams JR. and Page (2005) studied a data set collected from 71 developing nations regarding international migration, remittances, inequality and poverty. The findings indicated that migration and remittance significantly reduce the level, depth and severity of poverty in those economies. A 10% increase in per capita remittance reduces the share of people living under absolute poverty by 3.5%.

**3. Research Methodology**

**3.1 Description of Study Regions**

The study has been conducted in Eastern and Western regions of African countries. Eastern Africa contains 19 countries of Africa, including small Islands, (Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mayotte, Mozambique, Reunion, Rwanda, Seychelles, Somalia, Tanzania, Uganda, Zambia and Zimbabwe). It accounts for 33.47% of the African population (405,478,468 out of 1,211,382, 613).

Western Africa contains 17 countries (Benin, Burkina Faso, Cape Verde, and Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Saint Helena, Senegal, Sierra Leone and Togo). It is home for 29.95% of the African population (i.e. 362,805,216 out of 1,211,382, 613). Together, the regions account for 63.42% of the continent’s population (i.e. 768,283,687). For this study, 14 East African and 15 West African countries in total 29 countries are included.

**3.2 Data Type and Source**

A panel data from 29 nations covering a period from 2000-2014 was collected from secondary sources to this study. The data was collected from the World Development Indicators (WDI, 2016 and 2017 various updates), freedom house (www.freedomhouse.org), WIID. With regard to the variables of interest for which data was collected, personal remittance, total population, GDP, FDI, net official development assistance, current account balance, poverty head count, and other related variables were considered.

**3.3 Method of Data Analysis**

In this paper, both descriptive and inferential analyses techniques were employed.

*Model Specification*

The basic framework of panel data models is

$$y_{it} = \beta_0 + X_{it}\beta + u_{it} \text{-----}$$

-----(1)

Where  $\beta$  represents vector of coefficient parameters,  $X_{it}$  refers to the vector of explanatory variables for country I at time t,  $y_{it}$  represents the dependent for country I at time t,  $\beta_0$  is the intercept term and  $u_{it}$  the error term (assumed to be normally distributed)

For estimating the model using fixed effects we assume that coefficient parameters remain constant across individuals and the individual specific and time invariant heterogeneity (unobserved variation across individuals) , which can be correlated with the covariates, is assumed to be captured by the intercept parameter. So the model becomes:

$$y_{it} = \beta_{0i} + \beta_1x_{1it} + \beta_2x_{2it} + \text{---} + \beta_kx_{kit} + u_{it} \text{-----}$$

-----(2)

NB: here  $\beta_{0i}$  has not subscript “t” as it is assumed to be time invariant and individual specific variation but the individual specific differences are assumed to correlate with the covariates.

To estimate random effects individuals are assumed to be selected randomly and hence the individual variations captured by the intercept are random. This can be considered as normally distributed random

error. In such a case the intercept term is composed of the fixed that represents the population average and the random part. It is stated as:

$$\beta_{0i} = \beta_0 + \varepsilon_i \tag{3}$$

$$y_{it} = \beta_0 + \beta_1 x_{1it} + \beta_2 x_{2it} + \dots + \beta_k x_{kit} + (\varepsilon_i + u_{it}) \tag{4}$$

$$y_{it} = \beta_0 + \beta_1 x_{1it} + \beta_2 x_{2it} \pm \dots \mp \beta_k x_{kit} + v_{it} \tag{5}$$

Here  $v_{it}$  contains the individual and the random (idiosyncratic) components of the error. Here the individual variation is assumed not correlated with the explanatory variables. (Gujarati and Porter, 2009 pp 591-602; Hill and Griffiths, 2011 pp 543-553; Wooldridge, 2013 pp 486-497)

The model in relation to the effect of remittances on poverty reduction (taken from Banga and Sahu, 2010; UNCTAD, 2011).

$$POV_{it} = \alpha_1 + \alpha_2 \ln(PCY_{it}) + \alpha_3 INEQ_{it} + \alpha_4 \ln(REM_{it}) + v_{it} \tag{6}$$

Where  $POV_{it}$ = poverty measured by proportion (percentage) of population earning below USD1.9 per day in country i at time period t

$\alpha_1$  = captures fixed effects

PCY = per capita income (average of five years to fit the panel period)

INEQ = income inequality proxied by Gini coefficient (in percentage)

REM = personal remittance received (average of five years to fit the panel period)

NB: since poverty survey is not conducted for all the target countries during the same year, the data is organized in range of years. This means, to estimate the poverty model 3 periods are organized, i.e. the 15 year period is grouped in to 3 in such a ways that from 2000-2004 (period 1), from 2005-2009 (period 2) and from 2010-2014 (period 3). To match this period the values of per capita GDP and remittance are taken as averages of each 5 year period.

#### 4. Results and Analysis

In this section, the focus is on analyzing the role that personal remittance (as a flow of foreign currency from abroad) can play in improving the current account component of the balance of payments, enhancing economic growth and poverty alleviation. The first part covers the descriptive aspect particularly devoted for describing the effect of remittance on improving current accounts balance. The second section deals with the inferential analysis to see the effect of remittance on economic growth and poverty reduction with comparison in this effect between the two regions.

##### 4.1.Descriptive Analysis

Sub-Saharan Africa which comprises of 44 countries is located below the Sahara desert and is considered as the poorest region in the globe for the last several years though there are hopes of revival in recent few years. While for the last 55 years (1960-2015) per capita income (measured by per capita GDP) in SSA has grown on average only by about 0.83%, nominal GDP has grown by about 3.57% on average during same time period. Of course, the growth rate in both cases was not consistent throughout the period, i.e. sometimes negative on other time positive. In the recent 16 years (2000-2015) SSA has scored positive growth in both per capita and nominal GDP, i.e. on average 2.24% & 5.04 % in order of their appearance. Per capita income has grown from 118.62 USD in 1960 to 1571.33 in 2015 by about 13 fold. Total population in the region has grown on average by 2.72%, which over passed a billion (1000980981) in 2015 from 228,268,752 in 1960, i.e. approximately by 4.4 fold. Sub-Saharan Africa has 23.2 million, which is about 2.5% of the total population, migrant stock and its size is increasing over time. Arising from this, personal remittance is increasing in the region. For instance, from 1970 to 2015 personal remittance in the region has grown on average by 21.58% which reached 37,407,484,393.90 USD from 22,659,994.13. This is equivalent to a per capita income of 37.37 USD, i.e. about 2.38% of the per capita income in the region is contributed from personal remittance during 2015. Now is time to see the relative trend of GDP personal remittance (PREM), net official development assistance received (ODA) and foreign direct investment (FDI) covering the period from 1980-2014.



Figure 4. 1 trends of personal remittance in SSA relative to ODA and FDI

Source: own sketch based on WDI (June 2017)

In Sub Saharan Africa though net official development assistance remained above both FDI and PREM throughout 1980-2014, it fluctuates more than PREM. FDI, as expected from both theory and empirical findings is more volatile than both PREM and ODA, i.e. it turns up and down every now and then which one can easily observe from the figure above. PREM is smaller than both the other variables but it is relatively stable over time as well as it grows faster than them particularly after 2003. The reason for the relative high volatility of FDI and ODA can be traced back to their nature. Decision makers of FDI are foreigners motivated for profit. When the region experiences war, drought and other crisis (indeed it is prevailing fact), FDI flights out since the region might not generate enough profit. ODA may fluctuate due to the various pre-conditions that donors set and which may be beyond the capacity of the recipient economies in addition to the global (external) economic and political environment. The least volatility of personal remittance as compared to its counter variables matches with other research findings such as Pradhan A.H. et al. (2012). The target study countries are located in two sub-regions (15 in the West and 14 in the East nations totaling 29) of the Sub Saharan Africa.

The magnitude of international migration is increasing from year to year perhaps caused by relative international openness, conflict and war, poverty (the prevailing large income gap as incentive to migrate), natural calamities and disaster, etc. Within 15 years it has grown by about 42.9% (from 175 million in 2000 to 251 million in 2015). Out of the 251 million international migrants, refugees account for about 6% (i.e. 14.4 million). The top ten main destinations of global migrants are USA, (46.1 million), Saudi Arabia (14.6 million), Germany (11.1million), the Russian Federation (11 million), the United Arab Emirates (8 million), United Kingdom (7.8 million), France (7.5 million), Canada (7.4 million), Spain (6.6 million) and Australia (6.5 million) comprising 50.4% of the total 251 million international migrants (MPI, 2016; (World Bank Group fact book 2016; World Bank Group brief April 2016).

According to MPI (2016) estimation, out of the total international migrant stock, the percentage share of the countries included in this study was about 5.6% (i.e. 13,932,088 out of the 251 million total) during 2015 (NB: it includes the bilateral migration among these nations themselves). The main destinations for the migrants of these countries are USA (988284), Canada (186187), Germany (127133), France (628803), UK (772950), South Africa (1 312633), Spain (182560), Saudi Arabia (164678 of which 150,000 are Ethiopians), Italy (280518), Portugal (173299), Australia (128858).

Following this migrant stock, a total of 32.951 billion USD personal remittance inflows in to these countries was estimated though majority (about 62.9%) of it goes to Nigeria (once again bilateral remittance flow is included here).

In terms of remittance to GDP ratio Comoros (from East Africa) is ranked number one by receiving on average 17.58% of its GDP during 2004-2014. The next seven ranks are taken by the Western countries namely: Liberia (13.53%), Gambia (12.09%), Senegal (10.38%), Cape Verde (10.19%), Togo (9.7%), Nigeria (7.33%), and Guinea-Bissau (5.22%). The amount of remittance received by the remaining countries is below 5% of their respective GDP (please refer to table C1 in the appendix C). From this we can understand

that Eastern African countries receive less remittance as compared to their GDP. The next higher remittance to GDP ratio receiver in the Eastern African countries is Uganda (3.97%). The bottom 6 countries (including Ethiopia) in this ranking belong to the East sub-region and receive less than 1% of their GDP. Taking the 2015 data among the top ten remittances recipient countries in Sub Saharan Africa, Eight are included in this study. These are Nigeria (USD 20.8 billion), Ghana (USD 2 billion), Senegal (USD 1.6 billion), Kenya (USD 1.6 billion), Uganda (USD 0.9 billion), Mali (USD 0.9 billion), Ethiopia (USD 0.6 billion) and Liberia (USD 0.5 billion).

Before proceeding to the inferential analysis, the correlation between the dependent and independent variable and the summary description is presented below.

Table 4. 1: correlation between the dependent and explanatory variables

	lngdp	lnrem	lnoda	lnfdi	termso~e
lngdp	1.0000				
lnrem	0.5546	1.0000			
lnoda	0.3444	0.2563	1.0000		
lnfdi	0.5727	0.3021	0.2110	1.0000	
termsoftrade	-0.0482	-0.0447	0.0379	-0.0575	1.0000

Source: own computation

With reference to table 4.2 above, the correlation between growth in GDP and other variables such as growth in personal remittance, growth in foreign direct investment and growth in net official development assistance is all positive except terms of trade. The negative sign of terms of trade is as expected from theory. But in terms of strength, the growth in personal remittance is highly correlated with GDP growth next to FDI growth. The growth in personal remittance has an association of 55.46% and FDI growth has 57.27% association the rest being below 50%.

### 4.3 Inferential Analysis

#### 4.3.1. Panel Data Unit Root Test:

Table 4. 2: panel data unit root test for the variables that will be used in the regression

Variable name	Unit root test type	Unadjusted t-value	Adjusted t-value	p-value	Remark
Lnrem	Levin-Lin-Chu	-9.3166	-4.3640	0.0000	Stationary
Lngdp	Levin-Lin-Chu	-8.0631	-6.9210	0.0000	Stationary
Lnoda	Levin-Lin-Chu	-15.4243	-12.1058	0.0000	Stationary
TOT	Levin-Lin-Chu	-9.7842	-5.0794	0.0000	Stationary
lnfdi	Fisher-type unit-root test for lnFDI (since it is unbalanced data)	Inverse chi-squared(58) P	95.5270	0.0014	Stationary
		Inverse normal Z	1.6337	0.0512	
		Inverse logit t(144) L*	-1.9918	0.0241	
		Modified inv. chi-squared Pm	3.4843	0.0002	

Source: Own computation

From table 4.3 above, one can observe that the variables that are used in the regression are stationary using Levin-Lin-Chu for the first four variables and Fisher-type unit-root test for lnfdi data because it contains unbalanced dat

#### 4.3.2. Poverty Reduction Vs Personal Remittance

Out of the 29 study target countries 19 (65.52%) are yet under the low income category, 8 are in the lower middle income countries and only 1 each are in the upper middle income (Mauritius) and higher income (Seychelles) section the basis of the classification being per capita income. Based on this criterion, taking the 2014 data for illustration, the poorest (i.e. with lowest per capita income) country among these countries is Burundi with per capita GDP of USD 286 and the richest one is Seychelles having a per capita income of USD 15,563.79 (more than 54.4 times that of Burundi). Since remittance is received in the form of income to the receiving households, we need to see to what extent it contributes in alleviation of income poverty measured by the poverty line of USD1.9 per day.

For the sake of comparison data is estimated using 5 different models name pooled (simple OLS), feasible generalized least square model (population average), between estimation, fixed effects model (between) and random effects model. Referring to table A2 in Appendix A section, one can observe the following results. The coefficient of the lnrem (the natural logarithm of average remittance during the 5 year range) is

negative in all the five models though there is variation in terms of magnitude (please refer to table 4.5 above). Also it is significant at 5% level of significance in the pooled regression and fixed effect model and at 1% in population average regression and random effects models. However, it is not significant for the between estimation model. The natural logarithm of average per capita GDP (lngdppercapita) has a negative coefficient for all the five models with large variation in absolute magnitude. The largest size is registered in the between estimation (-7.064%) and the smallest is in the fixed effects model (-2.906%). This coefficient is statistically significant at 5% significance level in the between estimation technique and at 1% in the pooled, population average and random effects models but it is not significant for the fixed effect model. Gini coefficient has positive coefficients for all the models except the between estimation model. With respect to magnitude, it varies from 0.572 (fixed effect) to -0.31 (between). It is statistically significant at 5% level of significance for population average, fixed effect and random effects but not significant for pooled and between models.

The constant (intercept) term is positive and significant and 0.01% in all of the 5 models but its magnitude varies from 102.137 fixed effects to 157.029 between the others being 117.963 (pooled), 118.187 (population average) and 117.963 (random effects).

Whereas the within R<sup>2</sup> ranges from 10.6% (for the between estimator) to 28.7% (for random effects and pooled regression 27.1% estimators), the between R<sup>2</sup> ranges from 7.2% in the fixed effect to 25.91% in the between model. The random effects and pooled models have equal (18.3%) between R<sup>2</sup>. The overall R<sup>2</sup> for fixed effects model is 12.6% but the random effects and pooled models have equal overall R<sup>2</sup> as in the other cases (20.6%) and the between model has 21%. Now we need to decide which one of above models is the appropriate.

**Hausman Model Specification Test**

Based on the null hypothesis and the criterion set in the Hausman model specification test, table A5 in Appendix A, can help us to decide which model gives the acceptable parameter estimates. In that table the probability of  $\chi^2$  is 26.96% which is much greater than 5% and the value of  $\chi^2$  is smaller than the set standard for rejecting the null hypothesis. So we fail to reject the null hypothesis (i.e. we have no enough statistical evidence to reject that random effects model is the appropriate one). Therefore, random effect model is the appropriate model and hence the interpretation of the coefficients and other regression results should be based on the random effects estimation model. But before that we need one more test to check whether the appropriate is random effects (with panel effects) or simple OLS (pooled) regression.

**Breusch-Pagan Lagrangian Multiplier (LM) Test for Remittance on Poverty Reduction**

As discussed in the previous section, the null hypothesis is simple pooled regression is the appropriate model (i.e. there is no panel effect in the data). So to check this we have come up with table A6 in Appendix A. Based on the result, it is the random effects model which is appropriate since the probability of  $\chi^2$  is 0.0000 which is less than 5%, we reject the null hypothesis and accepted the alternative one (i.e. random effects model).

Now it is time to come back to the interpretation of the coefficients. The results of the random effects estimator are presented in table 4.9 below. To tackle the problems of heterosedasticity problem robust standard error estimation is employed

**Table 4.3: random effects GLS estimation for poverty headcount at \$1.9**

Random-effects GLS regression	Number of obs	=	87
Group variable: countrycode	Number of groups	=	29
R-sq: within = 0.2708	Obs per group: min =		3
between = 0.1833	avg =		3.0
overall = 0.2064	max =		3
	Wald chi2(3)	=	20.83
corr(u_i, X) = 0 (assumed)	Prob > chi2	=	0.0001
(Std. Err. adjusted for 29 clusters in countrycode)			

  

povertyheadc~19	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
lnrem	-2.545828	1.026868	-2.48	0.013	-4.558452	-.5332032
lngdppercapita	-6.065737	2.022853	-3.00	0.003	-10.03046	-2.101018
ginicoefficient	.4166425	.2828719	1.47	0.141	-.1377763	.9710613
_cons	117.9625	24.86861	4.74	0.000	69.22092	166.7041
sigma_u	12.987732					
sigma_e	9.7945333					
rho	.63746114	(fraction of variance due to u_i)				

Source: own computation

The intercept term, growth in remittance and per capita income growth are statistically significant at 1% level. Other variables kept unchanged, in each case, on average when personal remittance rises by 1%, the proportion of the population under poverty declines by about 2.55%. This shows us that remittance has more effect for poverty alleviation relative to its impact as growth driving factor, i.e. remittance has more multiplier effect in reducing poverty than increasing economic growth. This multiplier effect is confirmed by Gupta et al. (2009). Ratha (2013) has stated that remittance increases incomes to poor households and hence reduces poverty and Lubambu (2014) compared remittance receiver and non-receiver households and concluded that the incidence of extreme poverty on receiver households is lower. When per capita income (per capita GDP) grows by 1%, it leads to reduce the proportion of people earning below the poverty line by 6.07% (with approximation) and when Gini coefficient increase by 1%, poverty increase by 0.42% though it is not statistically significant.

**Hypothesis Testing:**

The parameter of growth in remittance and per capita GDP, i.e. the coefficients of each of these2 explanatory variables and the intercept term, are statistically significant using the Z-statistic. The respective Z-statistic values are -2.48, -3.00 and 4.74 which are all greater than the absolute values of 1.96 for 5% significance level.

Growth in per capita GDP and growth in remittance are statistically significant at 1% level of significance whereas Gini coefficient is not significant at any of the standard significance levels and the constant parameter is significant at 1%.

As we can see from the probability of the Wald  $\chi^2$  value, the model in aggregation is significant because the probability of  $\chi^2 = 0.0001$  which is less than 5%. About 63.75% of the variation in the composite error term of the model is due to the individual specific error component.

**Poverty alleviation effect of remittance in East Africa**

Based on the Hausman and Breusch-Pagan Lagrangian tests (table A7 in Appendix A), the appropriate model for estimating the effect of remittance on poverty alleviation in these countries is found to be random effects. Hence, the interpretation of the parameters is depends on the results of random effect model. A 1% growth in remittance flow to these countries lead to a 3.38% reduction in the proportion of the countries' population living below the poverty line (i.e. earning below 1.9 USD per day) and it is statistically significant at 1% level of significance. Per capita GDP has a reducing effect on poverty (i.e. it has -5.2% coefficient) and it is statistically significantly at 10% level of significance. Gini coefficient has 0.125% (positive) coefficient even though it is not significant. The intercept term is positive (139.738) and is significant at 1% level. About 68.24% of the variation in the composite error is caused by the variation in the individual panel units (countries) over time variation effects.

Table 4. 4: poverty reduction effect of remittance in the east Africa

Random-effects GLS regression	Number of obs	=	42			
Group variable: countrycode	Number of groups	=	14			
R-sq: within = 0.2536	Obs per group: min	=	3			
between = 0.1851	avg	=	3.0			
overall = 0.2012	max	=	3			
corr(u_i, X) = 0 (assumed)	Wald chi2(3)	=	11.74			
	Prob > chi2	=	0.0083			
(Std. Err. adjusted for 14 clusters in countrycode)						
povertyheadc~19	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
lnrem	-3.382396	1.225344	-2.76	0.006	-5.784026	-.9807663
lngdppercapita	-5.200402	2.789178	-1.86	0.062	-10.66709	.2662865
ginicoefficient	.1246637	.5186504	0.24	0.810	-.8918724	1.1412
_cons	139.7375	36.49351	3.83	0.000	68.21155	211.2635
sigma_u	17.096065					
sigma_e	11.664376					
rho	.68235545	(fraction of variance due to u_i)				

'Source: own computation

**Poverty Reduction Effect of Remittance in West Africa**

On the basis of the Hausman model specification test (table A8 in Appendix A), the appropriate model for estimation the poverty reduction effect of remittance in West African countries is fixed effect model. Thus, the interpretation of the parameters (the coefficients and other results) should be from the results of fixed effect estimation. As remittance flow to these, Western African, countries increases by 1%, the percentage of

population living below the specified poverty line declines by 1.14% but it is not statistically significant at any on the 3 standard levels (i.e. neither of 10%, 5%, 1%). Per capita income (GDP) has also a reducing effect on poverty yet it is not different from zero by statistical significance measures, i.e. An increase in per capita income by 1% causes poverty to decline by 5.06%. As Gini coefficient rises by 1%, poverty head count also rises by about 0.83% and it is significant at 1% level of significance. The average intercept term is 68.64 and it is significant at 10%. About 62.67% of the variation in the composite error term is caused by the variation in the individual effects variation.

Table 4. 5: fixed effect model: poverty reduction effect of remittance in the West Africa

Fixed-effects (within) regression		Number of obs	=	45	
Group variable: countrycode		Number of groups	=	15	
R-sq: within	= 0.4097	Obs per group: min	=	3	
between	= 0.0762	avg	=	3.0	
overall	= 0.1649	max	=	3	
corr(u_i, Xb) = 0.0356		F(3,14)	=	6.96	
		Prob > F	=	0.0042	
(Std. Err. adjusted for 15 clusters in countrycode)					
povertyheadc~19	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]
lnrem	-1.140348	3.749535	-0.30	0.766	-9.182301 6.901605
lngdpper capita	-5.058163	7.174308	-0.71	0.492	-20.44552 10.3292
ginicoefficient	.826022	.2751779	3.00	0.010	.2358241 1.41622
_cons	68.63547	35.11013	1.95	0.071	-6.668267 143.9392
sigma_u	12.828095				
sigma_e	7.8678607				
rho	.72665219	(fraction of variance due to u_i)			

Source: own computation

**Comparison**

Though in terms of growth effect the Western countries scored higher elasticity of remittance, poverty reduction effect of remittance outweighs in the East African countries relative to the Western African countries, i.e. approximately 3 times in magnitude and the poverty reduction effect of Western African countries is insignificant. The difference is 2.24% (i.e. 3.38-1.14 = 2.24). The estimation model chosen for poverty reduction effect of remittance in the East is Random effects and in the West is fixed effects. The question what could be the possible reasons for this difference can be answered in 3 ways: first, some empirical researchers found that the growth effect of remittance is higher in low income countries than higher income ones. For instance, Ziesemer (2012) confirmed that governments in low income countries receiving remittance respond more to remittance shocks via taxation and investing on human capital development as a core driver. Compared with Western Africa countries, the Eastern countries are low income. The second reason can be seen from the scarcity point of view. As described in section 4.2 (particularly table 4.6), the current accounts deficit is higher in Eastern African countries than their Western counterparts. So they might have used remittance as the main source of foreign currency and hence remittance played better role. The third reason can be given by noting that random effect model (which was found to be appropriate in the estimation of the Eastern African countries) shows relatively long run effects since it analyzes simultaneously both the within and between effects (i.e. both the overtime and across countries) and that of fixed effects (appropriate for the West) shows short run effects (showing only the within or over time variation). This is confirmed from Monte Carlo simulation by Bell and Jones (2015) Thus, the difference in effect indicates that the effect of remittance is more in the long run than the short run. This could be due to the multiplier effect that might be reaped in the long run compared with the short run. Hence, the two regions differ in the poverty reduction effect not only just in size of the impact but they differ in time where the effect will be realized. In the Eastern African countries the effect is larger because in the long run (applying random effects model) the multiplier effect of remittance plays a role in raising the magnitude of the coefficients.

In general, remittance has larger poverty reduction effect in the East as compared to its growth promoting effect in both regions. Moreover, the Eastern countries scored higher effects of remittance on poverty reduction and the Western countries got higher economic growth driving effect relative to the Eastern African countries.

## 5. Conclusion and policy implications

### 5.1 Conclusions

In Sub-Saharan Africa remittance flow is more stable relative to other foreign resources such as net official development assistance and foreign direct investment as it was confirmed from the data for the last 15 years. Among the top ten remittance receivers in Sub-Saharan Africa eight are included in this study. However, out of the eight, five are found in the Western sub-region.

When remittance increases by 1%, poverty declines by 2.55%. The reason for the higher effect on poverty reduction is that growth caused by remittance receipt has also indirect effects on poverty alleviation. In addition to this, mostly remittance is received at household level particularly by low income groups, which leads the poverty reduction capacity of remittance to be higher.

Comparatively, the poverty alleviation impact of remittance in the two regions separately estimated, it was found that remittance has more poverty reducing effect in the East African countries than its effect in those in the Western Africa. A 1% increase in remittance flow to the Eastern African countries brings a 3.38% reduction in poverty. However, in the Western countries, a 1% increase in remittance causes only 1.14% reduction in poverty but not significantly different from zero by statistical measures, i.e. yet only about half of the score in the East. The possible reason for the difference in the poverty reduction effect between the two regions could be the application of different estimation models (random effects for the Eastern African countries and fixed effect for the Western ones). This has long run and short run effect implications respectively in the East and in the West. Also, foreign currency shortage is more prevalent in East Africa relative to the West. This might have led the Eastern countries to use remittance as the main source of foreign currency and hence proper allocation made it more effective. In addition, Ziesemer (2012) confirmed that governments in low income countries receiving remittance respond more to remittance shocks via taxation and investing on human capital development as a core driver of growth. Since the Eastern countries are low income compared with the West, the finding matches with this evidence.

### 5.2 Policy recommendations

- Since remittance has significant effect on economic performance in terms of poverty reduction, the countries should give due emphasis in smoothing the flow of remittance by designing mechanisms that reduce cost of transfer perhaps by promoting the use of technology of transfer such as mobile banking and applying policy instruments that ease the transfer and creating good relation with the Diaspora community. However, this doesn't imply that migration should be enhanced. This is because we have not seen here the negative consequences of brain drain.
- In the finding remittance helped the proportion of population under the poverty line to reduce by 2.55% for every percentage increase in remittance flow. Thus, governments of these countries should promote saving by the receiving country households so that remittance becomes more productive and hence it will have multiplier effect on further poverty reduction. This could be done perhaps by using discriminatory policy on saving interest rate.
- As the formal remittance is contributing to the performance of the macroeconomy of these countries nations should work on tackling the problems of the transfer and bring the informal flow back into the formal one so that they would capture the real fruit of the effect there in. The deterrents that could be solved are might be, among others, the divergence in the official and black market exchange rates. This can be solved possibly by adopting flexible (at least managed) exchange rate regime and reducing the cost of transferred charged by the banking system.

## References

1. Adams JR., Richard H. and John Page (2005). Do international migration and remittances reduce poverty in developing countries? World Bank, Washington DC, USA. World development vol.33 No 10. Pp 1645-16 [www.elsevier.com/locate/worlddev](http://www.elsevier.com/locate/worlddev)
2. Addison, E. K. (2004). The Macroeconomic Impact of Remittances. Presentation at the conference on migration and development in Ghana
3. Afaha, Jhon S. (2013). Migration, remittance and Development in Origin Countries: Evidence from Nigeria. African Population Studies vol.27
4. Ahoure, E. (2008). Remittances, Governance and Growth in Sub-Saharan Africa Countries: A dynamic panel data analysis. In international migration institute workshop, November (Vol. 26).
5. Andersson, L. (2012). Migration, remittances and household welfare in Ethiopia. Migration, 004.
6. Baldé, Y. (2011). The Impact of Remittances and Foreign Aid on Savings/Investment in Sub-Saharan Africa. African Development Review, 23(2), 247-262.

7. Banga, R., and Sahu, P. K. (2010). Impact of remittances on poverty in developing countries. Working Papers, 2872.
8. Bell, Andrew and Kelvyn Jones (2015). Explaining Fixed Effects: Random Effects Modeling of Time-Series Cross-Sectional and Panel Data.
9. <https://www.researchgate.net/publication/233756428>
10. Chami, et al. (2008). Macroeconomic consequences of remittances. IMF
11. Emerta et al. (2010). International Migration, Remittances and Poverty Alleviation in Ethiopia. Ethiopian Economics Association (EEA) Ethiopian Economic Policy Research Institute (EEPRI): Working Paper No 1/2010
12. Fayissa, B., and Nsiah, C. (2010). The Impact of Remittances on Economic Growth and Development in Africa. *The American Economist*, 92-103.
13. Ghosh, Bimal (2006). Migrants' Remittances and Development: Myths, Rhetoric and realities. International organization for migration.
14. Goschin, zizi (2014). Remittances as an Economic Development Factor: Empirical Evidence from CEE countries. 7<sup>th</sup> International Conference of Applied Statistics.
15. Gujarati, Damodar N. and Dawn C. Porter. (2009). *Basic Econometrics* (5<sup>th</sup>ed). The McGraw-Hill companies
16. Hagen-Zanker, J. S. (2010). Modest expectations: Causes and effects of migration on migrant households in source countries. Boekenplan.
17. Heijdra, Ben J. (2009). *Foundations of Modern Macroeconomics* (2<sup>nd</sup>ed.). Oxford University Press, Oxford, New York.
18. Hill, R. Carter, William E. Griffiths and Guays C. Lim (2011). *Principles of Econometrics* (4<sup>th</sup>ed). John Wiley & Sons Inc. USA
19. Kapur, Devesh (2003) Remittances: the new development mantra. Harvard University and center for global development. Paper presented to the G-24 technical group meeting
20. Konte, Maty (2014). Do Remittances not promote Growth? A Bias-Adjusted 3 step Mixture of Regression.
21. Lubambu, Karine Manyonga Kamuleta (2014). The Impact of Remittances on Developing Countries. European Parliament.
22. Naudé, Wimand Henri Bezuidenhout (2012). Remittances provide resilience against disasters in Africa. Maastricht Economic and social Research institute on Innovation and Technology (UNU-MERIT). <http://www.merit.unu.edu>
23. Opong ,Kwaku K (2012). Prospect Theory and Migrant Remittance Decision Making. Adam Smith Business School, University of Glasgow <http://ssrn.com/abstract=2127615>
24. Paderanga, Jr. Ayetano W. (2010). The Macroeconomic Impact of Remittances in the Phillipines.
25. Pradhan A.H., Afrin S. and Islam R. (2012) contribution of remittances on current account of balance of payments in Bangladesh: VECM estimation. *International journal of applied research in business administration and economics*. Vol.1 issue 1. p70-77
26. Ratha, Dilip., and Mohapatra, S. (2007). Increasing the Macroeconomic Impact of Remittances On Development. World Bank.
27. Ratha, Dilip, et al. (2011). Leveraging Migration for Africa: Remittances, Skills and Investments. The World Bank.
28. Ratha, Dilip (2013). The impact of remittances on economic growth and poverty reduction. Migration policy institute : policy brief No. 8
29. Simplicio, Do ango (2015). The Effects of Remittances on Economic Growth in Cameroon: An ARDL-Bounds Testing Approach. *African integration and development Review* Vol.8
30. Singh, Raju Jan Markus Haacker, and Kyung-woo Lee (2009). Determinants and Macroeconomic Impact of Remittances in Sub-Saharan Africa. IMF
31. Spatafora N. (2005). "Two Current Issues Facing Developing Countries": in *World Economic Outlook: a Survey by the Staff of the IMF* chapter two.
32. Todaro, Michael P. and Stephen C. Smith (2012). *Economic development* (11<sup>th</sup>ed.) Pearson education, Inc. USA
33. UNCTAD (2011). *Impact of Remittances on Poverty in Developing Countries*. United Nations.
34. Wooldridge, Jeffrey M. (2013). *Introductory Econometrics: A Modern Approach* (5<sup>th</sup> ed. Cengage Learnings, USA
35. Wooldridge, Jeffrey M. (2002). *Econometric Analysis Cross-section and Panel Data* p264
36. World Bank (2016). *Migration and Remittances Fact Book 2016* (3<sup>rd</sup> ed.), World Bank Group
37. World Bank (2016). *Migration and Remittances: Recent Developments and Outlook*. Migration and development brief 26. World Bank Group
38. Yaseen, Hadeel S. (2012). The Positive and Negative Impact of Remittances on Economic Growth in MENA Countries. *The Journal of International Management Studies*, Volume 7 Number 1
39. Ziesemer, Thomas H.W. (2012). Worker Remittances and Government behavior in Receiving Countries. UNU-Merit Working paper series #2012-065

**Appendix A: various model specification tests for various estimations**

**Table A1: regression results of 5 comparative models for remittance effect on GDP growth**

Variable	pooled	PA	BETWEEN	FIXED	RANDOM
lnrem	0.147**	0.146***	0.307*	0.143***	0.147***
lnoda	0.161**	0.165***	0.067	0.182***	0.161***
lnfdi	0.134***	0.133***	0.166**	0.130***	0.134***
termsoftrade	0.051***	0.051**	-0.030	0.052**	0.051**
_cons	14.130***	14.080***	12.493***	13.853***	14.130***
N	314	314	314	314	314
chi2	167.164	473.974			367.586
r2			0.520	0.552	
r2_o	0.446		0.510	0.428	0.446
r2_b	0.439		0.520	0.420	0.439
r2_w	0.552		0.497	0.552	0.552
sigma_u	1.064			1.085	1.064
sigma_e	0.250			0.250	0.250
rho	0.948			0.950	0.948

legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

**Table A2: comparison of 5 model results regarding the effect of remittance on poverty reduction**

Variable	pooled	PA	BETWEEN	FIXED	RANDOM
lnrem	-2.546*	-2.545**	-2.689	-3.145*	-2.546**
lngdpperca-a	-6.066**	-6.087**	-7.064*	-2.906	-6.066**
ginicoeffi-t	0.417	0.414*	-0.310	0.572*	0.417*
_cons	117.963***	118.187***	157.029***	102.137***	117.963***
N	87	87	87	87	87
ll			-115.870	-302.018	
aic	.	.	239.741	612.037	.
bic	.	.	249.604	621.900	.
chi2	20.834	28.012			26.780
r2			0.259	0.287	
r2_o	0.206		0.210	0.126	0.206
r2_b	0.183		0.259	0.072	0.183
r2_w	0.271		0.106	0.287	0.271
sigma_u	12.988			15.065	12.988
sigma_e	9.795			9.795	9.795
rho	0.637			0.703	0.637

legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

Source: own computation

**Model Specification Tests:**

1. Hausman test

It has asymptotic  $\chi^2$  distribution

$H_0$ : The difference between the coefficients of random effects and fixed effects is not systematic, i.e. random effects model is appropriate.

$H_a$ : The coefficients of the two models differ significantly.

Criterion of the test:

If the probability of  $\chi^2 < 0.05$  or the  $\chi^2$  value is very large (say greater than 31.41) reject the null hypothesis and accept the alternative one, i.e. random effects model is not appropriate and thus fixed effect model will be chosen for estimation.

Based on this criterion since the probability of  $\chi^2$  is 0.0957 which is greater than 0.05, we have no enough statistical evidence to reject the null hypothesis (i.e. we fail to reject  $H_0$ ). So the appropriate model is random effects. This tells us that the individual differences are random rather than fixed and hence the results of the estimation can be generalized to other countries

2. Bruesch-Pagan Lagrange multiplier (LM) Test:-It helps to decide between random effects and simple OLS (pooled) regression.

$H_0$ : There is no panel effect (variances across entities is zero), i.e. simple OLS regression is appropriate

$H_a$ : There is significant difference across units, i.e. random effects model is appropriate

Criterion for the test is that if  $\chi^2 < 0.05$  reject the null hypothesis implying that the random effect model is appropriate model. Otherwise retain the null and simple OLS estimation will be acceptable.

Table A3: Hausman model specification test for growth effect of remittance in East Africa

Z

. hausman FIXED RANDOM

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) FIXED	(B) RANDOM		
lnrem	.1214067	.1300289	-.0086222	.
lnoda	.443294	.2903962	.1528978	.0321711
lnfdi	.1295899	.154637	-.0250471	.
termsoftrade	.4865557	.521309	-.0347532	.

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(4) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 22.33 \\ \text{Prob}>\text{chi2} &= 0.0002 \\ &(\text{V}_b\text{-V}_B \text{ is not positive definite}) \end{aligned}$$

Table A4: Hausman test for growth effect of remittance in West Africa

. hausman FIXED RANDOM

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) FIXED	(B) RANDOM		
lnrem	.2519482	.2698621	-.0179139	.0061756
lnoda	.1285972	.1408367	-.0122395	.
lnfdi	.12476	.1198505	.0049095	.0105156
termsoftrade	.0347709	.0302937	.0044772	.

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(4) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 67.59 \\ \text{Prob}>\text{chi2} &= 0.0000 \\ &(\text{V}_b\text{-V}_B \text{ is not positive definite}) \end{aligned}$$

Table A5: Hausman Model Specification Test for Poverty Reduction Model

. hausman FIXED RANDOM

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) FIXED	(B) RANDOM		
lnrem	-3.145441	-2.545828	-.5996134	1.03172
lngdpเปอร์capita	-2.905965	-6.065737	3.159772	3.073997
ginicoefficient	.571804	.4166425	.1551615	.0896523

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(3) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 3.93 \\ \text{Prob}>\text{chi2} &= 0.2696 \end{aligned}$$

**Table A6: Breusch-Pagan Lagrangian Multiplier (LM) Test for Remittance on Poverty Reduction**

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{lngdpperpercapita}[\text{countrycode},t] = Xb + u[\text{countrycode}] + e[\text{countrycode},t]$$

Estimated results:

	Var	sd = sqrt(Var)
lngdpper~a	.9365266	.967743
e	.1196787	.3459461
u	.7604661	.8720471

Test: Var(u) = 0

chibar2(01) = 50.09  
 Prob > chibar2 = 0.0000

**Table A7: Hausman and LM tests for poverty reduction effect of remittance in East Africa**

Random-effects GLS regression	Number of obs =	42
Group variable: countrycode	Number of groups =	14
R-sq: within = 0.2536	Obs per group: min =	3
between = 0.1851	avg =	3.0
overall = 0.2012	max =	3
corr(u_i, X) = 0 (assumed)	Wald chi2(3) =	11.58
	Prob > chi2 =	0.0090

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
lnrem	-3.382396	1.303808	-2.59	0.009	-5.937813 -1.8269796
lngdpperpercapita	-5.200402	3.207383	-1.62	0.105	-11.48676 1.085954
ginicoefficient	.1246637	.3595058	0.35	0.729	-.5799547 .829282
_cons	139.7375	33.01927	4.23	0.000	75.02092 204.4541
sigma_u	17.096065				
sigma_e	11.664376				
rho	.68235545	(fraction of variance due to u_i)			

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{povertyheadcountat19}[\text{countrycode},t] = Xb + u[\text{countrycode}] + e[\text{countrycode},t]$$

Estimated results:

	Var	sd = sqrt(Var)
povert~19	416.7767	20.41511
e	136.0577	11.66438
u	292.2754	17.09606

Test: Var(u) = 0

chibar2(01) = 16.11  
 Prob > chibar2 = 0.0000

**Table A8: Hausman and LM tests for poverty reduction effect of remittance in West Africa**

. hausman FIXED RANDOM

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) FIXED	(B) RANDOM		
lnrem	-1.140348	3.832248	-4.972596	3.46724
lngdpperca~a	-5.058163	-22.69018	17.63201	6.510466
ginicoeffi~t	.826022	.7376243	.0883978	.

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
 = 15.90  
 Prob>chi2 = 0.0012  
 (V\_b-V\_B is not positive definite)