

Inward Remittances and Economic Growth in Sub-Saharan African Countries: Application of Panel Cointegration Approach

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ABSTRACT

Remittance inflow into Sub-Saharan Africa region has increased substantially, even above other foreign capital flows like Foreign Direct Investment (FDI) and other Development Assistance (ODA). Empirical evidence on the impact of remittances on output growth in the region is rather scarce. Few studies on this topic produced mixed results probably due to their inability to identify the channels through which remittances might affect economic growth. This study then investigates the impact of remittances on output growth in sub Saharan Africa, looking specifically the financial development and investment channels. Panel data estimation techniques were adopted in the analysis, followed by the stability tests. The findings from the study indicate that remittance spur growth in the Sub-Saharan African region and that financial development and investment played pivotal role in the remittance output growth nexus.

Keywords: Remittances, economic growth, financial development, foreign direct investment, panel data analyses.

INTRODUCTION

Remittance and some Stylized Facts

International migrant remittances to Sub-Saharan Africa have experienced a significant increase in the recent years. Remittance is gradually taking a centre stage in world research agenda. This is not far-fetched from a recent discovery by financial economists and policy makers that remittance is a resilience source of foreign exchange as evidenced from recent global financial crisis. According to World Bank (2010), estimated official remittances were \$167bn for developing countries in 2008. World Bank estimates that remittances inflows to developing countries are expected to reach \$468 bn in 2014, in spite the ravaging effect of recent global financial crisis. Remittances is the second largest source of external finance for developing countries after Foreign Direct investment (FDI) and twice the amount of official aid received, both in absolute terms and as a proportion of GDP (Aggarwal, Demirguc-Kunt and Martinez, 2009).

Sub-Saharan Africa region is estimated to have received about \$31 bn, representing about 1 percent of GDP. According to World Bank (2012), if remittances sent through informal channels are included in official transfers, total remittances could be as much as 40 percent higher than the official records. Sub-Saharan African migrants prefer sending money through unofficial channels probably due high transfer cost charged by local banks. Despite these huge resource inflow, Foreign Direct Investment (FDI) and official Development Assistance ODA have received much more research attention from both academicians and policy makers alike. The reason for this oversight is due to some belief by most researchers that remittances is a consumption income and do not influence investment patterns.

According to the World Bank send money data base, Sub-Saharan Africa region is the most expensive region to send money to, with average remittance costs reaching 12.4 percent in 2012. The average cost of sending money to Africa is almost 12 percent higher than global average of 8.95 percent and almost double the cost of sending money to south Asia. Sub-Saharan African countries popularity in higher transaction costs remittance business is due to apparent lack of financial development infrastructure to intermediate these huge resource inflows Mohapatra and Ratha (2011). However, there have been several financial market reforms in most Sub-Saharan Africa economies in order to deepen the financial market, but whether these financial reforms have contributed to economic growth especially through remittances and investment is a question that requires an investigative answer.

From economic growth point of view, sources of economic growth in SSA have been the subject of an old debate in macroeconomic literature. While researchers like Solow 1956; Schultz 1980; Romer 1986, and Levine 1986 concentrated their research effort in search of economic growth variables on physical capital accumulation, Foreign Direct Investment, openness, investment and Finance respectively relatively little attention has been accorded to remittances flows as potential source of economic growth especially in SSA. Another contentious issue in macroeconomic literature in SSA economies is low output growth that is caused by paucity of investible funds to establish micro businesses.

There is a widespread belief within policy circles, that remittances provide finance for investment and thereby promote economic growth. This notion stems from the fact that remittances may not only provide much needed finance for establishing micro enterprises but also stimulate economic growth by increasing consumption capacity of recipient households. Surprisingly, empirical evidence supporting the channels through which remittance can promote growth is sobering.

LITERATURE REVIEW

Empirical Review

There have been debate and controversies on the relationship that exists among international migrant remittances and banking sector development on one hand, and economic growth on the other in both developed and developing countries. Jongqanich (2007); Guliano and Nyamongo et al (2012); Bettin and Zazzaro (2008); Cooray (2010) amongst others studied the impact of remittances and financial development on economic growth in developed countries. Studies that have focused on Africa, sub-saharan and recently on Nigerian include Kanu and Ozurumba (2013); Oke et al (2011); Akinpelu et al (2013); Owusu-Sekyere et al (2011); Nyamongo et al (2012) and Deodat (2011). Overall, the empirical evidence is inconclusive. This has been attributed to the ambiguous nature of the effects of remittances on financial development (through the conflicting interaction of whether remittances play substitution or complementary role in banking sector development), and also the conflicting role of banking sector development on output growth. Review of extant literature on the impact of international migrant remittances, and banking sector development on output growth will be on the following headings:

Implications of Remittances for Economic Growth

Abdullaev (2011) investigates the responsiveness of per capita GDP growth to workers' remittances along with traditional sources of economic growth using OLS and GMM. The result of the study indicates that countries with higher initial level of per capita income tend to grow faster than the countries with low levels of initial per capita income. Saddique A et al (2010) examined the causal relationship between remittances and economic growth in Bangladesh, India and Sri Lanka using data for the period from 1976 to 2006. They employed various time series econometric techniques such as unit root test, cointegration and causality. The result of the study indicate that there is only a uni directional relationship between growth in remittances and economic growth in Bangladesh; no causal relationship exist between growth in remittances and economic growth in India, but bi-directional casualty is found in Sri Lanka.

Buch et al (2002) analyzed the magnitude of remittances, their volatility, and their relationship on the other flows. They adopted correlation analysis and found that: First, remittances flow has increased worldwide when compared to private capital flows, especially in developing countries. Secondly, workers, remittances as a share of GDP are high for small and relatively disadvantaged developing countries. Thirdly, remittance volatility are lower than that of private and official capital flows. Fourthly, remittances are strongly positively correlated with official capital flows. Finally, remittances are found to be positively related to the business cycle and hence economic growth.

Chami et al (2005) towed the line of Buch et al (2002) by analyzing the volatility of remittances in relation to other capital flows as well as their effect on economic growth. They also adopted correlation analysis in their study but found a contrary result to that of Buch et al (2002) who found a positive correlation between remittances and capital flows. The result of their study revealed that remittances are negatively correlated with GDP, suggesting that remittances are compensatory in nature.

Glytsos (2005) did an extensive work aimed at providing a comprehensive analysis of dynamic effect of migrant remittances on growth for Mediterranean countries. Two stages least square techniques was employed. The result of the study suggests that the inter-temporal induced output differentiation is generated by the relative weight of remittances in the economy and the speed of change in volume of remittances. They found that rising remittances are relatively less powerful to generate output as falling remittances are powerful to reduce output.

Igbal and Satter (2005) attempted to examine the contribution of workers, remittances on economic growth in Pakistani. They used regression analysis on macroeconomic variables such as real GDP growth, GDP at current price, public investment, private investment, inflation and external debt. The result of the study suggests that right policies can channel remittance flows into more productive investment activities.

Catrinescu et al (2006) argues that institutions can play a role in how remittances affect economic growth, therefore in the presence of good institutions, remittances could be invested in a greater amount and more efficiently, ultimately leading to higher output. To examine the link between workers' remittances and growth: The physical and human capital channels, Ziesemer (2007) make use of Generalized method of moment with heteroscedasticity correlation (GMM-HAC) in order to provide empirical evidence. By examining the effects of Gross National Product as share of Gross Domestic Product, Savings as share of GDP interest rate, Gross Capital formation as a ratio of GDP, primary school enrolment, literacy and remittances as a ratio of GDP on Gross

Domestic product per capital. He however, found that countries with per capita income below \$1200 benefit most from remittances in the long run because they have the largest impact of remittances on savings.

In order to assess the relationship that exists between workers' remittances, economic growth and poverty in Developing Asia and Pacific countries, Jongwanich (2007) makes an empirical exploration using generalized method of moment (GMM). The study examines the relationship between government consumption, openness and inflation on GDP per capita. It is reported that remittances have a positive but marginal impact on economic growth in Asia and the Pacific countries through domestic investment and human capital.

Similarly, Fayissah and Nsiah (2008) in a survey of African countries used unbalanced panel data to examine the impact of remittances on economic growth and development. It was found that remittances boost growth in countries where the financial systems are less developed by providing an alternative way to finance investment and helping overcome liquidity constraints. Barajas et al (2009) examined whether workers' remittances promote economic growth. They used ordinary least square techniques (OLS) to analyze macroeconomic variables such as remittances, broad money supply as a share of GDP, average growth and trade pattern. The authors found an intriguing result that decades of private income transfers have contributed little to economic growth in remittance receiving economies and may even retard growth.

Sufian (2009) used data for Middle East and North American (MENA) countries to examine the relationship between workers' remittances and growth. The dependent variable is proxied as GDP per capita. Explanatory variables are remittances as a ratio of GDP, gross capital formation as a ratio of GDP, human capital, government consumption and inflation. The results were mixed. Remittances are positively and significantly correlated with growth and more significantly that remittances have more positive impact on growth in countries with less access to credit.

Raju et al (2010) used regression analysis to examine the determinants and macro economic impact of remittances in sub-Saharan Africa. The findings of the study suggest that the size and location of the Diaspora are important determinants of remittances on the impact of remittances on economic growth, there is a negatively coefficient of remittances on output growth. The authors concluded that countries with well functioning domestic institutions seem to be better at unlocking the potential for remittances to contribute to faster economic growth. The authors then concluded that this lends credence to the complementary role of remittance to growth.

Das and Chowdhury (2011) pooled cross section and time series data and examined the dynamics of remittances and GDP in eleven developing countries using panel co-integration and PMG Techniques. The results from unit root tests and panel co-integration suggest that there is a long run co-integrating relationship among the variables. Also, the result from pooled mean Group (PMG) suggest that a small impact of remittances on growth in the selected countries.

Shimul (2013) also employed Engle –Granger two step procedure and Auto Regressive distributed lag model (ARDL) on the impact of remittances on economic development in Bangladesh. The result of the study indicates that remittances are not significant contributing factor for the GDP both in the short and long run. Akinpelu et al (2013) in his own study of the effect of remittances inflows on economic growth of Nigeria found a long run equilibrium relationship between GDP and remittances inflow, exchange rate, foreign Direct investment, openness and capital formation. The result of the study also shows unidirectional causality from GDP to remittance inflows.

The study of Kanu and Ozurumba (2013) was on Sub-Saharan Africa and they used real per capita GDP as dependent variable and migrant remittances, openness, labour force exchange rate and inflation as explanatory variables. From the study migrant remittances were found to be positively correlated with economic growth in Nigeria, Ghana and South Africa. It was found that the greatest impact is on South Africa, Ghana before Nigeria, in terms of causality, remittances Granger cause economic growth in South Africa and Ghana but in Nigeria output growth Granger cause remittances.

METHODOLOGY

Sources of Data

The data for the analysis is collected from World Development Indicators. The sample set includes a balanced panel of countries over a period of thirty years. The sampled countries were selected on two important criteria. First, only Sub-Saharan African countries that have data on the World Development Indicators are included in the sample data. Secondly, in order to construct a balanced data, countries that have some missing figures for any of the variables required to complete the explanatory variables were not included in the data set. On the whole, nine countries were randomly selected for the study. Countries selected are Burkina Faso, Ethiopia, Senegal, Nigeria, Ghana, Swaziland, South Africa, Togo and Cameroon.

Panel Estimation Model

In this study, the dataset will be analyzed by applying the two models. An important choice will be made between fixed and random effect models, using the Hausman model selection criteria. The Hausman selection test is based on the fact that the individual effects and the regressors are uncorrelated. In such circumstance, the

random effects model becomes the focus of interpretation; however, the fixed effects will be showcased for empirical robustness. On the other hand, the fixed effect model will be the focus of analyses of the study. In order to choose the correct model Hausman specification test is conducted (Zebra, 2008) The panel data model for this study is stated as follows:

$$Y_{i,t} = \alpha_0 + \mu_i + \beta_i * X_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where

i = 1.....9
 t = 1982 – 2012

In the model i represent the cross section of selected countries and t for the time dimension, Y is the Gross Domestic Product (GDP) for each country given the specified time frame; X vector consists of the explanatory variables such as remittances, financial development, gross capital formation, labour force, secondary school enrolment, openness, and inflation. β represents the coefficients and μ_i represents country specific effects and ε indicates the disturbance term.

The model of this study is based on the work of Guiliano and Ruiz-Arranz (2005), Jongwanich (2007), Gyan et al (2008), Fayissa and Nsiah (2008), Sufian (2009) and Abdullaev (2011). This study adopts the model of Abdullaev (2011) which states that extended version of the neoclassical economic growth model is represented as:

$$Y_{i,t} = \alpha_0 + \mu_i + \beta_i * X_{i,t} + \varepsilon_{i,t} ; \varepsilon_{i,t} \approx N(0, \delta^2 \eta) \quad (2)$$

Where Y_{it} = natural logarithm of per capita GDP in country i at time t;
 X_{it} = Vector of the independent variables (Remittances, financial development indicators, physical and human investments)
 μ_i = country specific, time invariant effect;
 δ_i = time specific country invariant effect;
 β = Scalar vector of coefficients of $\beta_1 \dots \beta_8$
 ε_{it} = error term with $E(\varepsilon_{it}) = 0$ and $var(\varepsilon_{it}) = \delta^2 \eta$

TABLE 1: DESCRIPTIVE TESTS, NORMALITY ESTIMATES AND CORRELATION STATISTICS
PANELA: DESCRIPTIVE TEST AND NORMALITY ESTIMATES

Variables	Descriptive statistics				Normality estimates				
	Mean	Median	Std	Deviation	skewness	Kurtosis	Jarque Bera	Prob.	OBS
Creditor to private Sector (CPS)	35.93308	22.4200	40.7296		2.6108	9.1163	751.8424	0.000	279
Gross capital Formation (GCF)	18.5664	17.9800	6.0616		0.3259	3.1515	5.2066	0.000	279
GDP per capital (GDP Cap)	1033.717	527.6900	1290.046		2.6927	11.2501	1128.420	0.000	279
Inflation (Inf)	10.23534	7.2900	13.6653		3.3781	21.6706	4583.036	0.000	279
Human Capital Development (SECE)	34.38796	29.0200	22.0275		1.1780	4.0391	77.0798	0.000	279
Growth of Remittance REMG	2.9473	1.5400	3.5393		1.4604	4.1563	114.7188	0.000	279
GDP Growth	3.7459	3.7000	4.8093		0.6661	9.2669	477.2047	0.000	279
Trade Openness	66.1941	56.8100	37.8742		1.3294	4.4674	107.2192	0.000	279
Labour Force	69.5264	71.3000	10.8717		-0.2268	1.5344	27.3635	0.000	279

TABLE 2: CORRELATION STATISTICS

	CPS	GCF	GDP CAP	INF	SECE	REMG	GDPG R
Credit to private sector (CPS)	1.000						
Gross capital formation (GCF)	0.0083	1.0000					
GDP per capital (GDP cap)	0.8146	-0.0583	1.0000				
Inflation (Inf)	-0.0447	0.0087	-0.0100	1.000			
Human Capital Development (SECE)	0.7490	0.0347	-0.0795	0.0795	1.0000		
Growth of Remittance (REMG)	-0.1375	-0.0261	-0.1448	-0.1448	0.0263	1.0000	
GDP Growth (GDPGR)	0.0999	0.1223	-0.0100	-0.0100	-0.0354	0.1496	1.0000

Table 1 under panel A contains the descriptive and normality statistics for all the variables employed in the analyses of the study. The variables includes: Gross capital formation (GCF), credit to private sector (CPS), inflation (inf), trade openness (open), remittances (rem), human capital development (SECENR), GDP per capital (GDP cap) and Labour force (Lab F). Panel A reports that the mean and median values were in line with the statistical properties of all the variables. While the result indicates that many of the variables were positively skewed except labour force that is negatively skewed. While the result shows that some of the variables were centrally tailed. The normality test was conducted using Jarque Bera statistics, its probability values were reported as well. Almost all the variables reject the null hypothesis of no normality, thus, leading to acceptance of normal distribution for all the variables.

Panel B presented the correlation statistics, which generated mixed results with more of the variables reporting positive relationship and partly negative correlation. For instance, Gross capital formation to private sector credit, GDP per capital, human capital development and GDP growth rate presented positive relationship with some in strong form and others in weak form. However, inflation and remittance showed negative relationship to private sector credit.

PANEL UNIT ROOT TEST

Table 3 below reports the panel unit root test estimates for the variables. The unit root tests was conducted using four approaches, Levin, Lin and Chut (LLC), L, Pesaran and Shin W. Stat (IPS), Augmented Dickey- Fuller Fisher Chi square (ADF); and Phillip Perron Fisher Chi-square (PP). In the table below, the tests for panel unit roots were specified with individual effects only. The LLC t-stat suggest that credit for private sector as a percentage of GDP in level form exhibit a unit root even though other test reject the null of non stationarity.

The LLC t-stat has a t-stat of -2.417 and a probability value of 0.0078. However, other variables become stationary at first difference except labour force. In the case of IPS ADF, PP the t-stat and probability value indicates that all the variables become stationary in first difference at 1% level.

TABLE 3: PANEL UNIT ROOT TEST (FIRST DIFFERENCE)

	LLC	IPS	ADF	PP
Credit to private sector (CPS)	-2.4171***(0.0078)	-1.3264(0.0923)	28.6786(0.0525)	13.3408(0.7709)
Gross capital formation (GCF)	-1.8835**(0.0298)	-2.6525***(0.0040)	41.6138***(0.0000)	53.2923***(0.0000)
GDP per capital (GDP cap)	-6.3614***(0.0000)	-6.6374***(0.0000)	78.2513***(0.0000)	114.632***(0.0000)
GDP Growth Rate (GDPGR)	-13.1181***(0.0000)	-16.2080***(0.0000)	205.300***(0.0000)	235.122***(0.0000)
Inflation (Inf)	-11.5285***(0.0000)	-15.1295***(0.0000)	193.271***(0.0000)	289.805***(0.0000)
Labour Force (LabF)	-0.67380 (0.2502)	-3.8348***(0.0000)	46.4634***(0.0000)	122.271***(0.0000)
Broad money supply (MGDP)	-6.3527***(0.0000)	-8.6629***(0.0000)	104.710***(0.0000)	159.092***(0.0000)
Trade openness (Open)	-6.9125***(0.0000)	-8.3455***(0.0000)	101.002***(0.0000)	205.073***(0.0000)
Remittances (REM)	-4.1233***(0.0000)	-7.9439***(0.0000)	96.5603***(0.0000)	200.730***(0.0000)
Human capital dev. (SECENR)	-2.6542***(0.0000)	-3.3023***(0.0000)	45.2128***(0.0004)	86.7564***(0.0000)

*, **, *** mean significant at 1%, 5% and 10% level

Probability values in parentheses.

JOHANSEN FISHER PANEL COINTEGRATION TEST

The Johansen Fisher Panel co-integration test result indicates the existence of co-integrating vectors. Thus, confirming the existence of long run relationship among the variables considered. The acceptance of the existence of the long run relationship was as a result of significant value of trace statistics and eigen values with their significant respective probabilities as shown below.

Table 4: Johansen fisher panel cointegration test result

Hypotheses	Trace Test	Prob.	Max-Eigen Test	Prob.
Non	12.48	0.8217	12.48	0.8217
At most 1	5.545	0.9977	97.65	0.0000
At most 2	918.9	0.0000	314.3	0.0000
At most 3	459.7	0.0000	271.0	0.0000
At most 4	303.8	0.0000	158.2	0.0000
At most 5	173.7	0.0000	88.34	0.0000
At most 6	100.6	0.0000	58.16	0.0000
At most 7	57.04	0.0000	32.21	0.0208
At most 8	40.91	0.0016	30.64	0.0317
At most 9	35.47	0.0083	35.47	0.0083

TABLE 5: PANEL DATA REGRESSION OF REMITTANCES AND ECONOMIC GROWTH

PANEL 1: COEFFICIENTS AND RELIABILITY STATISTICS

DEPENDENT VARIABLE: GROWTH RATE OF GDP

Explanatory Variables	Fixed Effects Estimates	Random Effect Estimates
Gross Capital Formation (GCF)	0.0437(0.0295)	-2.8289(0.5591)
Credit to private sector (CPS)	-0.0135**(0.0285)	0.0565**(0.0413)
Inflation (Inf)	0.0098** (0.0299)	-0.0124**(0.0265)
Trade openness (open)	0.0313(0.1627)	0.119** (0.0567)
Remittance (Rem)	0.2552** (0.0226)	0.02015** (0.0410)
Human capital Development (SECE)	-0.0288(0.7397)	0.0263*** (0.0177)
Labour Force (Lab F)	-0.3076 (0.2458)	0.0539(0.3730)

DIAGNOSTIC STATISTICS

R-Squared	0.2751	0.4748
Adjusted R-squared	0.1351	0.4287
F-Stat	1.9653	1.9298
Prob.	0.0006	0.0650
Durbin Watson Statistics	1.69	1.5466

***, **, * denotes significant at 1%, 5% and 10%. Probability values in parentheses

IMPACT OF REMITTANCES AND ECONOMIC GROWTH

Table 4 presents the result of impact of remittances on economic growth. A critical inspection of the result begins with the fixed effects estimates which will be interpreted side by side with random model.

In column one of the table, the fixed effect and random effect regression reveals that the proxy variables to capture remittances (remittance as a percentage of GDP) are positive and significant to economic growth at the 5 percent level. This suggests that remittance inflow into Sub Saharan Africa region promotes growth. This finding conforms to the findings by Jongwanich (2007), Sufian (2009). This findings also corrects for the surprising and significant but negative findings in Raju et al (2010), Chaun et al (2005), Abdih et al (2008). In their works explained that remittances are compensatory in nature. This is not surprising because their studies are country specific, and could be influence greatly by individual effects as against regional effects. Abdih et al (2008) suggest possible reasons for negative relationship between remittance and growth to be as a result of multiple channels through which remittance may affect growth.

Surprisingly, Abdih et al failed to explore the channel through which remittance may affect growth in their studies. Specifying a 95 per cent confidence interval, a complete increase in remittance inflow into SSA should increase growth of GDP by 2.55 per cent in the fixed effect model and 201.5 per cent in the random effect model. In the case of financial development, the regression results indicate that financial development represented in this study by credit to private sector as a percentage of GDP is negatively signed and significant at 5% level in both the fixed and random effect model. This finding conforms to previous studies by Giuliano and Ruiz-Arranz (2009) and Fayissa and Nsiah (2008) who posits that remittances growth in countries where the financial system is shallow by providing an alternative way to finance investment and overcome liquidity constraints. The findings of the study is not surprising, because of the shallow nature of financial system in most Sub Saharan African economies. In addition, the regression result indicate that Gross Capital Formation as a percentage of GDP which is the proxy for physical investment is positively and significantly related to growth in both the fixed and random effect models at 5% significance level. The estimation results present supportive evidence that economic growth is dependent on physical investment.

Specifying a 95 percent confidence interval a 100 percent increase in capital accumulation should result in 4.37 per cent increase in output growth in fixed effect model and 5.65 per cent increase in random effect model. The implication that emerges from these findings suggest that remittance recipients households invest remittance receipts as start-up capital for micro enterprises in the absence of bank credit facilities.

This finding also lend credence to some micro economic studies such as Adams (2005) who found that households that receive remittances spend less on consumption and more on investment. Moreover, Giuliano and Ruiz-Arranz (2008) also corroborates Adams findings when he concluded that remittances help alleviate credit constraints on the poor, thereby substituting for lack of financial development, improving the allocation of capital and consequently accelerate growth.

The coefficient of secondary school enrollment which is the proxy for human capital investment is negative but insignificant in fixed effect model. Meanwhile, there is a complete sign reversal in the random effect model. The result of the random effect reports a positive and significant relationship between human capital investment and output growth in Sub-Saharan Africa.

In order to explore the channel through which remittances spur growth in the selected sub-Sahara Africa region, two additional models were specified; one on the financial development channel and second on the capital accumulation channel.

PANEL DATA REGRESSION OF FINANCIAL DEVELOPMENT REMITTANCE MODEL

The basic objective of this model is to ascertain whether financial development influence remittance inflow into the region in the period under study. This study examines the importance of the financial institutions to increase flow of remittances especially how transaction costs influences the propensity to remit. Table 5 presents fixed effect and random effect estimates.

In the two regressions, two measures of financial deepening used are: Liquid liabilities as a percentage of GDP and the credit to private sector as a percentage of GDP, respectively. The estimated coefficient of the liquid liabilities is positive and significant at 1 percent level for both fixed and random effect models as shown by the probability values of the t-statistics. Intuitively, financial infrastructures in Sub-Sahara Africa have encouraged migrant workers of sub-Sahara Africa region to remit money into their home countries.

Credit to private sector as a percentage of GDP is also used in this study as proxy for financial deepening. Some scholars prefer this to liquid liabilities because it measures the extent of banking activities of an economy. Table 6 indicates that private sector credits have a negative impact on remittances for both fixed effect and random effect models at one percent level of significance. In terms of magnitude, an increase by 100 percent point in the credit to private sector would decrease remittance inflow to sub-Sahara Africa region by 6.24 percent in the fixed effect model. Similarly, an increase by 100 percent point in the private sector credits would shrink remittance inflow into region by 4.54 percent. The implications that emerge from this finding are: one, the marginal impact of remittances on growth decreases with dept of the financial system. This result conforms with findings of Giuliano and Ruiz Arranz (2005) that remittances act as a substitute for financial services in promoting growth by offering the response to the needs for credit that the market has failed to provide.

TABLE 6 DEPENDENT VARIABLE: REMITTANCES

Explanatory Variables	Fixed Effect	Random Effect
Constant	-37.2857***(0.0004)	-11.8813***(0.0109)
Credit to private sector (cps)	-0.0624***(0.0000)	-0.0454***(0.0002)
Gross capital formation (Gcf)	-0.0197 (0.6161)	0.0157 (0.6581)
Inflation (inf)	-0.0143(0.3615)	-0.0050 (0.7120)
Openness (open)	0.0280** (0.0290)	0.0194** (0.0539)
Broad money supply MGDG	0.1670*** (0.0004)	0.1015***(0.0022)
Labour Force (Lab F)	0.4039***(0.0092)	0.1330**(0.0373)
Human capital development (SECE)	0.2365 ***(0.0004)	0.0783***(0.002)

DIAGNOSTIC STATISTICS

R-Squared	0.5681	0.1995
Adjusted R-squared	0.4848	0.1788
F-Stat	6.8133	9.6500
Prob.	0.0000	0.000
Durbin Watson Statistics	0.2791	0.1885

*** denotes significance at 1%

** denotes significant at 5%

* denotes significant at 10% - probability values in parentheses

IMPACT OF REMITTANCES ON INVESTMENT

Table 6 reports the estimation results for the impact of remittances on physical investments. The regression results showed that the coefficients of the indicators of remittances are positively related to investment in both fixed effect and random effect model and significant at one percent level specifically, the result shows that a 10 percent point increase in remittance inflow would lead to 0.136 percent in investment in the fixed effect model. The magnitude of coefficients of remittance impact on investment increased significantly in the random effect model. The result showed that a 10 percent increase in remittance inflow should result to 1.05 point increase in investment. These findings are not surprising considering the huge inflow or remittance into the Sub Sahara Africa region and seemingly lack of access to business finance from the formal financial system. The positive and significant effect of remittances on physical investment can be backed on its investment on acquisition of plant and machinery for production in micro enterprises. Meanwhile, previous studies document similar results (Mishra, 2005, Adams 2007, Lucas 2005 Amuedo Dorantes and Pozo 2006, Woodruff and Zenteno 2001).

Additionally, the negative and significant relationship found in the remittance versus financial development model, confirm our earlier result that emphasize the role of remittance on financial development. The results also lend credibility to other previous studies which indicates that remittance promotes growth in economies where the financial system lacks the potential to provide adequate finance for business. The diagnostic estimates, the R-squared, F-statistics and probability of the F-statistics indicate joint significance of all the parameters.

Another significant finding is the negative relationship between private sector credits and investment. This finding is against theoretical expectation in the sense that loanable funds should lead to improvement in capital accumulation. This could be explained to be as a result of the shallow nature of region's financial system that does not allow for efficiency in the financial intermediation process. The sub-Saharan Africa financial system is characterized by high interest charged on loans and decayed infrastructural facilities to support micro enterprises. The application of both fixed effect model and random effect model in this study is as a result of observation made by Judge et al. They stated that "if (T) the number of time series is large and the N the number of cross sectional units is small as in this case, there is likely to be little difference in the values of the parameters estimate by both models. Hence the choice here will be based on computational convenience. On this score, FEM may be preferable. However, if the cross sectional units in the sample are regarded as random drawings also as in this case, the random model is appropriate Gujarati (2004). Despite this, the random model will be subjected to stability test as follows:

**TABLE 7: PANEL REGRESSION OF PHYSICAL INVESTMENT AND REMITTANCES
 DEPENDENT VARIABLE: REMITTANCES AS SHARE OF GDP**

Explanatory Variables	Fixed Effect	Random Effect
Constant	-1.0757(0.7542)	8.2194**(0.0009)
Credit to private sector (cps)	-0.0702*** (0.0043)	-0.0454*** (0.0002)
Inflation (inf)	0.0173 (0.5069)	
Trade openness (open)	0.0750*** (0.0006)	0.0701*** (0.0001)
Broad Money supply (MGDP)	0.4066 ** (0.0000)	0.3345*** (0.0000)
Remittances (Rem)	0.0136 *** (0.0018)	0.1053*** (0.0013)
Human capital development (SECE)	0.1459* (0.771)	-2.5880 (0.0102)

DIAGNOSTIC STATISTICS

R-Squared	0.565	0.749
Adjusted R-squared	0.484	0.733
F-Stat	6.935	15.104
Prob.	0.0000	0.0000
Durbin Watson Statistics		

***, **, * mean significant at 1%, 5% and 10% level
 Probability values in parentheses.

STABILITY TEST

The stability test of the random model is based on standardized residual test and the confidence ellipse. The random models normality test was also reported by the Jacque Bera statistics and its corresponding histogram for the remittance growth model. The normality test indicates that the overall distribution of the random model is stable across time and space. The confidence ellipse in figure 4, supports the result of the standardized residual test on the overall stability of the random model. The ellipse were made on a six basis points to capture the stability effects of the quadrants of the square box. The figure below shows that ellipse were saturated within the confidence square box which signifies the stability of the overall specification of the model.

Figure 1: Confidence Eclipse

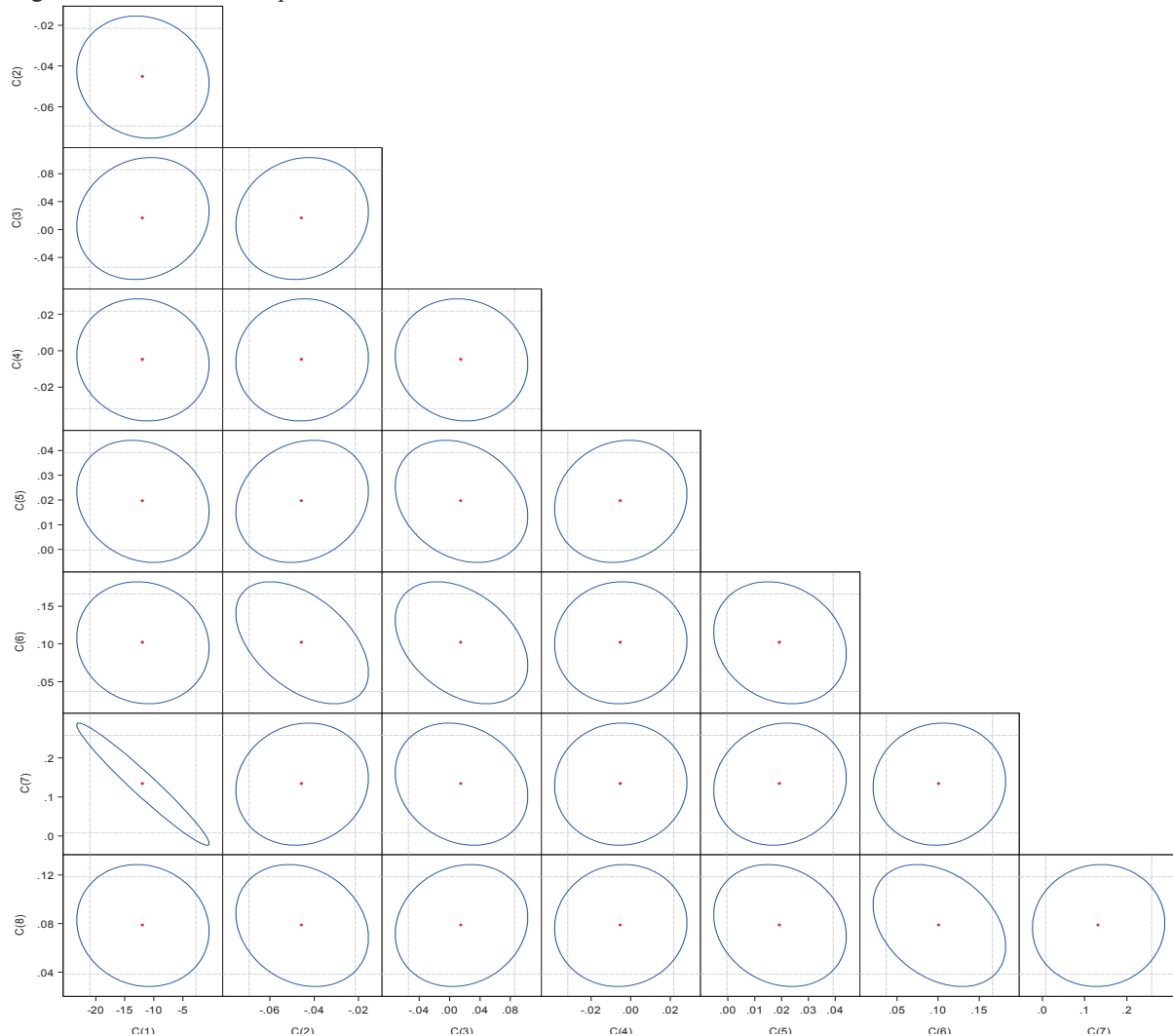
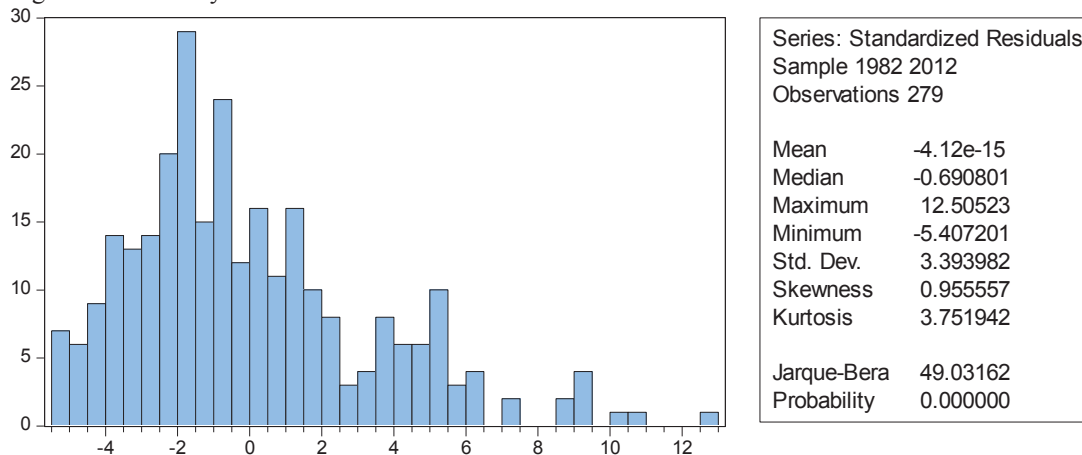


Figure 2: Normality Test



CONCLUSION

The study applied the co-integration panel least square approach to examine the impact of remittances on economic growth of selected sub Saharan Africa countries with special emphasis on the transmission channel. The panel least square regressions result of the impact of remittance on output growth indicates that remittance inflows into the region have a positive and significant impact on the economic growth of the selected countries.

The results was robust to both fixed effect and random effect models. This interesting result motivated the authors to explore the channel through which remittances affect output growth, looking specifically on the financial development and investment channels. Empirical evidence from this study shows that financial infrastructure of the selected countries motivated migrants to remit part of their income to their home countries. Additionally, findings from the study indicate that remittance recipient households substitute remittances for lack of financial development by offering the response to the needs for credits that the financial market failed to provide. This findings is in line with the findings of Guiliano and Ruiz-Arranz (2008), Adams (2005) amongst others. Finally, remittances was found to be positively related to physical investment in sub sahara Africa region, thus, confirming previous studies such as (Mishra 2005; Adams 2007, Lueas 2005, Amuedo Dorantes and Pozo 2006) amongst others.

In concluding this study, it is quite obvious that remittances inflow is growth enhancing to the sub shara Africa economics financial system infrastructure should be enhanced in order to reduced transaction. This will in no doubt encourage migrants to remit part of their savings for investments purposes.

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