The Impact of Remittances on Economic Growth in Nigeria: an Error Correction Modeling Approach

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Abstract: This paper investigated the relationship between remittances and economic growth in Nigeria, using an error correction modeling approach for the period 1981 to 2011. Our result revealed that in the long run, remittances impact positively on the economic growth of Nigeria. However, remittances show a significant negative relationship with output in the short run. Also, while foreign aid as an external source of capital have both short and long term significant influence on economic growth in Nigeria, its counterpart FDI can only exert positive impact on RGDP in the short run. Our result also affirmed the significant positive role of trade in promoting economic growth, suggesting that the more open the economy, the more stimuli it has on RGDP both in short run and long run. A policy implication which may be drawn from this study is that Nigeria can improve its economic growth performance, not only by investing on the traditional sources of growth such as investment in physical, foreign direct investment and trade, but also by strategically harnessing the contribution of remittances by ensuring their efficient and reliable transfers.

Keywords: Remittance, Economic growth, Error Correction Modeling, Nigeria.

JEL Classification: F24, F43

Introduction

The importance of remittances in compensating the human capital loss of developing countries through migration and their potential in boosting economic growth as in recent time gained momentum and became the subject of debate in political and economic literature. Worker remittances constitute an increasingly important mecha-

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nism for the transfer of resources from developed to developing countries, and remittances are the second-largest source, behind foreign direct investment and external funding for developing countries (Russell 1992; Ratha, 2003; Buch and Kuckulenz, 2004; Karagöz 2009).

Remittances are playing an increasingly large role in the economies of many countries, contributing to economic growth and the livelihoods of less prosperous people. Available statistics indicate that the number of international migrants in the world increased from just over 75 million in 1960 to just over 190 million in 2005 or 3 percent of the world's population (United Nations, 2006). Global remittances including those to high income countries are estimated to have reached $514 billion in 2012, compared to $132 billion in 2000.

The stability of remittance flow despite financial crisis and economic downturns make them reliable financial resources for developing countries. As migrant remittances are sent cumulatively over the years and not only by new migrants, remittances are able to be persistent over time. Remittances may ameliorate some of the problems that plague developing countries, such as credit market failures, inequality in income and in opportunities, income volatility, and poverty (Karagöz, 2009). Remittances flow to developing countries has more than quadrupled since 2000. According to the latest edition of the World Bank's Migration and Development Brief, officially recorded remittances flow to developing countries grew by 5.3 per cent to reach an estimated $401 billion in 2012. Remittances to sub Saharan Africa have been increasing despite the contraction that is associated with global financial crisis. In 2012, the region is estimated to have received about $31 billion in remittances flow.

The effects of remittances on receiving countries have been found at a microeconomic level to boost investment in human capital and educational attainments, raise health levels and investment in public infrastructure in many developing countries (Beine et al, 2010). In development literature, remittance inflows is claimed to promote microentrepreneurship by lifting budget constraints in areas with poor access to credit (Woodruff and Zenteno, 2001). From a macroeconomic perspective, remittances can boost aggregate demand and thereby GDP as well as spur economic growth. Remittances can also be used to offset chronic balance of payments deficits, by reducing the shortage of foreign exchange which can help to ease the often crucial restraint imposed on the economic development of the migrants' home countries by balance of payments deficits (Buch and Kuckulenz, 2004). Aside from the significance of this magnitude in the countries of origin, remittances are generally less volatile, compared to private capital inflows and foreign direct investment (FDI) as a source of funding. As a unilateral transfer, remittances do not create any future liabilities such as debt servicing or profit transfers (Ratha, 2003; Buch and Kuckulenz, 2004; Ojapinwa, 2012).

However, remittances if not appropriately used can create 'Dutch disease' effects through the appreciation of domestic currencies, leading to further de-industrializa-

tion in the receiving country (Beine et al, 2010). Bryan R. (2004) suggests potential costs of remittance flows to include brain drain and reduction of labor effort of recipient families and thus negatively affect on growth. Karagoz (2004) observed that large outflow of workers, especially skilled workers, can reduce growth in labor-skilled countries and indirectly affect labor supply, by encouraging some remittance-recipient households to choose more leisure than labour.

Over the past three decades, Nigeria has witnessed large movement of its labour, both graduate professionals and non-graduate professionals from one country to the other basically in search of greener pastures. Some of these factors attributing to migration include the high rate of unemployment and low levels of incomes in the country. There has been a remarkable increase in emigration to Europe, North America, the Middle East and South Africa, following economic downturn, introduction of liberalization measures and emergence of repressive military dictatorship (Adedokun, 2003). Nigeria is far the largest recipient of remittances in the sub Saharan African region, accounting for about 67 percent of the inflows to the region in 2012, followed by Senegal and Kenya (World Bank report, 2013).

While the conventional sources of economic growth have received considerable attention in the empirical literature, it is rather surprising to find that the macroeconomic impact of remittances on economic growth has not been adequately investigated, even though they represent a major part of international capital flows. Despite the increasing importance of remittances in the total international capital flows, the perceived growth effect nexus of remittances, especially in Nigeria, has not been adequately studied empirically. Most of the existing paper in Nigeria focused on socio-economic determinants of worker's remittances with few demonstrations on the impact of remittances on economic growth.

Against this backdrop, it is important to empirically examine the impact of remittances on economic growth in Nigeria by bringing out the pronounced positive effect of remittances on economic growth as compared to other external sources of capital. To this end, we employed an econometric procedure which heavily relies on Multivariate Cointegration within an error correction model (ECM) to establish both the short- and long- run relationships between inflows of remittances, investment level and other foreign exchange sources in the form of, foreign aid, foreign direct investment and openness to trade on economic growth for the period 1981 to 2011.

Literature Review

Approaches to the theory of remittances in the literature has identified and described various costs and benefits of remittances. A seminal paper by Lucas and Stark (1985) provide three explanations of migrants' decisions to remit. The first explanation is

pure altruism: migrants send money to their families in their home country in order to increase their families' income and thus, consumption. In this case remittances should be negatively correlated with family's income in the home country. Second, remittances might be motivated by self-interest, when the migrant aims to inherit part of the family's wealth or take advantage of convenient investment opportunities (i.e. higher returns) in the home country. Finally, remittances could be viewed as an outcome of a "mutually-beneficial contractual agreement" between the migrant and his family members. One of the underlying incentives for such arrangements could be household's intention to diversify risks by locating its members in different countries (cities, regions) which are less likely to be hit by an adverse shock simultaneously (Lucas and Stark 1985).

While the above former work on remittances has emphasized the motive, costs and benefits of worker remittances, economic literature is inconclusive on the manners by which international capital flows in the form of remittances can affect economic growth. The interactions have been examined with regards to the short and long run impact of remittances on growth. The following however, have been established from economic literature as the main theories / models that underpin the relationship between remittances and economic growth; the Keynesians, the Mundell-Flemming, the Endogenous and the Structuralist growth model.

The Keynesian model is the oldest attempt to capture the short-run macroeconomic impact of international transfers on output. The model, under the assumption of sticky prices, fixed exchange rate, interest rate and the absence of supply constraints postulates that distortions or shocks to the economy on demand side have a disproportionate effect on national output. the theory further argues that the magnitude of these shocks on national output would depend on Keynesian multiplier (which, itself, depends on several parameters such as the marginal propensity to import), and on the size of the transfer shock (which itself depends on the amounts received and on the recipients' marginal propensity to consume remittances as a constituents of the agents' expectations regarding future income streams. Based on this rationale, Glytsos (2005) developed a Keynesian type macroeconomic model to estimate the demand effect generated by remittances on consumption through disposable income. He found a positive and significant relationship between income, consumption and imports. In a similar vein, using annual data on Egypt for 1967-91, El-Sakka and Mc-Nabb (1999) found that imports financed through remittances have very high income elasticity, implying that remittances may have low multiplying effects.

The Mundell-Flemming model of an open economy with fixed prices and a single composite good provides a good alternative framework for analyzing the short-run run dynamics of international transfers on national output. The central focus of this framework is that, the effect of international transfers on GDP depends on the assumptions made about the degree of capital mobility and whether or not an economy

is operating a fixed or floating exchange rate regime. In the case of perfect capital mobility and where the economy operates a pure flexible exchange rate regime, the equilibrium level of GDP is fully determined by the money market and output is not affected by international transfers. A rise in the aggregate amount of remittances may stimulate the national expenditure, but this effect is fully compensated by a currency appreciation. In a pure fixed exchange-rate regime, on the other hand, the equilibrium of the balance of payments is obtained through variations in the money supply. It is under a fixed exchange rate regime that a rise in aggregate remittances or international transfers may induce an increase in national income.

Modern short-run macroeconomics, however, are based on a systematic exploration of the endogenous determination of wages and prices, a process in which expectations play a critical role. Using static demand-oriented models with sticky prices and wages, traditional short run macroeconomics have focused on the effect of international transfers on the aggregate expenditure and the national output. If expenditure shocks induced by international remittances are perfectly expected by wage-setters, the effect on the level of activity would then depend on the extent to which wages and prices are flexible. If prices are fully flexible, there should be no effect on output (in such a setting, only unexpected shocks may generate departures from the natural output level). If prices or wages adjustments are sluggish, however, temporary real effects could be obtained.

Recently, the long-run impact of remittances has been reformulated in an endogenous growth framework. Endogenous growth model provide the channel through which remittances could promote economic growth and development. Remittances have been recognized to affect the long-run performance of receiving economies in a way that depends on whether remittances are used for consumption or investment. The argument is that, it accelerates the pace of economic growth through enhancing human capital or productivity. Ratha (2003) pointed out that remittances augment the recipient individuals' incomes and increase the recipient country's foreign exchange reserves. If remittances are invested, they contribute to output growth, and if they are consumed, then they also generate positive multiplier effects. By generating a steady stream of foreign exchange earnings, they can improve a country's creditworthiness for external borrowing and through innovative financing mechanisms (such as securitization), they can expand access to capital and lower borrowing costs. While large and sustained remittance inflows can contribute to currency appreciation and so affect the production cost-sensitive trade goods, Stahl and Arnold (1986) argue that the use of remittances for consumption may have a positive effect on growth because of their possible multiplier effect. Moreover, remittances respond to investment opportunities in the home country as much as to charitable or insurance motives.

Barajas et al (2009) pointed out three channels through which remittance could affect economic growth and development, using growth accounting framework. One,

by directly financing an increase in capital accumulation relative to what would have been observed if the recipient economies had been forced to rely only on domestic sources of income to finance investment. Two, by labor inputs through labor force participation and third, may affect total factor productivity (TFP) growth through effects on the efficiency of domestic investment as well as the size of domestic productive sectors that generate dynamic production externalities.

A bridge between short and long run effects is laid by structuralist growth models that stress the interplay between current demand and future growth prospects. In demand-led growth models, current demand influences the level of capacity utilization, that is one of the determinants of investments. An expansion of capital can be hindered by an insufficient level of domestic demand; the increase in private consumption that remittances generate can thus induce firms to undertake new investments. In the harmonizing work of Solimano (2003), the impact on growth of remittances in the receiving economies is likely to act through savings and investment as well as short-run effects on aggregate demand and output through consumption. Workers' remittances are a component of foreign savings and they complement national savings by increasing the total pool of resources available for investments.

Much of the current literature on the workers' remittances has followed two broad strands. While some studies have concentrated on the determining factors of remittance inflows –((Aydas et al. (2005), Gupta (2005), Alleyne (2006), Hagen and Siegel (2007)) others have shown curiosity in macroeconomic impact of remittances on growth ((Chami et al. (2003), Ang (2007), Siddique, 2010)). With regards to methodology, according to Adolfo et al (2009), there are two types of studies of the growth effect of remittances. First, growth effect of remittances is considered in the traditional cross-country growth literature using either cross-section or panel data. The second type of literature investigates specific channels through which remittance inflows may affect growth in a country.

However, the net macroeconomic impact of remittances on receiving countries' economies is ambiguous. The literature investigating the economic impact of remittances on a host country's long-term economic growth still presents a considerable diversity of interpretations about the effects of workers' remittances even when the focus of the economic analysis shifts from the short to the long-run, thus generating inconclusive results. While some studies emphasized the positive impact of remittances on economic growth in the country of origin of the expatriate workers, others strand of the literature reports an insignificant or even negative impact of remittances on the home country's long-term economic growth.

Using panel data techniques for MENA countries over the period 1980–2009, Mim and Ali (2012), study the remittances' effect on economic growth. Estimation outcomes show that the most important part of remittances is consumed and that remittances stimulate growth only when they are invested. Moreover, empirical results

suggest that remittances can enhance growth by encouraging human capital accumulation. Human capital is therefore an effective channel through which remittances stimulate growth in MENA countries. The results show that remittances produce a positive and significant effect on growth. Fayissa and Nsiah (2010) also explores the aggregate impact of remittances on the economic growth of 18 Latin American Countries within the conventional neoclassical growth framework using an unbalanced panel data spanning from 1980 to 2005. The study shows that remittances have a positive and significant effect on the growth of Latin American Countries where the financial systems are less developed by providing an alternative way to finance investment and helping overcome liquidity constraints.

Edwards (2009), examines the relationship and growth impact of remittance and aid transfers. The results of fixed effects panel estimations on 22 LAC economies for the 1979-2008 periods suggest that remittances and foreign aid inflows are negatively associated with growth. This supports the altruistic and insurance motivation for countercyclical remittance and aid grants. Further statistical tests imply that they are substitutes and this relationship may also contribute to their negative association with growth. Sufian (2009), with the regression of panel data for 7 MENA countries during the period 1975-2006 finds significant positive effect of remittances on per capita income growth rate in these MENA countries. Using panel data for 17 countries in the Asian and Pacific region for the period 1993-2003 Jongwanich (2007) uses GMM method to estimate the impact of remittances on economic growth and investment and finds only a marginal impact of remittances on the economic growth operating through human capital formation and domestic investment. The author uses GMM method to estimate the impact of remittances on economic growth and investment.

Siddique (2010), investigates the causal link between remittances and economic growth in three countries, Bangladesh, India and Sri Lanka, by employing the Granger causality test under a VAR framework for 25 year period. The study found that, while growth in remittances does lead to economic growth in Bangladesh, there seems to be no causal relationship between growth in remittances and economic growth in India. A two-way directional causality is however found in Sri Lanka for economic growth and remittances. Chami et al. (2003), covering 113 countries found that remittances had a negative effect on growth. The authors of the study attribute this negative effect on the moral hazard problem that remittances create. Essentially, the study concluded that income from remittances allows receiving families to decrease their own work and productivity, which then translates into a reduction in the labor supply for the developing country. Ang (2007) shows the relationship between workers' remittances and economic growth at the national and at the regional levels in the case of Philippines. He found that at the national level remittances do influence economic growth positively and significantly. When he broke down his analysis at the regional level to confirm the national results, he found that mixed results giving

rise to his anecdotal observations that remittance do not positively affect economic growth. In sum, he concludes that remittances have to be translated to value-added activities and investments which are more foundational sources of development and growth.

Khathlan (2012) adopted the autoregressive distributed lag (ARDL) and the error correction model (ECM) techniques to establish the long-run and short -run relationship between worker remittances and economic growth in Pakistan during the period 1976-2010. The results reveal the existence of a positive and significant relationship between worker remittances and economic growth in the long-run and short-run in that country. Ravshanbek (2011), investigates potential impact of workers" remittances on the long-term economic growth of recipient countries. The results of the empirical regression analysis indicate that remittances have positive effect on the per capita income growth of 10 selected countries. Furthermore, the paper investigates the channels through which these worker" remittances can have positive impact on the economic growth. The results suggest that remittances have no impact on physical capital accumulation but positive impact on human capital accumulation in these countries. Karagöz (2009) investigate the effect of remittances on the economic growth of Turkey for 1970-2005 period. The time series regression findings show that remittance flow to Turkey have statistically meaningful but negative impact on growth. On the other hand, exports and domestic investments positively effect the economic growth, while foreign direct investment has no meaningful effect.

Most recent studies in Nigeria on the impact of remittances on economic growth reveal almost similar results. Iheke (2012) study provides empirical evidence that international remittance inflows are one of the major macroeconomic factors that significantly promote economic growth in a developing economy like Nigeria. Akonji and Wakili (2013) used the seemingly unrelated regression (SUR) analysis and Error Correction Model to study the impact of remittances on economic growth. The result also established a significant relationship between net remittance and economic growth. Akinpelu and Ogunbi (2013) in their study investigate the impacts of remittance inflows on the economic growth of Nigeria using cointegration and causality tests. The result of the study revealed that there is long run equilibrium relationship among the variables that were employed. Furthermore, the causality test shows a uni-direction causality from Gross Domestic Product to Remittance Inflows. Ukeji and Obiechina (2013) investigated the impact of the workers' remittances on economic growth in Nigeria within an error correction methodology (ECM) the period 1970 to 2010. The long-run static model and the short run dynamic model indicate that workers' remittances impact positively on economic growth.

Trends in Remittances, Foreign Direct Investment (FDI), AID and Economic Growth

Fig. 1 depicts the trends in worker remittances as a percentage of GDP and the GDP growth rate in Nigeria during the period 1981 to 2011. Worker remittances increased from an average of 0.02 percent of the GDP during 1981-1985 to an average of 4.56 percent during 2001-2005. Similarly, the average annual GDP growth rate increased from negative -5.24 percent during 1981-1985 to 3.52 percent during the 2001-2005. The figure also shows a positive link between the inflow of worker remittances and the GDP growth rate in 2006 and 2007. However, Worker remittances recorded a decline in 2008 to 9.3 percent but picked up again in 2009 before marginally declined in the following two years to 8.65 and 8.38 percent respectively. The GDP growth rate also recorded a decline in 2006 and 2008 to 3.44 and 3.17 percent respectively but reversed to increase in the following years before declining again in 2011

Figure 1: Remittances (% GDP) and GDP Growth in Nigeria: 1981-2011
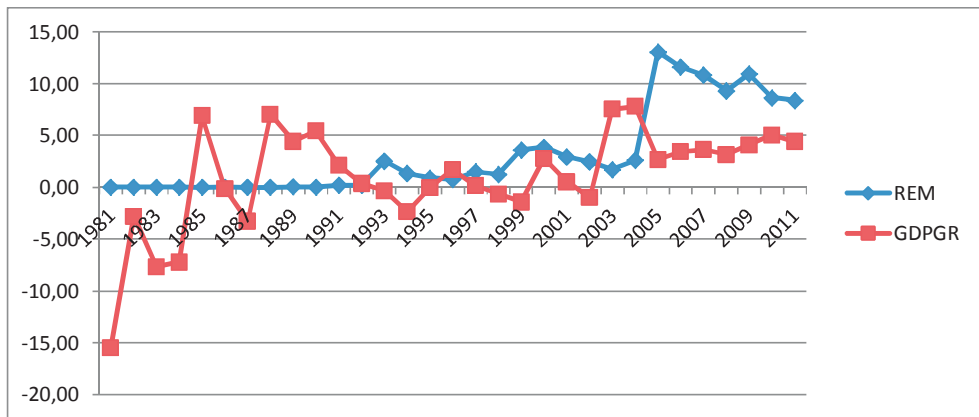
Sources: World Development Indicators (WDI), 2011, Central Bank of Nigeria, (2012).

Table 1: Growth Performance of the GDP and Worker Remittances along With FDI and AID in Nigeria during 1981-2011

Year	Remittances (₦ 'Million)	Remittances / GDP (%)	Net FDI (₦ 'Million)	Net FDI / GDP (%)	Official Development Ass ($million) AID	AID / GDP (%)	GDP Growth rate
1981-1985	10.49	0.02	336.70	0.61	37010000	0.10	-5.24
1986-1990	40.58	0.02	4694.04	2.93	168580000	0.69	2.9
1991-1995	9759.75	1.04	29841.86	3.37	241236000	0.93	-0.05
1996-2000	77909.69	2.20	102247.74	3.09	183430000	0.51	0.53
2001-2005	530869.48	4.56	699655.31	3.24	1553614000	1.54	3.52
2006	624,520.73	11.58	2,149,129.59	3.36	11428020000	1.19	3.44
2007	759,380.43	10.82	2,235,634.32	3.68	1956260000	1.73	3.65
2008	971,543.80	9.3	2,258,678.19	4	1290160000	2.29	3.17
2009	1,273,815.80	10.93	2,710,252.52	5.14	1657070000	2.85	4.09
2010	905,730.80	8.65	2,938,239.48	2.67	2061960000	3.00	5.05
2011	1,360,307.91	8.38	3,139,422.99	3.62	1813060000	2.57	4.42

Sources: World Development Indicators (WDI), 2011, Central Bank of Nigeria, (2012).

Over the past decades, remittances to Nigeria have lagged behind the FDI and foreign aid in the 1980s to the late 1990s. During the periods, Nigeria recorded sustained increase in FDI in the 80s reaching a peak of 6.4 percent of GDP in 1990 while playing dominance over remittances and foreign aid up to the late 90s. In 2000, recorded remittances amounted to N177251.90 million (or 3.87 percent of

Figure 2: Remittances, FDI and AID as a Percentage of GDP: (1981-2011)
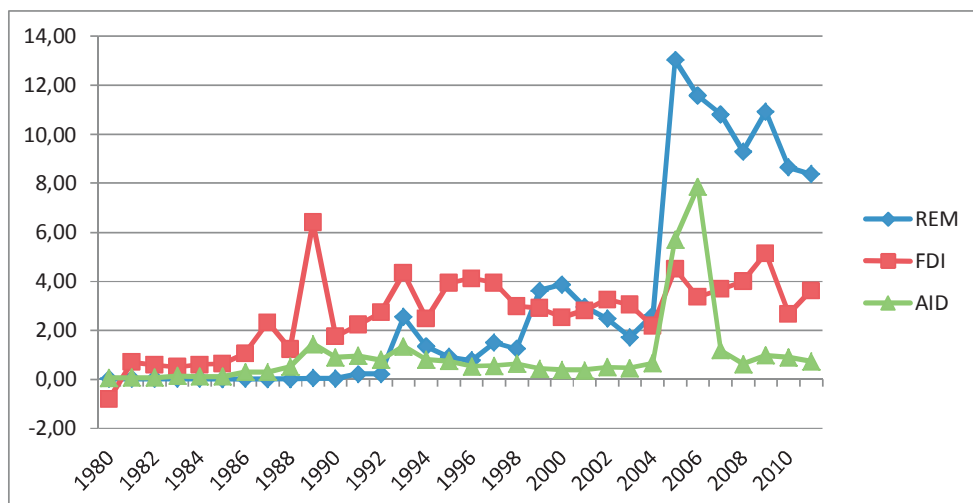
Sources: World Development Indicators (WDI), 2011, Central Bank of Nigeria, (2012).

GDP) and, maintaining an increasing path over the subsequent years, peaked at N 1,899,619.59billion (13.04 percent of GDP) in 2005 exceeding FDI and aid during these periods affirming the recent claims that remittances are now playing an increasingly large role in the Nigerian economies, growing above the FDI and foreign aid as a percentage of GDP (Fig. 2).

Data, Model Specification and Methodology

The empirical analysis focuses on the impact of remittance flows on economic growth of Nigeria. The time frame is the 30-years period of 1981-2011. The variables used in the regression models are extracted from two sources: the World Development Indicators (WDI) databank of the World Bank and the Central Bank of Nigeria (CBN) Statistical Bulletin.

   To determine the responsiveness of output growth rate to remittances, gross fixed capital formation as investment in physical and human capital, and external source of capital represented by foreign aid, foreign direct investment and openness of the economy as measured by the ratio of the sum of imports and exports to the GDP were used. Our basic empirical model is based on research studies of Chami et al. (2003) within an extended version of the neoclassical economic growth model. The model is modified to incorporate our variables of interest. Rather than considering growth, we look at the level of remittances to real gross dome3stic product (RGDP). According to Mansoor (2007), this is reasonable because a country would need to increase remittances year after year to promote growth, which would end up with a 100% share of remittances on GDP in the limit. The general form of the regression model is given in a log-linear modeling specification as below

$$LRGDP = \beta + LREM + \beta LGFCF + \beta LAID + \beta LFDI + \beta LTROP + \mu i \qquad 1$$

   LRGDP is the natural log of RGDP, LREM is the natural log of remittances, LGFCF is the natural log of gross fixed capital formation used as a proxy for investment in physical capital. Foreign aid (LAID) denotes the natural log of sum of official development assistance, (LFDI) indicates the natural log of foreign direct investment and (LTROP) denotes openness to trade measured by the sum of exports and imports as a percentage of GDP.

   Workers' remittances can affect economic growth positively or negatively as suggested by theory and existing literature. Therefore, it is difficult to predict the exact sign of the coefficient of LREM in advance. The literature purports a positive relationship between gross fixed capital formation (GFCF) and the economic growth.

   The last three variables in our model are used to capture the impact of external sources of capital on economic growth. There are two opposing views about the

impact of foreign aid (LAID) on economic growth. Proponents of aid argue that overseas capital flows are necessary for the economic growth of developing countries (Islam, 1992; Boone 1995; Fayissa and El- Kaissy, 1999). On the other hand, opponents of foreign aid argue that it has a negative effect on domestic savings and economic growth in less developed countries (see Heller, 1975 and Boone, 1994). At the same time, there exist several research papers about the impact of foreign aid on the economic growth which are inconclusive (Teboul and Moustier 2001), meaning that there may not be clear cut relationship between them and so we cannot a priori predict the impact official development assistance on economic growth. LFDI shows the impact of foreign direct investment on the growth rate of the country. The sign of this parameter is expected to be positive as foreign direct investment is widely viewed as transfer of (new) technology and (new) knowledge which enables the recipient country to exploit the experience of others for their development (see Chami et al ,2005). LTROP is used to capture the impact of trade, or openness of the economy on economic development of the country, measured by the sum of imports and exports as the ratio of GDP. Traditional views of openness of the country to trade describe positive effect of the openness on the economic growth, allowing countries to allocate resources efficiently by promoting innovation and entrepreneurial activities resulting from competition and access to larger markets (Berg and Kruger , 2003).

To estimate the parameters corresponding to variables of interest from the data under consideration, we use the cointegration approach, which is helpful for characterizing the long-run relationships between economic growth, remittances and other external sources of capital. We examined two unresolved questions in current literature: first, whether remittances positively affect GDP growth rate in the short run and long run, and second, whether remittances have a larger short/long-run effect on GDP growth than other sources of external capital.

According to the Johansen (1992) cointegration methodology, variables of interest can be understood as reflecting long-run cointegrating relations as presented below:

$$\Delta Yt = i{=}1p\; i\Delta\, Yt{-}1 + DZt\; +\; Yt{-}1{+}\,i \qquad\qquad 2$$

where Yt is a column vector of n endogenous variables, Zt is a column vector of *m* exogenous variables, Δ is the difference operator, and i is a column vector of white noise processes with mean zero and covariance given by the n x n matrix Σ, corresponding to covariance of residuals within and across equations. The matrix i contains parameters for a p-order lag process, while the Π matrix contains information about the long run relationships between the variables. When the Π matrix has a reduced rank (r ≤ (n−1)), it can be decomposed into $\alpha\beta'$, where the α matrix includes the speed of adjustment to equilibrium coefficients and β' is the long-run matrix of coefficients.

The existence of cointegrating vector(s) indicates long run relationship(s) among these variables, while short-term deviations from the long run time path of these series will be captured by the error correction model. To determine orders of integration of the variables in the model, we conducted traditional Augmented Dickey-Fuller and Phillips-Perron unit-root tests.

Finally, In order to estimate the short-run relationship among variables in equation (1), the corresponding error correction equation is estimated according to Engle and Granger (1987) as follows:

$$\Delta RGDP_t = \alpha 1_i + _{i=1}m\ \alpha 2_i ln \Delta REM_{t-i} + _{i=1}m\ \alpha 3_i ln \Delta GFCF_{t-i} + _{i=} \\ =1m\ \alpha 4_i ln \Delta AID_{t-i} + _{i=1}m\ \alpha 5_i ln \Delta FDI_{t-i} + _{i=1}m\ \alpha 6_i ln \Delta TROP_{t-} \\ -i + ecm_{t-1} + \mu_t \qquad\qquad 3$$

Where: Δ is the difference operator, m is the lag length of the variables, ecm_{t-1} denotes the residual from the cointegration equation (the error correction term), and μ_t is the uncorrelated white noise residuals.

Estimation and Discussion of Empirical Results

In this section, we begin with the preliminary analysis (i.e. summary statistics and correlation matrix of the variables). This will be followed by the results of the Unit Root Tests, the cointegration analysis and the interpretation of the results of the error correction model.

The result of the summary statistics of Table 2a (appendix A) revealed that the variables were of good fit with mean values of 374693 for LRGDP and probability value of 0.06. This was followed by LREM with mean values of 597558 with probability value of 0.004. This has an implication for the effect of remittance on economic performance of Nigeria. Moreover, the mean value of LFDI was 325540 with probability value of 0.000. It implies that foreign direct investment is important in explaining the contribution of remittance to economic development. The result of correlation matrix as shown by Table 2b (appendix A) indicates that most of the variables were not highly correlated. The result indicated that LRGDP and LREM correlated at 0.5321 and that of LREM and LAID correlated at 0.5806. This implies that most of the variables are well behaved for the regression analysis. The correlation matrix between LOPEN and LAID show 0.4500 which implies that openness and aid have long run relationship in explaining the effect of remittance on economic growth.

The analysis of empirical results starts with the examination of the integration order of each of the time series included in the model. The results of the Augmented Dickey-Fuller (ADF) and the Philips-Perron (PP) tests based on inclusion of an intercept as well as a linear time trend are shown in Table 3 below.

Table 3: Test of Stationarity using Augmented Dickey–Fuller (ADF) Phillips–Perron (PP)

Variables	ADF Values	PP Values	Order of Integration
LRGDP	-3.6711 (-3.574244)**	-3.5079 (-3.2217)***	I(1)
LREM	-5.7927 (-3.5742)*	-5.7927 (-4.3098)*	I(1)
LGFCF	-4.0892 (-3.5875)**	-3.9242 (-3.5684)**	I(0)
LAID	-4.8794 (-4.3240)*	-4.7716 (-4.3098)*	I(1)
LFDI	-3.4758 (-4.1985)***	- 3.5721 (-3.5684)***	I(0)
LTROP	-3.0155 (-4.4163)*	-8.1472 (-4.3098)*	I(1)

Note: * shows significant at 1%, ** shows at 5%, and *** shows at 10%: Extracted from E-Views 7 Output

It is apparent from Table 3 that all the variables were stationary at first difference, i.e. I(1) series, except LGFCF and LFDI that achieved I(0) stationarity in both ADF and PP tests. According to Haris (1995), variables of different order can be cointegrated, especially if theory aprior suggests that such variables should be included. To establish the existence (or otherwise) of a long-run relationship among the variables (series), a cointegration test was performed using Johansen's multivariate approach. In order to save the degrees of freedom, the highest lag length in the testing–down procedure of the lag-length tests was taken to be one, according to AIC and SC information criteria.

Table 4: Test of Cointegration

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	5 Percent critical Value	Max-Eigen Statistic	5 Percent critical Value
None *	0.7191	95.51	83.9371	36.8213	36.6301
At most 1	0.5619	58.69	60.06141	23.9362	30.4396
At most 2	0.4181	34.75	40.1749	15.7012	24.1592
At most 3	0.3492	19.05	24.2759	12.4564	17.7973
At most 4	0.1508	6.5912	12.3209	4.74183	11.225
At most 5	0.0618	1.8493	4.1299	1.84933	4.1299

Note:* denote the rejection of the null hypothesis at 5% significance level. Extracted from E-Views 7 Output

To test the hypothesis regarding the number of cointegrating vectors, the Johansen cointegration procedure performs two tests-Trace (λ_{trace}) and Max-eigenvalue (λ_{max}). Both Trace test and Max-Eigen value statistics indicate one cointegrating equation at 5% level of significance. Based on this, we can reject the null hypothesis (H_0) which says that there are no cointegrating vectors and conclude that the six variables under consideration are bound together by long-run equilibrium relationship under the assumption of no deterministic trend (Table 4).

As noted in table 4, since most of the variables are cointegrated, we normalize the coefficient on LRGDP in the cointegrating relationship to one, the long-run co-in-

tegrating equation relationship can be represented as follows: standard error (**.**) and t-statistics [**.**] in parenthesis

$$RGDP=662.678+0.187REM+0.204GFCF+0.039AID-0.448FDI+1.930TROP$$

	(0.079)	(0.202)	(0.084)	(0.172)	(0.270)
	[2.367]	[1.010]	[4.643]	[2.605]	[7.148]

The results from our model indicate that remittances variable has a positive and significant effect on the RGDP. Accordingly, a 1 percent increase in remittances would lead to a 0.19 percent growth in the RGDP in the long run. This revelation laid credence to the "view upheld by contemporary development economists that international remittance inflows are one of the major macroeconomic factors that significantly promote long-run economic growth in small-open developing econo-mies" (Ahortor and Adenusi, 2009). We also find that investment in physical capital as measured by the gross fixed capital formation (GFCF) has a positive but insignif-icant impact on the RGDP i.e., we observe that a 1 percent increase in investment in the physical capital will lead to about 0.20 percent increase in the RGDP. Our results also indicate that foreign aid (AID) has a significant positive effect on economic growth, confirming the position of the proponents of aid that overseas capital flows are necessary for the economic growth of developing countries (Islam, 1992; Boone 1995; Fayissa and El- Kaissy, 1999). We find a negative and significant relationship between the foreign direct investment (FDI) and the economic growth. The sign of this parameter is however expected to be positive as foreign direct investment is widely viewed as transfer of (new) technology and (new) knowledge which enables the recipient country to exploit the experience of others for their development (see Chami et al, 2005). A measure of the openness of the economy (TROP) has the ex-pected positive sign and significant impact on economic growth.

In addition to the long run estimate, this study also examined the short run rela-tionship between our variables of interest by utilizing the short run error correction model of equation (3). Before analyzing the short run regression estimate, the sta-tionarity property of the residual from the long run estimates was examined and the result is presented in table 5.

Table 5: Residual Stationarity Test

	Augmented Dickey-Fuller (ADF) Test		Phillip-Perron (PP) Test	
Variable	Level	Decision	Level	Decision
Resid	-5.0533*	I(0)	-5.0274*	I(0)

Note: * implies 1% significance level.

A key criterion for the estimation of the short run estimate (or error correction model) is that the residual from the long run estimate must be stationary at levels. Thus, we use the Augmented Dickey Fuller and the Phillip-Perron tests to check the residuals of the model and the result shows that the residuals from both model were stationary at levels (that is integrated of order zero) and at one percent significant level. Consequently, we proceeded to estimate the short run relationship behavior of our model.

In order to restrict the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics, we estimate the Error Correction Model (ECM). An Error Correction Model is designed for use with non-stationary series that are known to be cointegrated. Following the residual stationarity tests, we over parameterized the first differenced form of the variables in equation (3) and used Schwarz Information Criteria and Akaike Information Criteria (AIC) to guide parsimonious reduction of the model. This helps to identify the main dynamic pattern in the model and to ensure that the dynamics of the model have not been constrained by inappropriate lag length specification. The lag length on all variables in each model is set at two to ensure sufficient degrees of freedom (see appendix).

With respect to the parsimonious regression estimate capturing the short run analysis, it was observed from table 6 below that there was a significant improvement in the parsimonious models over the over-parameterized models (see appendix).

Table 6. Parsimonious short run regression estimate

Variables	Coefficient	Std. Error	T-Statistics	Probability
D(LRGDP(-1))	0.6419	0.2148	2.9891*	0.0073
D(LREM)	-0.0263	0.0119	-2.2051*	0.0393
D(LGFCF)	0.0733	0.0426	1.7224**	0.1004
D(LGFCF(-1))	-0.0541	0.0518	-1.0445	0.3087
D(LAID)	0.0142	0.0172	0.8271	0.4179
D(LFDI)	0.0170	0.0101	1.6751**	0.1095
D(LTROP(-1))	0.0654	0.0353	1.8508**	0.0790
C	0.0189	0.0124	1.5353***	0.1404
ECM(-1)	-0.4306	0.2068	-2.0836	0.0502
R-squared	0.5343	Mean dependent var		0.0493
Adjusted R-squared	0.3480	S.D. dependent var		0.0502
F-statistic	2.8685	Akaike info criterion		-3.3247
Prob(F-statistic)	0.0267	Schwarz criterion		-2.9003
Durbin-Watson statistics	1.9119	Hannan-Quinn criter.		-3.1918

Source: *Authors' computation from E-views 7: One, two and three asterisk denotes rejection of the null hypothesis at 1%, 5% and 10% respectively*

From the table, it was observed that the model was good fitted and appropriate for the analysis. The result obtained from the dynamic model indicates that the overall coefficient of determination (R^2) shows that 53.43 percent variations of RGDP is explained by the variables in the equation The adjusted R-squared shows that having removed the influence of the explanatory variables, the dependent variable is still explained by 34.8 percent of the model. The significant value of the F-Stat further confirmed the fitness of the model. The Durbin Watson Statistics was close to 2.0, an indication that there was no serial correlation in the model; hence the assumption of linearity is not violated.

The robustness of the model estimates were further ascertained by carrying out various diagnostic tests on the residual of the ECM model. Diagnostic checks are crucial in this analysis, because if there is a problem in the residuals from the estimation of a model, it is an indication that the model is not efficient, such that parameter estimates from such model may be biased. Results from various tests such as the histogram and normality test, the Breusch-Pagan-Godfrey serial correlation LM test, the Breusch-Pagan-Godfrey heteroskedasticity and autoregressive conditional heteroskedasticity (ARCH) tests in this study are presented in table 7.

Table 7: Residual Diagnostic Tests

Type of Tests	F-Statistics / coefficient	P-Value
Normality	0.2117	0.8996
Serial Correlation LM-Test	1.0239	0.3792
ARCH	2.6439	0.0917
Breusch-Pagan-Godfrey	0.4977	0.8435

Our results show that the residual from the error correction model is normally distributed because the P-value of the series was insignificant. The null hypothesis of no serial correlation as confirmed by Serial Correlation LM Test cannot be rejected since the test statistics are also not significant. The tests also confirm the absence of heteroskedasticity using both the Breusch-Pagan-Godfrey heteroskedasticity and ARCH tests, hence indicating that the model is well behaved (see appendix).

The negative and significant coefficient of the error correction term reveals which of the variables adjust to correct imbalance in the RGDP whilst the variable coefficients show the short-run effects of the changes in the explanatory variables on the dependent variable. The results confirm that output in Nigeria has an automatic mechanism and deviations from equilibrium are corrected in the short run. The speed of adjustment of about 0.43 indicates that when RGDP is above or below its equilibrium level, it adjusts by 43% within the first year. Therefore, the pace of adjustment toward the equilibrium is fast in case of any shock to RGDP. In addition to the above, the coefficient of individual variables is examined to determine the nature of the relationship between RGDP and Remittances as well as other external source of capital

variables in the short run. With respect to the coefficient of individual variables of the model (see table 6), it was observed that the first lagged value of real gross domestic product, had significant influence on current real gross domestic product. The co-efficient of current remittances was observed to be negative and significant while that of the gross fixed capital formation was positive and significant as was observed in the long run equation. However, the first lagged value of gross fixed capital formation was observed to be negative and also insignificant. The current value of foreign aid had insignificant influence on current real GDP while foreign direct investment is positive and significant to RGDP in the short run at five percent significant level.

The import from the above findings is that in the short run, our variable of interest –remittances, impact differently on economic growth. The study shows that in the short run, as remittances increases, the real GDP reduces and conversely. Foreign direct investment however, exerts a positive and significant effect on output in the short run as against the long run impact. The impact on foreign aid and openness to trade were as positive and significant just in the same matter as in the long run. The long run findings of the impact of remittances on economic growth in this study is also in line with most of the studies in Nigeria such as : Akonji and Wakili (2013); Ukeje and Obiechina (2013); Akinpelu et al (2013); and Iheke (2012).

Conclusion and Policy Recommendation

This paper examined the impact of remittances relative to the other external sources of capital such as foreign aid, foreign direct investment and openness to trade on the economic growth in Nigeria, using cointegration approach within an error correction model (ECM) framework for the period 1981 to 2011. The long run regression estimate showed that remittances positively impact the economic growth of Nigeria. We have found that a 1 percent increase in remittances would lead to a 0.19 percent increase in the RGDP in the long run. However, remittances show a significant negative relationship with output in the short run. This is in contrast with the findings of Adolfo et al. (2009) that remittance, when properly measured, and when the growth equations are well specified and instrumented, cannot have a robust and significant positive impact on long-term growth, and often would produce a negative relationship between remittances and growth.

In addition, the results showed that the conventional sources of growth such as physical investment can enhance productivity and spur economic growth both in the short and long run. Our result also revealed that while foreign aid as an external source of capital can have both short and long term significant influence on economic growth in Nigeria, its counterpart FDI can only exert positive impact on RGDP in the short run. Our result also affirmed the significant positive role of trade in promoting

economic growth, suggesting that the more open the economy, the more stimuli it has on RGDP both in short run and long run.

The impact of remittances in our studies on economic growth cannot be affirmed to be greater than the impact of other sources of external finance like foreign aid, foreign direct investment and openness to trade as adjudged in the literature. Policies which better channel remittance, aid flows and foreign direct investment toward investment, productive purposes would allow these transfers to serve more competently as a growth strategy.

A policy implication which may be drawn from this study is that Nigeria can improve its economic growth performance, not only by investing on the traditional sources of growth such as investment in physical, foreign direct investment and trade, but also by strategically harnessing the contribution of remittances by ensuring their efficient and reliable transfers. As a measure of caution, remittances should however not be seen neither as a panacea nor a substitute for a sustained and domestically engineered development endeavor such as FDI and openness to trade for curing the problems of the country.

Appendix A: Preliminary results

Table 2a: Summary Statistics of the Variables

	LRGDP	LREM	LGFCF	LAID	LFDI	LOPEN
Mean	374692.9	597558.3	712988.6	1.00E+09	325539.9	4367485.
Median	293745.4	20726.14	204047.6	2.11E+08	81155.50	1705790.
Maximum	834161.8	3139423.	4207423.	1.14E+10	2205442.	24469229
Minimum	183563.0	9.700000	8799.480	31710000	669.4000	14904.20
Std. Dev.	192796.7	1053574.	1163551.	2.29E+09	529897.5	6388577.
Skewness	1.018763	1.432107	1.959147	3.606706	1.978028	1.677844
Kurtosis	2.740711	3.286390	5.766436	15.85485	6.532570	4.980739
Jarque-Bera	5.449213	10.70241	29.71635	280.6538	36.33384	19.61262
Probability	0.065572	0.004742	0.000000	0.000000	0.000000	0.000055
Sum	11615478	18524307	22102647	3.11E+10	10091736	1.35E+08
Sum Sq. Dev.	1.12E+12	3.33E+13	4.06E+13	1.57E+20	8.42E+12	1.22E+15
Observations	31	31	31	31	31	31

Source: Authors' Computation from E-View 7 Output.

Table 2b: Correlation matrix

	LRGDP	LREM	LAID	LOPEN	LFDI	LGFCF
LRGDP	1.000000					
LREM	0.532108	1.000000				
LAID	0.502247	0.580579	1.000000			
LOPEN	0.968146	0.958436	0.454024	1.000000		
LFDI	0.755004	0.679932	0.313899	0.708936	1.000000	
LGFCF	0.935092	0.938477	0.367353	0.980934	0.689367	1.000000

Source: Authors' Computation from E-View 7 Output.

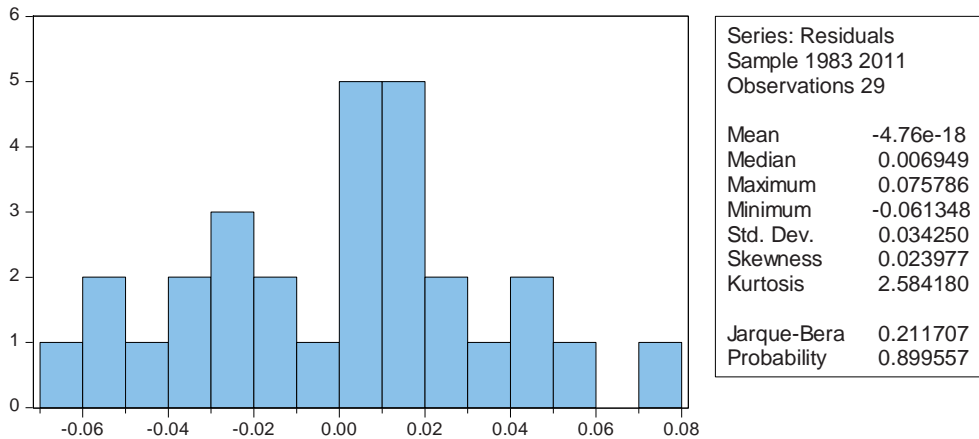## Appendix B: Over-parameterized Short Run Regression Estimate

Dependent Variable: D(LRGDP)
Method: Least Squares
Date: 01/13/14   Time: 14:13
Sample (adjusted): 1984 2011
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LRGDP(-1))	0.442471	0.366024	1.208859	0.2575
D(LRGDP(-2))	0.135799	0.472851	0.287191	0.7805
D(LREM)	-0.020332	0.017541	-1.159138	0.2762
D(LREM(-1))	-0.001517	0.023679	-0.064067	0.9503
D(LREM(-2))	-0.006115	0.020521	-0.298014	0.7725
D(LGFCF)	0.095219	0.094675	1.005744	0.3408
D(LGFCF(-1))	-0.009393	0.100463	-0.093502	0.9276
D(LGFCF(-2))	-0.025596	0.091603	-0.279424	0.7862
D(LAID)	0.035308	0.029170	1.210392	0.2570
D(LAID(-1))	-0.017652	0.031254	-0.564789	0.5860
D(LAID(-2))	0.012060	0.019888	0.606409	0.5592
D(LFDI)	0.017509	0.019211	0.911408	0.3858
D(LFDI(-1))	0.008392	0.029611	0.283414	0.7833
D(LFDI(-2))	-0.006363	0.018636	-0.341415	0.7406
D(LOPEN)	-0.062711	0.047204	-1.328513	0.2167
D(LOPEN(-1))	-0.000837	0.071784	-0.011659	0.9910
D(LOPEN(-2))	-0.044249	0.059741	-0.740673	0.4778
C	0.016836	0.023281	0.723153	0.4880
ECM(-1)	-0.514277	0.392065	-1.311713	0.2221
R-squared	0.642060	Mean dependent var		0.053673
Adjusted R-squared	-0.073819	S.D. dependent var		0.045134
S.E. of regression	0.046770	Akaike info criterion		-3.064984
Sum squared resid	0.019687	Schwarz criterion		-2.160988
Log likelihood	61.90978	Hannan-Quinn criter.		-2.788624
F-statistic	0.896884	Durbin-Watson stat		1.939544
Prob(F-statistic)	0.599004			

Appendix C: Diagnostic Tests

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.023856	Prob. F(2,18)	0.3792
Obs*R-squared	2.962116	Prob. Chi-Square(2)	0.2274

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.497722	Prob. F(8,20)	0.8435
Obs*R-squared	4.814967	Prob. Chi-Square(8)	0.7772
Scaled explained SS	1.813978	Prob. Chi-Square(8)	0.9862

Heteroskedasticity Test: ARCH			
F-statistic	2.643942	Prob. F(2,24)	0.0917
Obs*R-squared	4.874810	Prob. Chi-Square(2)	0.0874

Series: Residuals
Sample 1983 2011
Observations 29

Mean	-4.76e-18
Median	0.006949
Maximum	0.075786
Minimum	-0.061348
Std. Dev.	0.034250
Skewness	0.023977
Kurtosis	2.584180
Jarque-Bera	0.211707
Probability	0.899557

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