

REMITTANCES-ECONOMIC GROWTH NEXUS: AN EMPIRICAL ANALYSIS OF THE TRANSMISSION CHANNEL IN NIGERIA

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ABSTRACT

Understanding the potential channels (mechanisms) through which remittances affect growth is crucial for more focused policy perspectives. It is against this background that this paper examines the impact of remittances on growth and, in particular, the dynamic channel through which these flows affect growth, using the vector auto-regression approach (VAR) and Granger Causality testing. The results show that remittances affect the economy mainly through the channel of aggregate demand variables, consisting of investment, government and household expenditures, consumption and international trade (i.e import of capital and intermediate goods used to boost domestic production capacity, as well as export of goods and services. The results also show that GDP shocks are absorbed by remittances, as variations in GDP to the tune of 0.03 to 7.45% are explained by remittances within the forecast horizon. The results of the Granger Causality test show a unidirectional causation from remittances, consumption and government expenditure to economic growth, while a bidirectional (feedback) causality exist between investment and economic growth. Based on these findings, it is recommended that the strengthening of capacities of existing services and institutional framework dealing with diaspora issues, particularly remittances and brain gain be implemented. These should be complemented with sound, stable and competitive macroeconomic and socio-political environment that will propel migrants' resource transfers for the growth of the Nigerian economy.

Keywords: Remittances, Transmission Channel, Economic growth, VAR, Nigeria.

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1. Introduction

There is increased empirical works on the impact of migrants' transfers on the economies of 'sending' countries, with, little or no empirical attempt on the transmission channel of these flows to growth. Remittances constitute a powerful tool that is used to steer the growth course of an economy. It is therefore crucial to have a good understanding of the channels through which these flows are transmitted. Theory indicates that an increase remittance flows should lead to increase in economic activities and may potentially increase real output. This can occur through a variety of channels, including the expenditure, investment, international trade and the credit channels. An extensive empirical literature has recognized the microeconomic benefits of these financial flows, while a growing number of studies have examined their macroeconomic effects of these flows (see Gupta, Patillo & Wagh, 2009; Jidhoud, 2015). The transmission channel through which remittances affect growth has however occupy the front burner of empirical research and policy discourse in recent times.

Besides, other flows, remittances plays a key role in bridging the foreign exchange gap in the economy, thus helping to facilitate international trade, especially the importation of capital and intermediate goods required to boost domestic production capacities (Siddique, 2010), and tend to be more stable and persistent than other financial flows (Jidoud, 2015). Remittances are more impacting, as it targets individuals and household directly, thus significantly reducing the effect of corruption and poverty, and hence the most gainful direct source of external financing (Yuni, 2012). Nigerian migrants see it as a duty to transfer money home periodically to sustain family and friends, particularly during economic downturns in line with the insurance hypothesis that remittance tend to increase during economic downturns as migrants increase their send-outs to support those they have left behind at home. The main channel of transmission of remittances to growth are consumption, investment and international trade, particularly in the context of facilitating the import of capital machineries and inputs used to boost domestic output.

In general, international migration enables movement from hostile to more life- sustaining environments. Among the push factors are political instability, poor socio- economic living conditions, unemployment, drops in real income, currency devaluation, rising cost poor living, bad governance, disaster, escape from persecution, quest for knowledge and leisure overtime remained as key precipitating factors for net movement of people. The pull factors on

the other hand, include; high salaries, greater job opportunity, mobility and professional career, high standards of living, acquisition of high-level skills, foreign scholarships and educational support amongst others. In most cases, the loss of highly skilled professional is critically resented in African countries of origin, as they are active in important development fields: agriculture, business, education, engineering, health, science, e.t.c. Most migrants in these professional categories leave their country of origin in order to maximize the return on their investment in education and training by moving in search of the highest paid and/or most rewarding employment (Iredale, 2002). A number of studies have considered the growth-benefits, as well as brain drain effect of international migration. These studies all agree that migration is a critical source of induced investment, augmented income and better living standards to sending countries.

One area that seems not to have received sufficient empirical investigation in the international migration or remittance literature is the transmission channel by which remittances influence growth. Although the existing literature has brought evidence of the positive and smoothing impact of remittances on growth in recipient countries (*see* Glytsos, 2002; Gupta, Patillo & Wagh, 2009; Jidhoud, 2015 among others), it has been silent about the theoretical mechanism or channel through which it affects growth. Thus far, the remittances transmission channel to growth has not been investigated in Nigeria. This creates difficulties in formulating and implementing appropriate policy, as the significance and effect of each transmission channel is not quantified. Therefore, an empirical study of the transmission mechanism is timely and useful, in revealing many important policy implications for Nigeria, with respect to growth. In addition, given the importance of international migration transfers as one of the critical channels of globalization, which no country can rightly ignore in good wisdom, many policy makers, are incorporating the dynamics of migration and remittances in their policy making.

To this end, the objective of this study is to carry out an empirical examination of the transmission channels (mechanisms) through which remittances affect economic growth in Nigeria. The study also has the objective of investigating the extent of the magnitude of fluctuations in output that is absorbed by remittances. Such analysis provides additional dimension and understanding of the dynamics of the remittances growth- link in Nigeria. This is investigated with the vector auto-regression (VAR) approach, focusing primarily on the reduced-form relationships between remittances and growth, using aggregate

demand link variables.

Aside this introduction, Section 2 presents some stylized facts on remittances. The review of theoretical and empirical literature is presented in section 3. Section 4 contains the methodology, model specification and data. The empirical results and analysis are presented in Section 5, while the conclusion and policy recommendations are presented in Section 6.

2. Some Stylized facts on Remittances

Although significantly under-estimated, official recorded remittance flows to Africa has increased from \$9.1 billion in 1990 to over \$45 billion in 2016, outweighing other financial flows (IMF, 2016). Nigeria had maintained a rising trend of remittances inflow over the years. World Bank data shows that international remittances flow into Nigeria was \$10.2 million in 1981, rising to \$803.55 million in 1995. Remittances grew by 61.7 percent to \$1.3 billion in 1999; rising astronomically to \$5.4 billion in 2006, representing a 315.4 percent growth. By 2010, international remittances had climbed to \$10 billion, indicating a growth rate of 85 percent. In 2015, international remittances to Nigeria were over \$13 billion, representing a 30 percent growth (World Bank, 2017). On a global scale, the total sum of remittances receipts grew from \$68 billion in 1990 to approximately \$558 billion in 2016. In terms of the average, remittances from Diaspora (in 2011 constant dollar) rose from \$688 to \$2,128 in 2016, representing a growth rate of 209.3 percent. Nigeria had the highest inflow remittances of \$22.3 billion from her citizens living abroad, compared to other African countries, making her the country with the highest remittance inflows in more than two decades. This value by Africa's largest economy was up by 10.94 percent from \$20.1 billion in 2016. The surge in remittances by Nigerians abroad followed the precipitous fall of the naira against major currencies such as the Dollar, Euro, the Pound sterling and other major currencies, which resulted from the abrupt fall in crude oil prices in the international market.

The World Bank's Global Migration and Remittances Data (WBGMRD) show that remittances from Nigerian Diasporas climbed to \$23.2 billion in 2018 and \$24.1 billion in 2019. This excludes the volume of remittance that goes through informal channels, which were largely unaccounted for (World Bank, 2019). Remittances to Nigeria came in as the fifth largest in the world and the largest when compared to its African peers, as Egypt remitted \$18.1 billion, Senegal

\$2.3 billion, Ghana \$2.1 billion, East Africa's largest economy, Kenya remitted \$1.8 billion and South Africa \$765million (World Bank, 2017). According to the World Bank, globally remitted funds rebounded by 3.86 percent or \$22.14 billion to \$595.64 billion in 2017 from a previous \$573.5 billion in 2016. Meanwhile, remittance inflows improved in all regions of the world and the top remittance recipients were India with \$69 billion, China (\$64 billion), the Philippines (\$33 billion), Mexico (\$31 billion, and Nigeria (\$22.3 billion), which occupied the last spot on the top five countries. Remittance to Sub-Saharan Africa (SSA) also accelerated 11.4 percent to \$38billion, supported by uptick in the global economy, especially in the high-income Organization for Economic Cooperation and Development (OECD) Countries with stability in commodity prices providing further support. The underlying factors driving such trends include economic status, family size, financial development and institutional factors, amongst others.

A further breakdown of the report shows that remittances to low-and middle-income countries rebounded to a record level in 2017 after two consecutive years of decline. Officially recorded remittances to low and middle income countries (including Nigeria) reached \$466 billion in 2017, an increase of 8.5 percent over \$442.9 billion in 2016. Official data from the World Bank (2019) showed an increased in global remittances in 2018 by 4.6 percent to \$642 billion in 2018, rising further to \$715 billion in 2019, an increase of about 11.37 percent. On the channels through which remittances influence growth, the available evidence show that the main channels include investment, household expenditure, international trade (imports and exports) and human capital.

3. Literature Review

3.1 Theoretical Literature

3.1.1 Transmission Channel of Remittances to Growth

The Keynesian theory of aggregate demand maintained that increased aggregate demand has the capacity to stimulate output or growth of national income. Accordingly, a rise in any of the components of aggregate demand, particularly consumption, government and household expenditures and investment would stimulate national output. Following this contention, the most basic channel through which remittances affect growth is the aggregate demand i.e consumption, expenditure, investment and international trade and finance (imports and

exports). Consequently, increased remittances inflows, which increases the supply of money, causes the real interest rate to fall through the liquidity effect. The reduced cost of capital induces businesses spending and investment, as well as consumers spending on housing and durable. The increased spending results to a larger aggregate demand (i.e consumption and investment), and, thus, increased output for the economy. In other words, an increase in remittances flow boosts domestic demand, which raises economic activity and thus growth. For countries operating in an international environment, the international trade channel constitutes a critical channel of transmitting the effects. An increase in remittances bridges the savings gap and foreign exchange gap (i.e the two gap thesis), thereby facilitating the importation of capital and intermediate goods required to boost domestic production capacities, which eventually raises output and hence, growth.. Financial investment, such as diaspora bond is another important channel through which remittances influence economic growth, particularly as it helps in the mobilization of domestic resources for development-oriented projects and critical infrastructure relevant for national growth (e.g the Federal Government of Nigeria diaspora bond, in the mid-2017, which was oversubscribed by 130 percent.

In the same vein, an increase in external resource inflows in the form of remittances and investment in stocks leads to appreciation of stock prices, in accordance with Tobin's q theory of investment via the effects of stock market investment, thereby boosting domestic consumption of goods and services, and in turn, induces economic growth. Finally, the credit channel may also be important. The credit channel operates via the bank-lending channel (Mishkin, 2006). For bank lending, an increase in financial flows due to remittances leads to increase in bank deposits, which further increases the volume of money that banks have to loan out. This, increases capacity utilization, entrepreneurial initiatives, investment, employment and ultimately, growth.

3.1.2 Theoretical Issues in Financing Gap

The theoretical foundation for the proposition that financial flows in the form of remittances can promote economic growth is the two gaps model advanced by Mckinnon (1964). The two-gap proposition posits that the growth of developing countries could be hindered by the existence of two gaps viz: the savings gap and the foreign exchange gap. The savings gap arises from the fact that, for multiple reasons, domestic savings tend to be low in a typical developing country. Thus, savings will inevitable fall short of the required investment needed to propel

the rapid development of their economy (Iyoha, 2004). Financial flow in the form of remittances can thus be used to fill this gap. The role of financial flows (remittances) in this context is that it enables the developing country to invest more than it can save domestically.

The foreign exchange gap on the other hand, arises from the fact that most developing countries on account of their extreme dependence on single or narrow range of primary commodities that are vulnerable to externally generated and transmitted shocks resulting from variations in commodity prices, export instability and unfavourable terms of trade, find it difficult to import the required capital machineries and intermediate goods to boost domestic production. These savings and foreign exchange gaps can be filled by financial flows in the form of remittances. Increased external resource inflows, in the form of remittances can therefore be used to complement potential sources of financing gap in order to achieve sustainable growth and development (Ozekhome, 2019). It is argued that even when a country has enough domestic resources in the form of savings; it may not be possible to transform them into foreign exchange resources needed to accelerate economic growth. Thus, there can be a foreign exchange gap without a savings gap. A savings gap without a foreign exchange gap could also exist (Iyoha, 2004, cited in Ozekhome, 2017). Occasionally, both gaps exist. In terms of the foreign exchange gap, it is believed that capital imports financed by transfer of resources tend to fast-track the rate of capital formation. Given the supplementary role of financial inflows in the form of remittances, as additions to domestic investment resources (i.e domestic resource augmentation), economic growth tend to be accelerated.

3.2. Empirical Literature

With theory suggesting a wide variety of potential channels for remittances-growth, a review of some of the pertinent studies is presented.

The analytical framework for the remittance transmission mechanism has been set forth in few empirical studies, such as Taylor (1992) and Glytos (1999), which proposes an empirical framework for analyzing the remittances transmission channel, and finds several policy implications. The few studies that examine the transmission mechanism include, *Adelman & Taylor* (1992), *Glytos* (1999), *Glytos* (2002). More broadly, the traditional focus of empirical studies has been on the broad impact of remittances on economic performance. Jones, Colho and Easton (1986) focused on induced changes in domestic factor

prices and producer-surplus in an undistorted sending economy. The findings show that the reduction in opportunities to trade and skilled labour affect growth negatively, thus making international trade and human capital potent channels through which migration and remittances influence growth.

Adelman and Taylor (1992) using data from Mexico find evidence that each dollar of remittance spent had a multiplier effect of 3.0 on output through the expenditure channel. In contrast, El-Sakka and McNabb (1999), using 1967-1991 data from Egypt, find that imports financed with remittance have high income elasticity, thus corroborating the findings that remittances help to facilitate international trade, especially the importation of capital and intermediate goods required to boost domestic production capacities. The finding thus attest to the international trade as the main channel through which remittances affect growth. Athukorola (1993) investigates the relationship between the informal remittance ratio and three macro-economic indicators: the real deposit rate, the financial intermediation ratio and the black market premium in South-East Asia. These variables are accordingly, indicators of the effect of international migration transfers on the economy. The findings show that remittances increase financial intermediation. The intermediation rate is expressed as the ratio of available amount of money in an economy (M2) to total GDP. Since theory posits that the higher the rate of money supply (liquidity), the higher the level of economic activities, a higher level of monetary transfer implies higher growth. Remittances thus affect growth through their positive impact on financial development. They give financially constrained households access to credit markets by collateralizing the assets they build using remittances. These findings have been buttressed by the results of Sander and Maimbo, (2003), Adams Jr. (2005); Adams Jr. and Page (2006; and Tansel and Anser (2010).

Durand et al (1996) captures the key ways in which remittance can affect the state of an economy to include elevation of a family's standard of living, contribution to business formation and leading to community improvements. Ilahi, and Jafarey (1999) examines the impact of remittances on growth and the transmission mechanism of remittances in Pakistan. They findings show evidence in support of the investment channel of remittances to growth. Glytos (1999) investigates the impact of international migration transfer on recipient countries' economies, using the aggregate demand component channel from seven Mediterranean countries. The evidence shows that remittances significantly influence economic performance via expenditure, investment and import of capital equipment that

boost domestic production of recipients' economies.

Eicher and Garcia-Penasola (2001) using evidence from Caribbean countries examines the dynamic impact and channels of international migration transfers on economic performance. The findings show that remittances significantly stimulate economic performance through its influence on aggregate demand, especially investment. The study by Lowel (2001) focus on the impact of migration transfers on growth through financial development and intermediation channel. Glytsos (2002) examine the impact of remittances on growth, and in particular, how the potential transmission mechanism to growth can be enhanced. He found strong impact of remittances on growth through the expenditure and investment channels.

Bucovetsky (2003) and Haupt and Janeba (2004) have considered the fiscal discipline that skilled emigration could impose on tax authorities in skilled-worker's sending' countries. According to them, human capital, once acquired, is sunk and therefore vulnerable to over-taxation by governments' ability to tax human capital. Arising from this is the possibility that brain drain can induce governments to act in their country's own long run interests, thus raising the long-term level of human capital investment and per capita income.

The critical role of technology and innovation arising from knowledge and skills transfer to the growth of the home country has also been considered as a potential channel through which international migration affects growth. Incorporating technological diffusion into an endogenous growth model, Adams (2006) finds that migrant' technology transfers induce higher economic growth in poor countries, when the skills, knowledge, expertise gained are channelled. This is an addition to the fact that the home remittances of migrants are used to train manpower, in the form of skills acquisition and higher education. The return of migrants who have acquired new skills and knowledge abroad can be considered a form of knowledge transfer. In as much as the application of knowledge depends on the availability of technology, a technology transfer necessarily accompanies knowledge transfer. Even in case the migrants do not return home, however, they can still contribute to the development of their home countries. While staying abroad, they might promote cooperation between universities, technological research centres and business associations of the home and host countries. Internet and satellite-based information technology greatly enhances this cooperation potential.

Osili (2004) investigate the effect of migrants housing investments in their communities of origin, using evidence from Nigeria. He finds that remittances used to finance investment constitute a potential avenue of enhancing economic growth and poverty reduction. The study was however, limited in that it did not specifically investigate the channel through which remittances affect growth. Udah (2011) investigate the impact of remittances on economic performance in Nigeria. He finds that household expenditure of the sender's family has a role to play in the magnitude of resources to be transmitted. He further finds a strong positive link between remittances, human capital development and economic performance in Nigeria growth. Although a wide variety of potential transmission channel for remittances exists, these theoretical mechanisms have rarely been investigated in Nigeria.

A similar area in the literature on the transmission channel of remittances is the capacity of remittance to reduce macroeconomic fluctuations. In this direction, the capacity to reduce macroeconomic fluctuations is regarded as a determining factor of economic performance and the channels of influence to growth. Remittances are viewed as automatic stabilizers, which buffer shock and smooth aggregate fluctuations, and thus enhance growth. The insurance role of remittances and migration hinges on the countercyclical of these financial flows with respect to recipients countries' fundamentals and their resilience to economic developments within the originating countries. Hayes et al (2004) investigates the link between fiscal stimulus, investment distribution and human capital of remittances. The findings show that economic activities are increased through investment and human capital development financed by remittances, and that remittance inflow reduces fluctuations in domestic investment.

Gupta, Patillo and Wagh (2009) examine the effect of remittances on poverty and financial development in Sub-Saharan Africa. Using a disaggregated model, the findings show the remittances significantly reduce poverty mainly through its positive impact on financial development and investment. Tansel, and Anser, (2010) investigates the impact of remittances on growth, and the transmission mechanism in India, using the vector auto-regression approach (VAR), and focusing on the reduced- form relationships between real output, investment and expenditure and credit. The results show that that remittances has strong positive impact on real output. In terms of the transmission mechanism, the expenditure and investment channels are more potent and important than the other channels.

Ben and Mabrouk (2011) examines the effect of remittances on economic growth, focusing on the main transmission channels. Using data from 27 developing countries and the system-GMM estimation approach, the findings show that remittance is positively and significantly related to economic growth. On the channels of transmission, no definite inferences concerning the investment channel is found, but findings show that remittances speed up human capital accumulation, thereby stimulating growth. The human capital channel is also found to have an indirect effect on growth through investment. In a related study, Mim and Ali (2012) investigates the channel through which remittances spur growth in MENA countries. Estimating several specifications, the findings show that significant parts of remittances are consumed and that remittances stimulate growth only when they are invested, thereby making the investment channel significant.

Orozco and Ellis (2013) investigate the dynamic influence of remittances on growth in sample of developing countries. They find that remittances influence developing countries' economies via trade, investment and expenditure patterns. Further evidence show that remittances enhance growth by encouraging human capital accumulation. They conclude that human capital is an effective channel through which remittances stimulate growth in MENA countries.

Jidoud (2015) employs a simple endogenous growth model, with standard endogeneity tests (correlation and the Nakamura and Nakamura test), as well as the generalised least squares method to investigate the impact and channels of remittances on macroeconomic volatility. He finds that remittances reduce both consumption and output fluctuations. Specifically, an increase in workers' remittances-to GDP of one percentage reduces the log of the standard deviation of real per capita GDP growth by 3.2 percent, while volatility of real consumption growth reduces by 2 percent. In a similar vein, he use a simple panel econometric framework designed by Asdrubali, Sorensen and Yoshi (1996) to examine the transmission mechanism of remittances, and in particular, the response of GDP to remittances. The findings show that around 4 to 22 percent of GDP shocks are smoothed through remittances impact on investment and consumption.

A study by the Asian Development Bank (ADB) (2017) on how to channel remittances for economic growth, finds that remittances from migrant workers can only fuel economic growth if they pass through the financial system and channelled into productive investments. The study recommends appropriate policies and institutional framework to channel remittances into productive

investment.

Igbinedion and Ighodaro (2019) investigate the effect of remittances and public expenditure on education in an oil dependent economy of Nigeria. Utilizing annual time series data that covers the period 1981-2017, cointegration, and error correction modelling approach, the findings show that remittances and public expenditure positively and significantly impact on education. Based on the findings, the authors recommend strategic measures that will encourage remittance inflows through continuous engagement of Nigerians in the Diaspora in the socio-economic affairs of the country.

Ozekhome (2019) investigates the role of external resource inflows in the economic growth of ECOWAS countries and whether macroeconomic policy environment and institutional quality matter to the effectiveness of foreign resource inflows, using panel data methodology and system-GMM on 15 ECOWAS countries for the period 2002-2015. The study finds that external resource inflows (remittances in this context) positively and significantly influence economic growth in the presence of good macroeconomic policy environment and institutional quality. Based on the evidence, the author suggest appropriate macroeconomic policy environment and institutional framework that will encourage resource inflows from abroad to the country.

Adejumo (2019) investigates the effects and transmission channels of remittances on tradable sectors in Nigeria using annual time series data that covered the period 1981-2016. Employing the techniques of error correction modelling (ECM), the findings show that the main channel through which remittances affect the tradable sector is the exchange rate. Against the backdrop of this finding, the author suggest policy measures to make the exchange rate competitive to encourage the tradable sector.

3.3. Gap in Literature

From the review of the pertinent literature, it can easily be discerned that the channel through which remittances affect economic growth has not been investigated, using Nigerian data, in spite of the significant contribution of remittances to Nigeria's economic growth. In addition, apart from the study by Tansel and Ansel (2010) which employed the VAR methodology, no previous study has employed this powerful technique, which has the capacity to appropriately model the transmission channel of a variable to another through the impulse response function (IRF) that captures the dynamic responses in terms

of the shock innovations of a variable to a shock in itself and other variables in a simultaneous equation framework, including the forecast error variance decomposition (FEVD) that disintegrates the variation in an endogenous variable into component shocks/innovations to the endogenous variables, thereby showing the relative importance of each random innovation to the variables and thus, the channels of influence. It is in view of these perceived obvious gaps and the underlying strengths of the VAR framework that justifies a further empirical investigation of the remittances-growth channel, using the VAR methodology.

4. Empirical Methodology

4.1. Model Specification

This paper adopts a Vector autoregressive (VAR) to capture the dynamic impact of remittances on growth, and the potential channels through which it influences growth. The choice of VAR methodology is based on its ability to appropriately model the dynamic relationship between variables, and in particular, the channel of remittances to growth via the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD). It also has the advantage of being able to overcome the twin problem of potential endogeneity and OLS bias among the selected time-series variables and to examine more systematically shocks to these variables.

The mathematical form of a VAR employed for this study is generally specified as: $\ddot{Z}_t = A_1 \ddot{Z}_{t-1} + \dots + A_p \ddot{Z}_{t-p} + B \ddot{X}_t + C_t$ (3.1)

where Z_t is a k vector of stationary jointly determined endogenous variables; Z_{t-1} is vector of lagged endogenous variable, X_t is a d vector of exogenous variables, A_1, \dots, A_p and B are matrices of coefficients to be estimated, and \dot{a}_t is a vector of innovations that may be contemporaneously correlated with each other but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. In addition, $\dot{a}(a_t)$ is independently and identically distributed with zero mean i.e. $\dot{a}(a_t) = 0$ and $\dot{a}(a_{t-k} * a_{t-k}) = 0$. The error term, \dot{a}_t also has a constant covariance. The functional form of the VAR model is specified as: $\ddot{Z}_t = A_1 \ddot{Z}_{t-1} + \dots + A_p \ddot{Z}_{t-p} + B \ddot{X}_t + C_t$

$$Z_t = [RGDPPC, REMIT, CONS, INV, GEXP, IMP,] \quad (3.2)$$

where RGDPPC is real GDP per capita- a measure of economic growth; REMIT is inflow of remittances; CONS denotes consumption; INV represents investment, GEXP is government expenditure; EXP indicates exports, and IMP is imports.

The ordering of the VAR model is based on the rationalisation that remittances is taken as exogenously determined and that remittances initially affects the aggregated demand channel through various macroeconomic channels (i.e. transmission mechanisms) and in turn, affects overall growth prospects of the economy. In other words, the channel of transmission of remittances to growth is through consumption, investment, government expenditure and international trade (i.e import of capital goods and machineries use for boosting domestic production and export of goods and services (i.e international trade). The VAR model in (3.2) is re-specified in the reduced (compact) form as:

$$\begin{aligned}
 \Delta REMIT_t &= \alpha_{1,0} + \sum_{i=1}^k A_{1,1} \Delta CONS_{t-i} + \sum_{i=1}^k A_{1,2} \Delta INV_{t-i} + \sum_{i=1}^k A_{1,3} \Delta EXP_{t-i} \\
 &+ \sum_{i=1}^k A_{1,4} \Delta EXP_{t-i} + \sum_{i=1}^k A_{1,5} \Delta IMP_{t-i} + \sum_{i=1}^k A_{1,6} \Delta RGDPPC_{t-i} + \sum_{i=1}^k A_{1,7} \Delta REMIT_{t-i} + \varepsilon_{1,t} \\
 \Delta RGDPPC_t &= \alpha_{1,0} + \sum_{i=1}^k A_{1,1} \Delta CONS_{t-i} + \sum_{i=1}^k A_{1,2} \Delta INV_{t-i} + \sum_{i=1}^k A_{1,3} \Delta EXP_{t-i} \\
 &+ \sum_{i=1}^k A_{1,4} \Delta EXP_{t-i} + \sum_{i=1}^k A_{1,5} \Delta IMP_{t-i} + \sum_{i=1}^k A_{1,6} \Delta REMIT_{t-i} + \sum_{i=1}^k A_{1,7} \Delta RGDPPC_{t-i} + \varepsilon_{1,t} \\
 \Delta CONS_t &= \alpha_{1,0} + \sum_{i=1}^k A_{1,1} \Delta RGDPPC_{t-i} + \sum_{i=1}^k A_{1,2} \Delta INV_{t-i} + \sum_{i=1}^k A_{1,3} \Delta EXP_{t-i} \\
 &+ \sum_{i=1}^k A_{1,4} \Delta EXP_{t-i} + \sum_{i=1}^k A_{1,5} \Delta IMP_{t-i} + \sum_{i=1}^k A_{1,6} \Delta REMIT_{t-i} + \sum_{i=1}^k A_{1,7} \Delta CONS + \varepsilon_{1,t} \\
 \Delta INV_t &= \alpha_{1,0} + \sum_{i=1}^k A_{1,1} \Delta RGDPPC_{t-i} + \sum_{i=1}^k A_{1,2} \Delta CONS_{t-i} + \sum_{i=1}^k A_{1,3} \Delta EXP_{t-i} \\
 &+ \sum_{i=1}^k A_{1,4} \Delta EXP_{t-i} + \sum_{i=1}^k A_{1,5} \Delta IMP_{t-i} + \sum_{i=1}^k A_{1,6} \Delta REMIT_{t-i} + \sum_{i=1}^k A_{1,7} \Delta INV_{t-i} + \varepsilon_{1,t} \\
 \Delta EXP_t &= \alpha_{1,0} + \sum_{i=1}^k A_{1,1} \Delta RGDPPC_{t-i} + \sum_{i=1}^k A_{1,2} \Delta CONS_{t-i} + \sum_{i=1}^k A_{1,3} \Delta INV_{t-i} \\
 &+ \sum_{i=1}^k A_{1,4} \Delta EXP_{t-i} + \sum_{i=1}^k A_{1,5} \Delta IMP_{t-i} + \sum_{i=1}^k A_{1,6} \Delta REMIT_{t-i} + \sum_{i=1}^k A_{1,7} \Delta EXP + \varepsilon_{1,t} \\
 \Delta IMP_t &= \alpha_{1,0} + \sum_{i=1}^k A_{1,1} \Delta RGDPPC_{t-i} + \sum_{i=1}^k A_{1,2} \Delta CONS_{t-i} + \sum_{i=1}^k A_{1,3} \Delta INV_{t-i} \\
 &+ \sum_{i=1}^k A_{1,4} \Delta EXP_{t-i} + \sum_{i=1}^k A_{1,5} \Delta EXP_{t-i} + \sum_{i=1}^k A_{1,6} \Delta REMIT_{t-i} + \sum_{i=1}^k A_{1,7} \Delta IMP + \varepsilon_{1,t}
 \end{aligned} \tag{3.3}$$

\hat{A} = matrix of coefficients of autonomous variables

A_i = the matrix of coefficients of all variables in the model

4.2 Data

Data used for the study are annual time-series data for the period 1980-2019 sourced from Central Bank of Nigeria Statistical Bulletin, the World Bank and the World Migration Report.

4.3. Measurement of Variables/Unit of Measurement Remittances (REMIT):

The main variable of interest is remittances. Remittances flow is measured by total officially recorded remittances inflow to GDP percent. Consumption (CONS): Consumption is captured by aggregate consumption as percentage of GDP. This ratio measures the value of consumption as proportion of national output. Investment (INV)- is measured as real gross capital formation to GDP percent. Government expenditure (GEXP) - Total government expenditure to GDP percent. Export (EXP) = Total export of goods and services as percentage of GDP. Import (IMP) = Overall import of goods and services to GDP percent. Real GDP per capital (RGDPPC: This is measured as the growth rate of per capita real GDP- used to measure the real rate of economic growth.

Prior to estimating the VAR model, important diagnostic test are conducted to ensure the reliability consistency and tenability of results for policy perspectives. These include unit root test, lag length selection, VAR stability, and Granger Causality tests. While the unit root test of stationarity is important to ensure the stationarity of variables, the lag length selection criteria test is used to determine the appropriate and optimal lag length, a requirement to ensure the consistency of the in the model. The VAR stability and causality tests on the other hand, are used to test the reliability of the impulse response function and the direction of causation among the variables, respectively.

5. Empirical Results and Analysis

Since VAR model employs time-series data, the unit root test and the lag length criteria test need to be conducted to assure the stationary of the macro variables and appropriateness of the lag for the model.

5.1 Unit Root Test

Unit root test involves the test of stationary for variables used in regression analysis. The importance of stationarity of time series used in regression borders on the fact that a non-stationary time series is not possible to generalize to other times apart from the present. This makes forecasting based on such time series

to be of little practical value. In addition, the regression of a non-stationary time series on another non-stationary time series may produce spurious and inconsistent parameter estimates. The Augmented Dickey Fuller (ADF) test is employed in order to analyze unit roots in this study. The results are presented in levels and first difference in Table 1.

Table 1: Unit Root Stationary Test

Variables	ADF Statistic (in Levels)	ADF Test (in First Difference)	Order of Integration	Remark
RGDPPC	-1.2201	-5.8874	I(1)	Stationary
REMIT	-0.9873	-5.6062	I(1)	“
CONS	-1.0216	4.9802	I(1)	“
INV	-1.1220	-5.2283	I(1)	“
GEXP	-1.2063	-5.4170	I(1)	“
EXP	-1.0692	-4.8867	I(1)	“
IMP	-0.9874	-5.2192	I(1)	“

Source: Author's computation

A cursory examination of the unit root test results indicate for all the variables, the null hypothesis of no unit root could not be rejected, implying that the variables are non-stationary at levels. However, after first differences, the variables became stationary. This implies that the variables are difference-stationary. They are thus integrated of order one (i.e. I [1]).

5.2 Johansen Test for Co-integration

Having established that a unit root process characterizes the macroeconomic variables, the test of cointegration is conducted to determine the existence of any long-run equilibrium relationship among the variables. The co integration test is based on the argument by that given that time series have unit roots; a long run relationship exists between a linear combination of such series. Co-integration of a vector variable implies that the number of unit roots in the system is less than the number of units in the corresponding univariate series (Granger & Weiss, 1983; Granger, 1986; Engle & Granger, 1987). The Johansen Cointegration method is used in this analysis because the study involves the use of multivariate estimations. The results from the multivariate cointegration test are presented in Table 2.

Table 2: Johansen Multivariate Cointegration Tests Results

Trace Statistic			Maximum Eigenvalue Test			
Null Hypothesis	Test Statistic	Critical Value	Null Hypothesis	Test Statistic	Critical Value	Hypothesized No of CE(s)
r = 0*	142.22	89.30	r = 0*	105.30	77.28	None **
r = 1 *	112.43	68.36	r = 1*	86.25	65.13	At most 1 **
r = 2*	80.20	50.15	r = 2*	64.20	48.26	At most 2 **
r = 3*	48.21	39.05	r = 3*	40.72	33.84	At most 3 **
r = 4*	27.24	20.22	r = 4*	18.24	19.22	At most 4 **
r = 5*	12.36	9.02	r = 5*	9.11	7.02	At most 5 **
r = 6*	0.01	0.06	r = 6*	0.01	0.06	At most 6

Max-eigenvalue test indicates 6 cointegrating eqn(s) at the 0.05 level

(**) denotes rejection of the hypothesis at 5% significance level.

Source: Author's computation

As can be seen from the table, both the λ -max and the trace test statistics indicate that there is at least five significant cointegrating vector among the variables since the hypothesis of no cointegrating vector ($r=0$) is to be rejected. Apparently, the number of cointegrating relations or vectors (indicated by r) is at least five. The implication of this is that a long run relationship exists between remittances and economic growth in Nigeria

5.3 Granger Causality Test

The results of the pairwise Granger causality test among the macroeconomic variables, which is a preliminary aspect of a VAR analysis, used to provide the background for estimating dynamic relationships is presented in table 3.

Table 3: Granger Causality Test results

Null Hypothesis:	F-Statistic	Prob.	Decision	Causality
<i>LREMIT does not Granger Cause LRGDPPC</i>	4.19	0.29	Reject	Unidirectional
<i>LRGDPPC does not Granger Cause LREMIT</i>	0.138	0.87	Accept	
<i>LCONS does not Granger Cause LRGDPPC</i>	6.896	0.004	Reject	Unidirectional
<i>LRGDPPC does not Granger Cause LCNS</i>	1.584	0.225	Accept	

<i>LDINV does not Granger Cause LRGDPPC</i>	7.617	0.003	Reject	Feedback
<i>LRGDPPC does not Granger Cause LDINV</i>	13.534	0.0001	Reject	
<i>LGEXP does not Granger Cause LRGDPPC</i>	12.646	0.0002	Reject	Unidirectional
<i>LRGDPPC does not Granger Cause LGEXP</i>	0.0123	0.988	Accept	
<i>LEXPORTS does not Granger Cause LRGDPPC</i>	1.297	0.291	Accept	None
<i>LGDPPC does not Granger Cause LEXPORTS</i>	1.692	0.204	Accept	
<i>LIMPORTS does not Granger Cause LGDPPC</i>	0.664	0.524	Accept	Unidirectional
<i>LGDPPC does not Granger Cause LIMPORTS</i>	3.904	0.033	Reject	
<i>LREMIT does not Granger Cause LCONS</i>	1.448	0.254	Accept	Unidirectional
<i>LCONS does not Granger Cause LREMIT</i>	5.980	0.008	Reject	
<i>LREMIT does not Granger Cause LDINV</i>	4.758	0.018	Reject	Feedback
<i>LDINV does not Granger Cause LREMIT</i>	7.364	0.003	Reject	
<i>LGEXP does not Granger Cause LDINV</i>	5.834	0.009	Reject	Feedback
<i>LDINV does not Granger Cause LGEXP</i>	3.657	0.041	Reject	
<i>LEXPORTS does not Granger Cause LCONS</i>	15.162	5.E-05	Reject	Unidirectional
<i>LCONS does not Granger Cause LEXPORTS</i>	0.285	0.754	Accept	

Source: Author's computation

As is generally the case, the F-test is conducted on the null hypotheses in order to determine the direction of causality between each pair of variables. The rejection of each of the null hypothesis is based on the significance of the F-value for the particular relationship. Focus is on the relationships that are of interest in the study. The test result shows clearly that in relation to RGDPPC, the null hypothesis that REMIT does not granger RGDPPC is rejected, but the reverse hypothesis is not rejected. This shows that the direction of causality is actually from remittances to economic growth and not the other way round. Thus, financial resource flows (remittances) tends to cause/stimulate economic growth in the country. The implication of this is that, the more the remittances the greater the economic activities, reflected in greater growth. A unidirectional

causality running from CONS to GDPPC and GEXP to GDPPC is also observed between CONS, GDPPC and GEXP and GDPPC. This is in consonance with the Keynesian aggregate demand analysis in which both consumption and investment stimulate growth. Domestic investment is seen to have a feedback (bi-directional) causality with economic growth. Thus, increase investment stimulates economic growth, while the resultant increase in economic activities generate increases in investment on the part of business firms and government, giving credence to the accelerator theory of investment. The causality test also show a unidirectional relationship running from economic growth to imports; an implication that increased economic growth and the resultant increase income generates higher level of importation of goods and services, thus validating the notion of marginal propensity to import. For the other variables, the Granger Causality results show a unidirectional causation running from consumption to remittance, consumption to investment, government expenditure to investment, and exports to consumption, while a bi-directional relationship exist between remittances and investment.

5.4 Optimal Lag Length Selection

The VAR estimation procedure commences with the determination of the optimal lag length of the variables. It determines the extent, to which a variable in the previous period affects the variable in the current period, and ensures that the parameters in the model are consistent. The VAR lag length structure of the model is presented in Table

4. Following the results from the lag order selection criteria, the values marked with asterisk indicate the lag order selected by the criterion. As presented in the table, the final prediction error criterion (FPE), Akaike information criterion (AIC) and the Schwarz information criterion (SIC) all select lag order two, while the Likelihood ratio (LR) test and the Hanan-Quinn Information criterion (HQ) select the order five and three respectively. Therefore, the lag length selection results indicate that a lag period of 2 (lag 2) is optimal and chosen.

Table 4: VAR Lag Length Selection Test.

Lag	Log L	LR	FPE	AIC	SIC	HQ
0	121.10	NA	3.33	28.32	23.93	22.31
1	-112.31	209.65	13.33	14.32	14.31	14.32
2	-10.33	152.42	0.002*	7.34*	7.15*	13.05
3	-131.40	638.59	0.321	2.32	0.32	7.32*
4	313.93	5221.15	6.32	-6.22	-2.11	-1.39
5	-109.11	121.33*	11.32	-0.53	-132	-1.32
6	-131.94	60.31	66.07	-1.39	-0.34	-6.33
7	22.41	431.32	72.32	-2.25	-1.11	-1.38

* Indicates lag order selected by the criterion.

Source: Author's computations

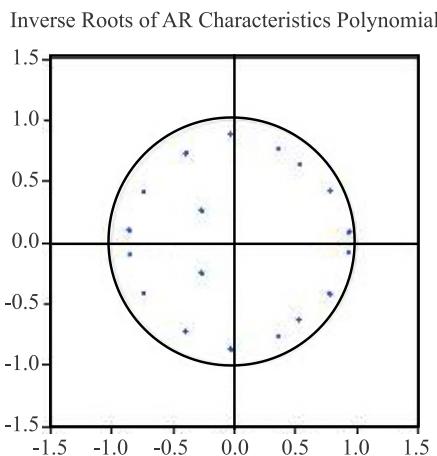
5.5 Vector Auto Regression (VAR) Estimates

The VAR estimates show that two period lag-consumption has a positive and significant impact on current consumption levels and economic growth, an indication that the consumption is persistent and reinforcing. This reinforces economic theory that past consumption behaviours affect current consumption patterns and economic growth. Similarly, a significant but negative relationship exists between two period lag consumption and exports. One period lag remittances has a negative impact on consumption. Nevertheless, there is significant positive relationship between the first period lag of remittance and domestic investment as well as exports. For domestic investments, a one period lag shows a positive and significant relationship with its current investment and exports. In the second period, a negatively significant relationship between exports and domestic investment is observed. Government expenditure and investment are both positively and significantly related to economic growth; an implication that increases in government expenditure and investment are highly growth-inducing. As argued in Blanchard and Perotti (2002), the estimates of a VAR model do not offer any significant economic implication. Thus, analysing the estimates does not fundamentally contribute to policy discourse. Based on this, the derivatives of the VAR estimates, namely, the Impulse Response Function (IRFs) and the Forecast Variance Decomposition based on the VAR model are the focus of the analysis. As a prelude to this, the stationarity/stability test is conducted.

5.5.1 Stationarity/Stability of the VAR

The stationarity, and hence the stability of the VAR is a determinant of the reliability of the impulse response function. Prior to investigating the dynamic response of economic growth to one standard error shock or innovation in itself, and in other variables in the system, the stationary/stability test is performed by observing the inverse roots of AR characteristic polynomial. The result is presented in figure 1.

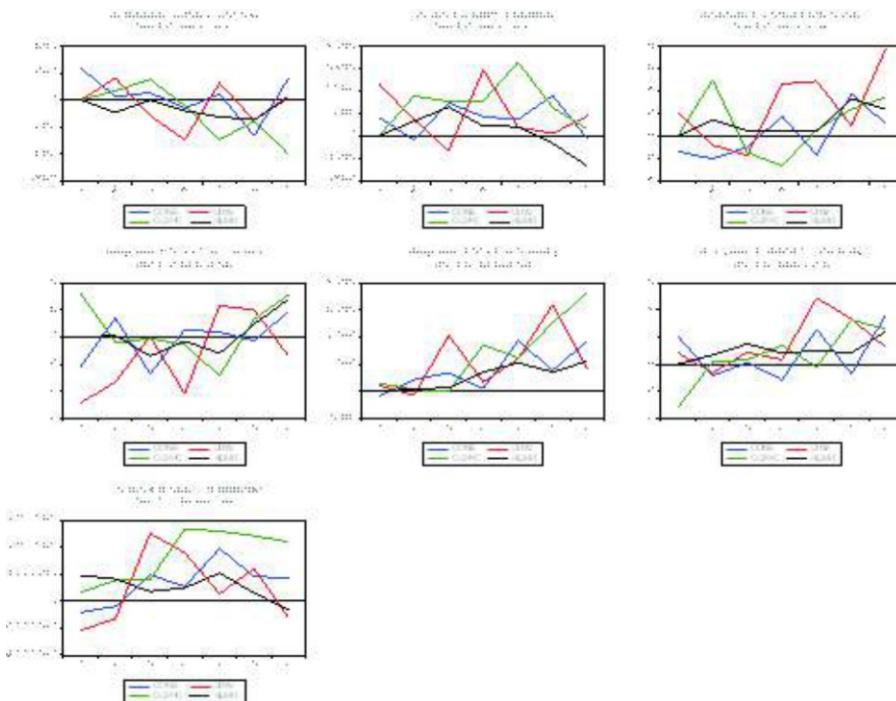
Figure 1: Stationary of the estimated VAR system



From figure 1, it is observed that no root lies outside the unit circle. The VAR therefore satisfies the stability condition. Thus, the VAR could be relied upon for impulse response analysis.

5.5.2. Impulse Response Functions

The dynamic analysis of the relationships among the variables within the VAR framework is conducted using first, the Impulse Response Functions (IRFs) presented in Figure 2. The results are presented in the form of the dynamic impulse responses of the variables in the VAR to a shock in either REMIT or RGDPCC equivalent to one sample standard deviation. In order to obtain better multiplier estimates in the dynamic framework, focus is on the impulse response function graphs. These charts are designed to provide a visual presentation of the dynamic effects of shocks to the system and analyzed succinctly. They reveal the proper ordering. The solid lines in the graphs give point estimates, while the broken lines give one standard deviation bands.

Fig. 2: The Impulse Response Function

The impulse response graphs show that consumption responds to a shock in itself by falling in the first three periods and continues in that direction until the fifth period, but it never stabilizes as the shock takes away the path of RGDPPC away from equilibrium perpetually. A one standard deviation innovation/shock in remittance is associated with a concomitant fall in RGDPPC, but stabilizes after the sixth period when it begins to rise. This implies that consumption constitutes a critical channel through which remittances affect growth. Shock/innovation to domestic investment is also observed to be associate with an initial sharp decrease in RGDPPC (in first two periods), with the fall perpetuating until the fifth period, when it starts rising. A one standard deviation innovation to the government expenditure variable is associated with an increase in income in the first two periods that thereafter decreases until the fourth period, and then, begins to rise until the seventh period. Innovation to the exports variable is associated with a rise in RGDPPC in the first two periods, thereafter declines to a lower trough up to the fifth period fifth period, , from which time it begins to trend upward, going beyond its initial level in the seventh period. The general

system of responses of the variables to shock in remittances indicates that each of the variables has a particular pattern of response to shocks in them. Apparently, changes in remittances tend to affect income per capita, through the channels of consumption, investment and expenditure, international trade). Thus, the channel of transmission of remittances to growth is through the aggregate demand.

5.5.3 Variance Decomposition

The VAR system dynamics can also be depicted with the variance decomposition, which decomposes variation in an endogenous variable into the component shocks/innovations to the endogenous variables in the VAR. It therefore gives information about the relative importance of each random innovation to the variables in the VAR. The ordering of the VAR is RGDPCC, CONS, INV, EXPORT, GEXP, IMPORTS and REMIT, based on the assumption that an increase in remittance will lead to an increase economic growth (output), via the aggregate demand channel. The variance decomposition of GRDPPC is presented in Table 5.

Table 5: Variance Decomposition

Period	S.E.	LRGDPPC	LCONS	LINV	LEXPORTS	LGEXP	LIMPORTS	LREMIT
1	130.9214	24.09598	11.03897	55.47150	9.393558	0.000000	0.000000	0.000000
2	152.3214	18.08034	11.69230	60.20822	9.779143	0.151829	0.062756	0.025414
3	167.6868	14.93100	20.12811	49.68358	10.53195	0.915094	0.930302	2.879955
4	189.7008	12.02393	16.05465	58.3172	8.915497	0.741699	1.595772	2.350731
5	211.2507	17.05892	13.06425	51.88803	8.932635	4.370335	1.482583	3.203251
6	231.7590	15.51640	10.90448	46.13810	7.798634	13.46793	2.824215	3.350233
7	259.5379	18.34456	10.91081	38.04452	8.780737	13.51360	2.951465	7.454306

Cholesky Ordering: LGRDPPC LCONS LINV LEXPORTS LGEXP LIMPORTS LREMIT

Source: Author's computation

The variance decomposition output clearly indicates innovation to investment has the strongest impact on economic growth (LRGDPPC), reaching 60.2% in the 2nd period and 39.04% in the 7th period. This is followed by innovation to its own self which accounting for about 18.34 in the seventh period. Shock to consumption has the next strongest impact on the variation in economic growth rate, accounting for over 20% of the variation in the second period and ending about 11% in the 7th periods. This is followed by the impact of shocks/innovation to government expenditure, which accounts for 9.77% of

the variation in economic growth rate in the 2nd period and ending 8.7% in the 7th period. Shock to remittance accounts for 0 - 7.45% of the variation in economic growth rate, while innovations to imports accounts for 0- 2.95% of variation in economic growth rate. Base on the empirical results of the variance decomposition, domestic investment (DINV) has the strongest impact on economic growth, and thus constitutes the major channel through which remittances affect economic growth. This is in consonance with Keynesian theory of aggregate demand in which investment is a major channel through which resource inflows affect the economy, and constitutes an injection to the economy.

6. Conclusion and Policy Recommendations

This paper employs the vector auto regression model to investigate the remittance- growth nexus, focusing on the dynamic transmission channels through which remittances affect economic growth in Nigeria, over the period 1980 to 2019. The empirical results show that remittances has strong effect on economic growth, via the channels of investment, consumption, government expenditure and international trade (i.e exports and imports). The analysis also quantifies how much of GDP shocks are absorbed by remittances, that is risk-sharing through migration transfers. In particular, the findings show that around 0.3 to 7.45 percent of GDP shocks are smoothed through remittances inflows. This finding corroborates the results of Jidoud (2015). A unidirectional causality runs from remittances, consumption and government expenditure to economic growth, while a bidirectional (feedback) causality exist between investment and economic growth.

In the light of the empirical findings, it is recommended that appropriate measures in the form of financial instruments to attract diaspora savings and investment (e.g diaspora bonds) be designed. The diaspora community could be a huge potential for domestic investment and infrastructural growth if appropriately harnessed. Migration can be both costly and beneficial. The main cost of migration is the significant loss of human capital and subsequent manpower gaps in key-sectors for national development. However, migration contributes to balancing economic growth in Nigeria and other resource-scarce countries, particularly through diaspora transfers (remittances) back home. The Federal government of Nigeria in this direction issued the first ever Federal Government of Nigeria diaspora bond, in the mid-2017, which was oversubscribed by 130 percent. Given such remarkable success, attractive diaspora financial instruments that will enhance

domestic savings and resource mobilization for growth should be developed. Remittances from Nigerians abroad contribute in major ways to the cumulative national purchasing power, as well as to individual household income, thereby enhancing economic welfare and reducing poverty. It also enhances knowledge and technology transfers from developed countries. In particular, diaspora remittances play an important role in economic development. Beyond sending remittances, they can also promote international trade, foreign direct investment (FDI), create businesses, spur entrepreneurship, and transfer new knowledge and innovative skills critical for rapid economic growth and development.

In the light of the empirical findings, the following are recommended for policy considerations.

- (i) Promotion of remittance-linked capital market instruments. This involves designing appropriate financial instruments to attract diaspora inflow of resources and savings, (e.g diaspora bonds and remittance securitization), that would encourage the mobilization of domestic and high national savings.
- (ii) Expand digital finance (ie. e-finance/e-banking). To appropriately channel remittances into investment, access to formal financial services must be expanded through well-designed technologically and innovative-oriented financial services that will encourage Nigerian Diaspora.
- (iii) Building the capacities of existing services, legal and regulatory frameworks, as well as institutions dealing with migration and diaspora issues.
- (iv) Devising means and strategies towards converting the "brain drain" to "brain gain" in the area of knowledge and technology transfer from developed countries to the benefit of the country.
- (v) A crucial policy challenge of the future is to involve the skilled members of the Nigerian diaspora in innovative forms of cooperation and knowledge transfer to promote the expansion and sustainability of key-sectors for national development (World Migration, 2003).
- (vi) Robust policies to enhance the relevant channels through which diaspora remittances affect growth such as a conducive investment climate, favourable tax regimes, tax holidays, increased government expenditure on economic infrastructure, outward trade-oriented policies e.t.c.
- (vii) Creation of stable macroeconomic and socio-political environment that will enhance diaspora remittances to Nigeria.

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