

Human capital flight and output growth nexus: evidence from Nigeria

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Abstract

Purpose – Human capital flight from developing countries to developed nations has been rising and giving concerns to governments and scholars alike. This paper aims to explore the impact migration from Nigeria has on economic output growth by focusing on the migration rate, remittances, population growth and secondary school enrolment. This has not received adequate attention in the literature, as many papers have primarily focused on the impact of remittances on economic growth.

Design/methodology/approach – Leveraging on the macro-level approach to migration, remittances and the economy, this research considers the nexus among the human capital flight and output growth variables by using the autoregressive distributed lag (ARDL) method of analysis for time series data between 1986 and 2018.

Findings – The net migration rate from Nigeria was found from the empirical analysis to be more disadvantageous for the economy, given its negative relationship with economic growth despite the large volume of foreign incomes (remittances). It also shows that secondary school enrolment positively and significantly impacted the Nigerian growth rate in the long run.

Originality/value – This research has widened the use of variables by combining net migration rate, remittances from abroad, population growth rate and secondary school enrolment to obtain a more robust outcome with implications for research and practice.

Keywords Emigration, Remittances, Brain drain, Output growth, Human capital flight

Paper type Research paper

1. Introduction

Human capital flight portrays a significant increase in the amount of highly proficient people leaving a geographic region which in most cases is their country of origin to an entirely different location. Globalization has to a large extent aided this movement to



advanced countries of the world. The impact of increased migration on human capital development cannot be overemphasized. While the home countries (oftentimes developing countries) may become deficient in skilled labor, the host countries benefit more through the addition of skilled labor to their labor market. As a result, human capital development keeps getting weak for developing countries. Indeed, concerned stakeholders have been worried over the incessant rise in emigration as it results in loss to the country's resources and further worsens the state of welfare of the citizens. Thus, although the net advantages of human capital flight to the countries being migrated to, oftentimes are considered "brain gain" the net worth of the act is considered in some cases as a "brain drain" to the countries of origin. [Aravossitas and Sugiman \(2019\)](#).

The migration of people from their country of origin to other countries has been explored by people for various reasons. Human capital flight over the years has made the macroeconomic environment of an economy deplete, having a negative influence on transparency and accountability. It also makes the necessary resources to develop a nation scarce at the time when a nation wants to develop, limiting the output growth of the economy. On another hand, Africans in the diaspora have continued to contribute massively to the foreign currency income of Africa. In fact, it is observed that households that have internal and international migrants tend to be better educated and richer compared to households without migrants ([Foods and Agriculture Organisation, 2017](#)). However, human capital flight is even more detrimental to the growth and development of African economies. This is because the region is capital-scarce continuous migration of highly skilled personnel may mean financial loss for the region. As a result, the study of human capital flight in Africa deserves critical attention.

Continuous migration of skilled labor out of Nigeria is especially worrisome. This is because unemployment, rising poverty, inequality among other socio-economic challenges characterize the Nigerian economy. In fact, Nigerians have been recognized as one of the most mobile populations in Africa with Nigerian citizens found in almost all continents ([Adeagbo and Ayandibu, 2014](#)). Notably, a large proportion of migrants relocate to high-income countries. While it is expected that the policymakers and other stakeholders will rise to the occasion to formulate and execute policies that will improve the economy and cut down the rate of migration out of the country, the reverse is the case. The net emigration rate in Nigeria has maintained a negative figure over the past 30 years implying that the emigration rate is more than the immigration rate. More worrisome is the fact that the negative value has continued to increase over the years. As of the year 2018, the net emigration rate was -0.3 as against -0.2 in 1990 ([World Bank, 2019](#)). This reveals the desperation in Nigerians to leave their country. A major argument for migration is remittances from abroad. [World Bank \(2016\)](#) further revealed that Nigeria is the top remittance-receiving country in Africa and fifth in the world. However, the direct impact of migration on economic growth is an area not very much studied in the literature.

Given the assertion above, our paper seeks to extend and augment two strands of human capital flight economic literature. First, are those who argue that human capital flight is instrumental to shaping the structure of an economy in terms of remittances or income from abroad ([Bredtmann et al., 2019](#); [Ubi and Ebi, 2017](#)). Second, are those who argue that human capital flight hampers economic growth in that value is rather added to another man's land rather than the homeland ([Aravossitas and Sugiman, 2019](#); [Musibau et al., 2019](#)). Which of these two positions is then closer to the reality for Nigeria?

Therefore, the purpose of this study is to examine the human capital flight and output growth nexus in Nigeria using the Autoregressive Distributed Lag (ARDL) model. This is to enable us to study the relationships among emigration, remittances, education outcomes and

output growth in the Nigerian context. From the understanding reached through our findings, this research is among the scanty papers that have applied the ARDL approach in examining this relationship using the variables under study. Furthermore, this paper would take a distinctive approach from the overly stretched perspective that is pervasive in the existing literature on the determinants of human capital flight. This approach is very important as it takes a broader approach in analyzing the relationship between human capital flight and output growth through the inclusion of the emigration rate in the model.

The remainder of this paper proceeds as follows: Section 2 presents the theoretical and empirical review. Section 3 discusses the methodology used while the result discussions are presented in Section 4. Section 5 provides the conclusion and recommendations from the study.

2. Literature review

Large empirical studies have been carried out to examine migrants' decisions and the impact on home and host economies. [Beine et al. \(2001\)](#) focused on the effect migration potentials have on human capital formation and growth using cross-sectional data of 37 developing economies. They assumed the skill set and educational attainment of the agents to be diverse in the setting of doubt as to the migrations in the future. They also distinguished between the two effects of growth: an ex-ante "Brain Effect" (the migration potentials, encourages educational sector investment owing to increased remittance from abroad) and an ex-post "Drain Effect" (as a result of flows in actual migration). According to them, the case for a Beneficial Brain Drain (BBD) arises from the dominance of the initial effect, that is, in situations where the average rate of human capital is more in an economy prone to migration in lieu of an economy, which is not migration prone. Their examination opines that educational subsidies are less relevant with the increased probability of the educated citizens departing the country. [Ndulu \(2004\)](#) corroborated the assertion made by [Beine et al. \(2001\)](#) by opening that developing countries lack the capacity to retain educated and skilled citizens. Again, although [Ndulu \(2010\)](#) recommended that African countries should possess the ability to secure skilled workforce and also adopt repatriation technique in bringing back to home countries educated and skilled migrants, [Ndulu \(2004\)](#) observed that the cost of repatriation to African countries is often huge, thus, the "moderate success" of repatriation programs.

[Joshua et al. \(2014\)](#), [Egbefo \(2014\)](#) and [Tabassum et al. \(2017\)](#) opined that leadership failure to a large extent is the cause of brain drain from African countries. This again was corroborated by the findings from the study carried out by [Omonijo et al. \(2011\)](#). The outcome from the study showed a correlation between deficient leadership of the country and brain drain. Furthermore, it revealed students had left their countries of origin after their studies in a bid to familiarize themselves with advanced societies. Along with similar research thought, [Ajide and Alimi \(2018\)](#) observed that political instability was a leading cause of human capital flight and also influenced the level of remittances to African countries. The authors, thus, recommended the need for African political leaders to provide a stable environment, which is conducive for growth to take place which will also reduce human capital flight. [Faggian et al. \(2017\)](#), however, opined that the role of innovation in the development of the local economy is colossal to reduce the likelihood of migration. Indeed, the Endogenous growth model of the 1980s placed much emphasis on the role of innovation.

Other push factors have also been identified in the literature. [Yamin and Luna \(2016\)](#) opined that push factors such as infrastructure, lack of job opportunity, unavailable higher education facilities among other factors "push" migrants out of their home country.

However, the study by [Popogbe and Adeosun \(2020\)](#) revealed that increased population growth rate and poor life expectancy increases the likelihood of migrating out of Nigeria. Indeed, [Adeosun and Popogbe \(2020\)](#) affirmed that the increasing population has always been to the disadvantage of the Nigerian economy. This is because although the population has spiraled over the years, human development utilization is very poor. This is shown in the high rate of unemployment and level of education. The study by [Tabassum et al. \(2017\)](#) again affirmed that in Pakistan, a high rate of unemployment led to labor migration which negatively impacted the economy.

While developing countries are characterized by factors that “push” migrants out of the countries, advanced countries are characterized by factors that “pull” migrants into them. According to [Yamin and Luna \(2016\)](#), some of these pull factors are the provision of financial benefits and better career or professional developments. [Foo \(2011\)](#) again adopted the survey approach and descriptive technique to discuss some pull factors with a special focus on the Malaysian economy. According to the study, some of these factors are wage differentials and better quality of life for the family. This to an extent supports the altruism theory that migrants are often concerned with the welfare of their families.

Literature has also revealed that the act of migration is not without its own costs and benefits. The costs and benefits are experienced in varying degrees by both the home and host countries. [Mago \(2018\)](#) examined if the benefits of migration are realized by Ethiopian migrants with respect to their livelihood. Using primary data and descriptive analysis, interesting findings were gotten from the migrants based largely in South Africa. A large number of respondents opined that migration had reduced unemployment; enhanced migrants’ standard of living and increased the likelihood of sending remittances back to home countries. Findings also show that similar to previous studies, a large part of remittances was spent on consumption purposes; however, some other recipients also invested remittances in business-oriented activities. The study further recommends implementing a framework that will enhance the inflow of remittances into Ethiopia. Furthermore, [Aravossitas and Sugiman \(2019\)](#) examined the impact of the “brain drain” from Greece on the Canadian economy. Using descriptive statistics, the study revealed that the migration of Greeks was actually “brain gain” for Canada in the following respect: educational, socio-political and economic advancement to Canada. Regrettably, the benefits migrants enjoy may be a leading factor in the increase in the number of irregular migrants ([Ambrosini, 2016; Erdal and Oeppen, 2017](#)).

The negative impact of migration on the home country was established by [Akanbi \(2017\)](#) and [Vecchione \(2018\)](#). Focusing on 19 sub-Saharan countries between 1990 and 2013, [Akanbi \(2017\)](#) examined the impact of migration on both economic growth and human development in the region. On the other hand, [Vecchione \(2018\)](#) focused on the Italian economy and found that high skilled migration drastically reduced human capital accumulation in Italy. The findings showed that migration negatively impacted human capital development. These findings imply that the problem of human development may be a cause and effect of human capital flight as revealed by [Tabassum et al. \(2017\)](#), [Adeosun and Popogbe \(2020\)](#); and [Popogbe and Adeosun \(2020\)](#). The study by [Docquier and Rapoport \(2012\)](#) further revealed that uncontrolled high-skilled migration led to a shortage of health workers in Sub-Saharan Africa in 2010, which, in turn, led to worsened health status. [Kim and Lee \(2016\)](#), however, provided a different perspective on the effect of human capital flight on the home economy. Applying the static fixed-effects model and comparing with results derived in the dynamic panel model with system generalized methods of moments estimators, the study found a negative effect of high-skilled migration and foreign direct investment in the latter estimation technique used. However, [Kim and Lee \(2016\)](#)

revealed that by combining other related variables, there was a positive relationship between high-skilled migration and the growth rate of source countries. It can, therefore, be deduced that while migration alone may negatively impact economic growth, the interaction of migration with other variables can produce positive impacts on the home economy.

The impact of remittances on developing countries' economies has also been widely examined in the literature. Examining the long-run relationship between migrants' remittances and the Nigerian economic growth between 2000 and 2010, [Afaha \(2013\)](#) used the cointegration and error correction mechanism techniques. Findings from the study show that the real GDP growth was significantly in line with the growth in remittances. It was also observed that remittances from abroad subsidized household livelihoods and improved their welfare. The findings by [Afaha \(2013\)](#) were also similar to that of [Azizi \(2018\)](#) and [Adeagbo and Ayandibu \(2014\)](#). However, [Azizi \(2018\)](#) opined that if remittances are done on the basis of altruism, the resulting effect may be consumption smoothing rather than investment purpose which would have strengthened the business cycle in the home country while [Adeagbo and Ayandibu \(2014\)](#) recommended the need for a policy framework to efficiently use remittances from abroad for the benefits of the larger economy.

On the contrary, using Pedroni's cointegration test, [Lim and Simmons \(2015\)](#) observed that there was no form of a long-run relationship between remittances and economic growth in the Caribbean but a long-run relationship existed between remittances and consumption. In a similar vein, [Anetor \(2019\)](#) found a significant negative relationship between remittances and economic growth in both the short and long run in Nigeria. This further proves that remittances are oftentimes spent on consumption rather than investment purposes as revealed by [Mago \(2018\)](#). Contrarily, [Meyer and Shera \(2017\)](#) found a positive impact of remittances on economic growth with the impact increasing at higher levels of remittance compared to the Gross Domestic Product in a panel study conducted in six developing countries. Similar to findings by [Tabassum *et al.* \(2017\)](#) and [Mago \(2018\)](#), [Asad *et al.* \(2016\)](#) confirmed a long-run relationship between workers' remittances and economic growth and a uni-directional causality from workers' remittances to economic growth. Furthermore, the study found a uni-directional causality from unemployment to labor migration. Interestingly, the level of remittances to home countries may not be influenced by the level of migrants' education ([Bredtmann, *et al.*, 2019](#)).

Comparing the sources of revenue in Africa, [Masiyiwa \(2016\)](#) opined that if oil revenue was stripped out, diaspora remittances would be above the revenues derived from the exportation of all available forms of minerals and the cash crops from agriculture such as tobacco, cotton, coffee, etc. This contribution was estimated to be over 20% of their net income seeing that on average, they repatriate to their countries of origin an estimated \$62Bn annually from the annual \$310Bn net income earned yearly from their jobs abroad. More practically, [Meyer and Shera \(2017\)](#) revealed that in recent times, about 27% of developing nations' GDP is accounted as remittances. Sadly, remittance inflows have been seen as being used for consumption purposes rather than productivity spending ([Asad *et al.*, 2016](#); [Lim and Simmons, 2015](#)).

From the foregoing, the review of empirical literature has indicated that there are controversial findings on the relationship between human capital flight and economic growth, thus the need for further studies. Again, Nigeria is one of the many countries experiencing a high rate of human capital flight and understanding the impact of this on output growth, in the long run, is a welcome development. Furthermore, the reviews have shown that many studies carried out in Nigeria either examined the factors that contributed to migration ([Ndulu, 2010](#); [Joshua *et al.*, 2014](#); [Egbefo, 2014](#); [Tabassum *et al.*, 2017](#); [Ajide and Alimi, 2018](#); [Popogbe and Adeosun, 2020](#)) or examined the impact of remittances on the

home economies (Anetor, 2019; Mago, 2018; Azizi, 2018). On another hand, while the studies by Henry (2013) and Okonkwo *et al.* (2020) on the impact of capital flight on economic growth in Nigeria have a semblance of our current study; however, it is important to note that human capital flight and capital flight are two distinct concepts. While capital flight focuses on capital and investment outflows, human capital flight focuses on the migration of humans from one country to another. Thus, less attention has been given to empirically examine the impact of migration on the economic growth of the home countries. The study, therefore, seeks to examine this relationship, as well as the relationship of other control variables such as remittances, education and population growth rate with economic growth.

3. Theoretical framework and methodology

3.1 Theoretical framework

3.1.1 Macro-Level approach to migration, remittances and the economy. Remittances are framed in terms of global flows and the national impact of migrants' actions and funds on the home economy. The macro-level approach also provides a framework to understand the push-pull factors that draw surplus labor from sending countries (Cohen, 2005). Within this theoretical approach, Cohen opines that loss of workers diminishes the welfare and bargaining power of the sending nation and their populations. Again, there is difficulty in replacing lost workers because of rigidity in transferring skills.

A key impact of migration on economic development is from the perspective of remittances sent by migrants to family members back in their home country. Remittances also have the potential to secure the foreign capital of a country which makes savings and household maintenance possible (Cohen, 2005). However, if the "substitutability" between migrants and natives is low, migration may have a negative impact on output and productivity. Therefore, the skill composition of labor in migrants' sending economy is critical in determining income and productivity. This is influenced by advancement in human capital made possible as a result of access to education. This will improve the skills of migrants and make them more competitive in host countries (Katseli *et al.*, 2009). Again, remittances have been seen as an important factor in consumption smoothing and enhancing the productivity of migrants' families back in-home country (Adeagbo and Ayandibu, 2014). Remittances, thus, have the ability to indirectly foster savings, ease foreign exchange and positively change national economics (Cohen, 2005; Katseli *et al.*, 2009).

Cohen also opined that geography, regional and local history can impact the flow of remittances to the home nation. Geographic location has barred the inflow of remittances from certain countries in the world; this is due to fear of terrorism financing which has led to tight monetary control (Wagle and Devkota, 2018). Historically, events in time affect the use of remittance in the destination region and the amount of inflow from the source region. The impact of these remittances over time has a positive effect on the source region. Regionally, Cohen opined that migrant remittances increase inequality in the migration region, as those with remittances are better off than others; this is at an early stage of migration (Adida and Girod, 2011). As the cost of migration becomes affordable by many, inequality begins to decrease as many now have remittances from abroad.

Migration has the capacity to aid development in both host and home countries if migration is well explored and strengthened (Katseli *et al.*, 2009). Indeed, a moderate rise in migration has the capacity to enhance productivity and improve the home country. On the other hand, migration can also lead to depopulation and or large departure of labor with specific levels of skills which may have an adverse effect on the human capital of the home country. Therefore, these interactions affect the economic development of an economy.

3.2 Methodology

3.2.1 *Data source.* The empirical model for this study hinges on Cohen’s macro-level approach to migration and remittances and model specification is done in line with previous studies. The dependent variable is the real GDP annual growth rate and it is the proxy for economic growth; net migration rate proxy for human capital flight (Docquier and Rapoport, 2012). Other control variables to be examined are remittances from abroad, population growth rate and secondary school enrolment (see previous studies by Kim and Lee (2016), Meyer and Shera (2017)). Data sources are the World Bank and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) data file from 1986 to 2018. E-views 11 statistical software was used in carrying out analysis.

3.2.2 *Model specification.* To determine the responsiveness of Nigerian economic growth to human capital flight, we specify the following functional relationship equation:

$$RGDPGR_t = \beta_0 + \beta_1NMR_t + \beta_2REMIT_t + \beta_3PGR_t + \beta_4SSE_t + \mu_t \tag{1}$$

Where:

- $RGDPGR_t$ = Real GDP annual growth rate in time t;
- NMR_t = Net migration rate in time t;
- $REMIT_t$ = Workers’ remittances in time t;
- PGR_t = Population growth rate in time t;
- SSE_t = Secondary school enrolment in time t;
- β_0 = Constant;
- $\beta_1 - \beta_4$ = Coefficients; and
- μ_t = Error term.

3.2.3 *Estimation technique.* The descriptive analysis was used to provide a trend of variables estimated in the study. Also, summary statistics were carried out to further explain the peculiarities of these variables. The Autoregressive Distributed Lag (ARDL) modeling approach developed by Pesaran and Shin (1999) has been adopted for the empirical analysis in this study. The reason for the adoption of the ARDL method of analysis is due to its flexibility in using variables that are integrated of order I(0) and I(1), unlike other cointegration techniques which may not accept such mixed stationarities. It is also advantageous in examining long-run relationships and also estimating the long-run parameters (Naiya and Manap, 2013). Therefore, by a further specification of the functional form of equation (1) above, an ARDL is specified in the form:

$$\begin{aligned} \Delta RGDPGR_t = & \beta_0 + \beta_1RGDPGR_{t-1} + \beta_2NMR_{t-1} + \beta_3\log REMIT_{t-1} \\ & + \beta_4PGR_{t-1} + \beta_5SSE_{t-1} + \sum_{i=1}^m a_1\Delta RGDPGR_{t-1} + \sum_{i=1}^m a_2\Delta NMR_{t-1} \\ & + \sum_{i=1}^m a_3\Delta \log REMIT_{t-1} + \sum_{i=1}^m a_4\Delta PGR_{t-1} + \sum_{i=1}^m a_5\Delta SSE_{t-1} + \varepsilon_t \end{aligned} \tag{2}$$

Where:

- \log = natural log of workers’ remittances;
- Δ = first difference operator; and
- $a_1 - a_5$ = short-run dynamic parameters of the regressors.

The null hypothesis to be tested is that there is no cointegration or long-run relationships $H_0 : a_1 = a_2 = a_3 = a_4 = a_5 = 0$ against the alternate hypothesis: $H_A : a_1 \neq a_2 \neq a_3 \neq a_4 \neq a_5 \neq 0$ as proposed by Pesaran *et al.* (2001).

The error correction mechanism of the short-run relationship is as indicated:

$$\Delta RGDPGR_t = \beta_0 + \sum_{i=1}^m a_1 \Delta RGDPGR_{t-1} + \sum_{i=1}^m a_2 \Delta NMR_{t-1} + \sum_{i=1}^m a_3 \Delta \log REMIT_{t-1} + \sum_{i=1}^m a_4 \Delta PGR_{t-1} + \sum_{i=1}^m a_5 \Delta SSE_{t-1} + \lambda_1 ECM_{t-1} + \varepsilon_t \quad (3)$$

Where a negative (-) λ_1 shows that short-run disequilibrium as a result of shocks to all the variables used will converge back to long-run equilibrium.

4. Empirical results and discussions

4.1 Trend of estimated variables

Figure 1 provides a trend analysis of the variables measured in this study. With the exception of the net emigration rate and population growth rate, the other variables show notable differences in values over the years. The real GDP rate has fluctuated with a peak growth experienced in the year 2002 at a rate of 15% increase compared to the previous year. Notably, the government administration of Nigeria in the early 2000s created a platform for “economic recovery and growth” (Dada *et al.*, 2017). Regrettably, the economy has been on a downward slide, as then with the economy witnessing a negative real GDP growth rate in 2016. This was due to a fall in global oil prices coupled with a contraction in non-oil revenue in Nigeria (Oluocha and Laessing, 2017). Although the real GDP increased by 2% in 2018, the trend shows that this is still not a desirable increase as a greater increase had been recorded in previous years.

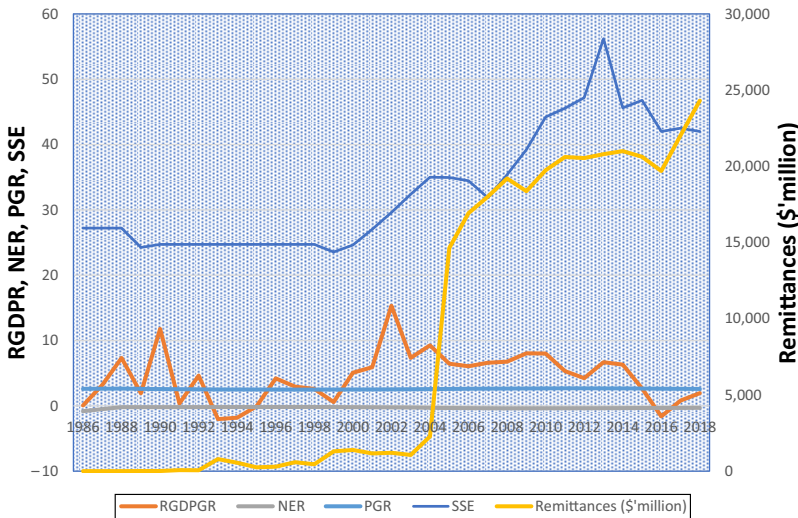


Figure 1. Trend of selected variables (1986–2018)

The net emigration rate shows the difference between the emigration and immigration rates. The values have remained negative since 1986 implying that emigration has always been more than migration into Nigeria. This is not surprising as the economic, political, socio-cultural conditions in Nigeria are discouraging (Ajide and Alimi, 2018; Egbefo, 2014; Tabassum *et al.*, 2017). These challenges hinder the productivity of high skilled labor, thus the constant migration out of the economy.

The growth in remittances also shows an interesting trend. From as little as \$4m in 1986, remittances inflow increased to \$1,391m in the year 2000 and a whopping \$24,311m in 2018. Although there was a slight decrease in remittances periodically, the decrease was not as much as the decrease seen in the growth of real GDP. Nigeria was among the top African countries with the highest inflow of remittances in 2018 and the trend also shows that the highest value of remittances to Nigeria was received the same year. Interestingly, the reported figure of remittances has been revealed to be lower than the actual estimates (Nevin and Omosomi, 2019).

The secondary school enrolment reveals a sustainable increase over the years, however, with periodic decrease. The peak enrolment was experienced in 2013 with a ratio of 56% to overall enrolment and a decrease of 24% in 1999. The trend shows that since 2003, about half (and in some cases, more than half) of yearly enrolment was into secondary school. The reason for this is not far-fetched. The Nigerian government offers free education for students up to the Secondary School level (Evans-Obinna and Ndieze, 2017). Again, there is scanty information to represent tertiary education, thus the adoption of the secondary school enrolment, being the least level accepted for occupying public offices in Nigeria. It is, however, expected that the majority of secondary school graduates will proceed to tertiary education.

Finally, there has been a consistent increase in the Nigerian population since 1986. Yearly, the population has increased by about 4 million (implying a 3% increase yearly). Okpala (1990) rightly predicted that the Nigerian population is expected to double in 22 years (by 2017) should the yearly growth rate of 3%–4% be maintained. Indeed, by 2017, the Nigerian population stood at 191 million from 91 million in 1985. The continuous increase has been attributed to religion, illiteracy, male-child preference, etc (Theodore, 2006).

4.2 Summary statistics and correlation matrix

The descriptive statistics as shown in Table 1 reveals the summary statistics of the variables used in this study. On average, the real GDP growth rate of the Nigerian economy between 1986 and 2018 stood at about 4%, –0.3 per 1,000 population for net migration rate, \$87m for remittances, about 3% mean population growth rate value and 90% gross secondary school enrolment mean value. The maximum real GDP growth rate was 15% while the minimum was –2%. There exists a large gap between the minimum and maximum value of workers' remittances of about \$24bn between 1986 and 2018. This shows that there has been a large volume of remittances from abroad into the Nigerian economy over the years.

Studies have found that a large part of the remittances are spent on consumption while it is also reported that the actual remittances into the economy are greater than the recorded figures (Lim and Simmons, 2015; Mago, 2018; Nevin and Omosomi, 2019). It behooves the government and other policymakers to efficiently track remittance inflow and optimize same for the economic development of the economy. Both minimum and maximum values for net migration rate show negative values implying that the emigration rate has always

Table 1.
Summary statistics

Statistics	RGDPGR	NMR	Variables REMIT	PGR	SSE
Mean	4.45	-0.29	87.27	2.58	90.52
Median	4.63	-0.29	1,301.06	2.59	89.74
Maximum	15.33	-0.17	24,311.02	2.68	102.11
Minimum	-2.04	-0.81	2.42	2.49	78.66
SD	3.92	0.13	9,735.50	0.07	6.10
Skewness	0.45	-2.02	0.37	-0.05	0.28
Kurtosis	3.31	8.87	1.23	1.53	2.16
Jarque-Bera	1.23	69.72	5.06	2.97	1.40
Probability	0.54	0.00	0.80	0.23	0.50
Sum	146.76	-9.72	288.01	85.19	2,987.15
Sum sq. dev.	491.69	0.53	3.03E + 21	0.15	1,189.82
Observations	33	33	33	33	33

Source: Researchers' computation 2020

been higher than the immigration rate in Nigeria. This has a negative impact on human capital development and should be checked.

The skewness, kurtosis and Jacque bera results show that the sample size of each variable is normally distributed. Although the results obtained for NMR shows a slight deviation from the accepted range for kurtosis, however, this is not a sufficient reason to discard the variable as further tests in the study showed appropriate model specification.

The correlation matrix in Table 2 shows that none of the variables are correlated. There exists a negative correlation between net emigration rate and real GDP growth rate. However, a positive correlation exists between real GDP growth rate and remittances, real GDP growth rate and population growth rate and also real GDP growth rate and secondary school enrolment. These are preliminary analyzes and the ARDL estimation will further prove these results.

4.3 Unit root test

Unit root tests are important to test the stationarity of time series data. This is necessary to avoid "spurious" regression results which will make accurate forecast impossible (Gujarati, 2003). The time-series properties of the data adopted for this study were, therefore, tested using the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests. This is presented in Table 3.

Table 3 shows the ADF and PP unit root tests outcome. The Akaike Info Criterion (AIC) automatic selection and max lag of 4 were set for the ADF test while the Bartlett Kernel

Variables	RGDPGR	NMR	LOGREMIT	PGR	SSE
RGDPGR	1				
NMR	-0.0088	1			
LOGREMIT	0.1011	-0.0612	1		
PGR	0.2338	-0.6085	0.3550	1	
SSE	0.2568	-0.1083	0.1742	-0.1353	1

Source: Researchers' computation 2020

Table 2.
Correlation matrix

estimation method and Newey-West Bandwidth were adopted in calculating the Phillips-Perron test. The result reveals a mixture of stationarity among the variables of orders I(0) and I(1).

4.4 Autoregressive distributed lag estimation

As the variables are integrated of orders I(0) and I(1), the ARDL bounds test for the establishment of a long-run relationship was carried out and the result is illustrated in Table 4.

The result of the bounds test in Table 4 shows that the estimated F-Stat is 10.7 and this is above the upper critical bound at the different levels of significance. This establishes the existence of long-run cointegrating among the variables. We can, thus, proceed to estimate the ARDL estimation results.

Table 5 shows the ARDL estimation of short-run coefficients. Specifically, the net migration rate (one period lagged value) negatively impacted real GDP. This implies that while the net migration rate may not impact real GDP in the current period, it impacted real GDP in the previous period. The same result applies to the remittances inflow. While remittances did not impact real GDP in the current period, they impacted real GDP negatively in the previous period. The population growth rate also showed a negative relationship with economic growth. Thus, an increase in population does not necessarily translate to better economic growth. This corroborates the findings by Adeosun and Popogbe (2020). The error correction term is -1.7 , which is statistically significant at 1%, suggests a 172% annual adjustment toward long-run equilibrium. This high value, however, depicts that the speed of adjustment fluctuates forward around the long-run value before settling to equilibrium. Therefore, disequilibrium in economic growth as a result of shocks from previous periods will converge back to long-run equilibrium.

Table 3.
The augmented
Dickey-Fuller (ADF)
and Phillips-Perron
(PP) unit root test

Variable	ADF <i>t</i> -statistics	ADF @ 5% critical values	Order of integration	PP <i>t</i> -statistics	PP @ 5% critical values	Order of integration
RGDPGR	-3.8435	-2.9571	I(0)	-3.9265	-2.9571	I(0)
NMR	-5.036	-2.9604	I(1)	-4.6975	-2.9571	I(0)
logREMIT	-6.5139	-2.9604	I(1)	-6.5142	-2.9604	I(1)
PGR	-3.2528	-2.9678	I(0)	-1.9612	-1.9521	I(1)
SSE	-3.1008	-2.9604	I(0)	-3.9265	-2.9604	I(1)

Source: Researchers' computation 2020

Table 4.
ARDL bounds test
for a cointegrating
relationship

<i>Null hypothesis: no long-run relationship exists</i>		
F-stat	Value = 10.657	k = 4
<i>Critical value bounds</i>		
Significance	I(0) bound	I(1) bound
10%	2.20	3.09
5%	2.56	3.49
1%	3.29	4.37

Source: Researchers' computation 2020

Table 5.

Estimation of short-run coefficients

Variable	Coefficient	Std. error	t-statistic	Prob.
D(RGDPGR(-1))	0.5761	0.1685	3.4190	0.0035
D(RGDPGR(-2))	0.7721	0.1365	5.6564	0.0000
D(NMR)	0.9179	35.2848	0.0260	0.9796
D(NMR(-1))	-54.6293	9.4956	-5.7531	0.0000
D(LOGREMIT)	-1.3322	1.3445	-0.9908	0.3365
D(LOGREMIT(-1))	-4.1184	1.2181	-3.3890	0.0038
D(PGR)	-406.1421	70.6038	-5.7524	0.0000
D(PGR(-1))	420.1417	68.3356	6.1482	0.0000
CointEq(-1)*	-1.7298	0.2141	-8.0808	0.0000
R-squared	0.8858	Mean dependent var		-0.1799
Adjusted R-squared	0.8423	S.D. dependent var		4.4936
S.E. of regression	1.7845	Akaike info criterion		4.2395
Sum squared resid	66.8722	Schwarz criterion		4.6598
Log-likelihood	-54.5919	Hannan-Quinn criter		4.3739
Durbin-Watson stat	2.8354			

Source: Researchers' computation 2020

The long-run estimates, as shown in Table 6, reveals that a unit increase in the net migration rate will reduce the real GDP growth rate by 59 units in the long run. Continuous rise in migration rate will reduce the manpower needed for productivity in the home countries. This, in the long run, will drastically reduce economic growth. Economic growth is a prerequisite for economic development; the implication of low economic growth will, thus, mean reduced welfare benefits for citizens. Worker remittances also negatively impacted the real GDP growth rate at a 1% level of significance. This negative relationship was also established in the short run. This finding is in line with Anetor (2019), although contrary to findings by Afaha (2013) and Meyer and Shera (2017). The negative relationship between remittances and economic growth simply implies that a large inflow of remittances does not necessarily lead to economic growth. This can be as a result of remittances spent on consumption purposes and not revenue-yielding investments. This has been corroborated in the literature (Adeagbo and Ayandibu, 2014; Asad *et al.*, 2016; Lim and Simmons, 2015). Our findings do not, therefore, conform to the proposition of Cohen (2005).

Population growth rate negatively impacted real GDP growth rate, but this relationship is not significant while secondary school enrolment positively influenced growth rate and that significantly. According to Beine *et al.* (2001), educational attainment may increase due to increased remittances from abroad induced by migration from the home country. In fact, a unit increase in secondary school enrolment increased the real GDP growth rate by 28%.

Table 6.

ARDL estimation of long-run coefficients

Variable	Coefficient	Std. error	t-statistic	Prob.
NMR	-58.9200	27.5498	-2.1387	0.0482
LOGREMIT	-2.9418	0.7136	-4.1224	0.0008
PGR	-28.6233	33.4676	-0.8553	0.4050
SSE	0.2789	0.0714	3.9034	0.0013
C	64.8478	79.1091	0.8197	0.4244

Source: Researchers' computation 2020

This positive relationship is also empirically found in [Kim and Lee \(2016\)](#). Besides, higher secondary school enrolment indirectly implies more secondary school graduates who can acquire skills needed to be productive in the economy.

4.5 Diagnostic and stability analysis

As shown in [Table 7](#), the Breusch-Godfrey Serial Correlation LM test was carried out for serial correlation; Ramsey Reset test for model specification; heteroskedasticity test; and the Jacque-Bera test to test the normality of the model. The results show that the null hypothesis of the diagnostic is to be accepted against the alternate. The diagnostic tests show that the model is not auto-correlated, the model is well specified, the heteroscedasticity problem does not exist and the regression model is normally distributed. The CUSUM and CUSUM of squares are represented in [Figures 2\(a, b\)](#), respectively, and show that the model is relatively stable.

5. Conclusion and recommendations

The aim of this research is to analyze the nexus among the human capital flight and economic growth variables within Nigeria. In a bid to accomplish this objective, the real GDP annual growth rate (RGDPGR) was used as a proxy for economic growth, while the Net Migration Rate (NMR) was used as a proxy for human capital flight as the true exogenous variable. The control variables were Workers' Remittances (REMIT), Population Growth Rate (PGR) and Secondary School Enrolment (SSE). Time series data of 32 years spanning

Test	T-Stat	p-value
Breusch-Godfrey serial correlation LM test	2.0265	0.1688
Ramsey reset test	0.5283	0.6050
Heteroskedasticity test	0.7483	0.6977
Jacque-Bera	-3.5438	0.1700

Table 7.
Diagnostic tests

Source: Researchers' computation 2020

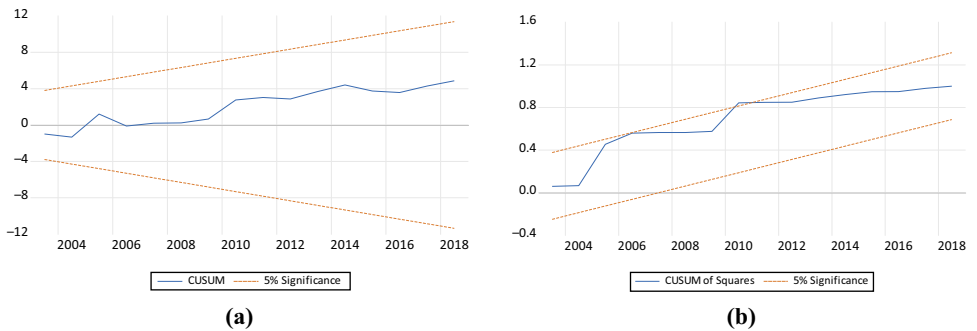


Figure 2.
The CUSUM and
CUSUM of squares

from 1986 to 2018 was sourced from the World Bank and the UNESCO data file. Both Augmented Dickey-Fuller and Phillips-Perron tests were carried out to test the stationarity of the variables and results show that the variables are integrated of orders $I(0)$ and $I(1)$. This justified the use of the ARDL estimation technique in this study.

The Bounds cointegration test showed the existence of a long-run relationship among the variables. The ARDL regression result implied that the net migration rate in Nigeria negatively impacts on real GDP of the country significantly in both the short and long run. This has been supported by some previous studies and this finding further corroborates the disadvantage of migration on the Nigerian economy. Again, the study found out that although workers' remittances from abroad have increased over the years; however, the relationship between remittances and the growth rate is negative. This shows that Cohen's theory, to a large extent, does not apply to Nigeria. Migrants' remittances back to their home country may possibly be based on the care and concern they have for their family members in the home country.

Again, some of the reviewed literature confirmed that remittances are oftentimes spent on unproductive activities that do not contribute to economic growth. This may, thus, have accounted for the negative impact remittances had on economic growth in this study. On the other hand, secondary school enrolment positively and significantly impacted the real GDP growth rate and this also further confirms the positive effect of human capital development on an economy's growth.

Therefore, in line with our findings, we recommend that pull – factors like enabling environment and infrastructural facilities in foreign countries should also be established in Nigeria so as to retain human capital. This will also reduce the volume of remittances from abroad and cause skilled labor workers to be more productive in their home country. We also recommend that the labor law should be such that it will ensure competitive compensation and benefit for workers; and job security for both private and public holdings, among others. Better conditions of service will discourage skilled migration and improve the home economy.

Furthermore, the Nigerian Government should provide a linking framework with Nigerians in diaspora whereby they will be motivated to invest a greater proportion of their net income intangible assets such as real estate, government bonds and so on as this will stir plausible growth for the economy and better to improve the well-being of their family members in the country. The value of education is also incalculable in economic growth. It is, therefore, important to judiciously allocate resources that will aid the educational sector, especially at the secondary level. This level is a key determinant as students are taught basic skills that make them productive to an extent as young adults. Stakeholders are, therefore, advised to invest more in the educational sector because higher enrolment implies a broader human capital base in the economy and a higher likelihood for enhanced economic growth.

6. Limitations and scope of the study

The study focused on only available data between 1986 and 2018. Also, as a result of data paucity, wage differential and skilled emigration were omitted from the analysis. With the availability of such data, further studies can explore that peculiar dimension to the study as such will be a valuable contribution to the literature on migration. Moreover, future studies may carry out cross-country analysis to provide comparative analysis among countries where the human capital flight is on the rise.

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Further reading

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