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*Department of Economics,*
*Nnamdi Azikiwe University, Awka,*
*Anambra State, Nigeria.*

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# HUMAN CAPITAL FLIGHT AND ECONOMIC GROWTH IN NIGERIA

*Ezefibe, Chidimma; Eze, Anoke Eze & Okoli, Uju Victoria.
Department of Economics, Nnamdi Azikiwe University, Awka.
* Corresponding Email: Ezefibe.chidimma@gmail.com

**Abstract**

In order for economic growth to be sustained, countries adopt every possible measure to retain their human capital – which has not been the case of Nigeria. This study examined the impact of human capital flight on economic growth in Nigeria from 1990 to 2022. Using the auto regressive distributed lag model, the findings of the study showed that human capital flight has no significant impact on economic growth in Nigeria in lag one and two. However, in the third lag, the reverse is the case. Human capital flight had a significant impact on economic growth in Nigeria during that period. More so, evidence from the Granger causality test showed that net migration does not Granger cause real GDP but RGDP Granger causes net migration. Also, unemployment does not Granger cause human capital flight, infrastructure Granger causes human capital flight, poverty rate Granger causes human capital flight but human capital flight and access to education does not have any causal relationship. Therefore, the study recommended among others that increased investment in infrastructural facilities in the country will reduce the rate of human capital flight vis-à-vis, economic growth of the country.

**Keywords**: Economic growth, human capital flight, Net migration, Unemployment rate, real GDP
**JEL Classification Codes**: E24, F43, I32, J6

## 1. Introduction

A nation's productivity is typically measured by its gross domestic product (GDP) (Idris, 2021). The World Bank (2021) states that an increase in GDP, or the total value of all products and services produced in a nation in a given year, is the key indicator of economic growth. The general consensus among economists is that physical capital, natural resources, technology, and human resources/capital all have positive impacts on economic growth. Governments in developed nations concentrate on these issues. Lucas (2015) and Romer (1989) contend, however, that human capital is a major contributor to rising returns and the difference in growth rates between industrialized and developing nations. Lucas (2015) further demonstrated in his new growth theory that human capital is one of the major predictors of economic growth. Still, no one element reliably generates the precise or optimal level of growth required for an economy. Human capital refers to the collective knowledge, skills, abilities, and attributes of individuals

that drive economic prosperity and societal progress (Goldin, 2016). By extension, human capital flight refers to the migration of these skilled individuals from their country of origin to other countries (Mayer, Malin & Hazboun, 2017).

Human capital flight is defined as a notable increase in the number of highly skilled individuals moving to a completely new area from a geographic region that is typically their nation of origin (Obidike, Uma, Odionye & Ogwuru, 2015). This is usually a common activity in developing nations. Okonkwo et al. (2022) further asserts that human capital flight also known as brain drain, is the exodus of young talent through emigration as well as the depletion or loss of intellectual and technical personnel. It also refers to the movement of skilled intellectual and technical labour to more advantageous geographic, economic, or professional environments. As a result, the country from which they fled is in some way impoverished, depriving their home countries of the skills and knowledge they would otherwise have offered towards economic growth and development. Anastasiou, Anagnostou, Theodossiou and Papamargaritis (2020) explain that globalization also, to a large extent, aided this movement to advanced countries of the world as the impact of increased migration on human capital development cannot be overemphasized. However, Olaniran (2020) argued that the failure of successive leadership and governments to raise the standard of living of their citizens is one of the primary reasons for the brain drain in the developing countries.

The addition of skilled labour to the labour market benefits the host countries more than the home countries, which are frequently developing nations, even though the former may experience a shortage of trained labour. Development of human capital so continues to deteriorate for emerging nations (Okoro, Omeluzor & Bamidele, 2014). Concerned parties have been alarmed by the unabated increase in emigration since it depletes the nation's resources, deteriorates citizen wellbeing, and stunts the nation's overall economic growth (Adeosun & Popogbe, 2021). Therefore, even while the benefits of human capital flight to the new countries are frequently referred to as brain gain, the act's net worth is occasionally referred to as a brain drain to the countries of origin (Anastasiou et al., 2020).

In Nigeria, human capital flight has been a contentious issue for the past decades. Emeghara (2014) describes how human capital flight started in the early 1970s and 1980s, following the oil boom. During this time, Nigeria emerged a destination for economic migrants as a result of the influx of professors and instructors from India and other African countries into public secondary

schools and universities (Offor, Egbulonu, Ikwumezie & Njoku, 2022). Up until the financial crisis and an IMF economic measure that introduced a structural adjustment programme, the government could afford to pay them (Offor et al., 2022). A substantial number of students were forced to migrate to other countries in Europe and Asia in pursuit of cheaper and better educational opportunities as a result of this economic policy decision, which ended in a dangerous funding shortage for the educational sector (Offor et al., 2022).

Meanwhile, Okonkwo et al. (2022) asserts that the foundation of brain drain, according to academics, is poor leadership, corruption, mass unemployment, low pay, poor working conditions, mass poverty, religious crises, communal crises, political crises, inadequate education, etc. African brain drain, according to Ndulu (n.d.), robs the continent of its future. In very plain terms, it means that economic growth and poverty reduction on the continent are becoming nearly impossible due to the brain drain of highly qualified professionals from Africa to possibilities outside.

Okonkwo et al. (2022) further reinforce that despite not being included in the balance of payments of countries, human capital flight involves the international transfer of resources such as people capacities and skills. Despite having lagged behind the movement of commodities and financial capital, the flow of human capital is nevertheless is negatively substantial in terms of its influence on its growth. In Nigeria for example, data show that about 49, 000 skilled workers left the country in 2014, 145, 000 in 2015, and 54,000 in 2016. Sadly, this increased to approximately one million in 2019 and 2022 (Wirajing, Nchofoung & Etape, 2023). When compared to the 15.3% growth rate recorded in 2002, Nigeria's annual economic growth rate has also been declining (World Bank, 2024). The country recorded a relatively low growth rate of 6.3% in 2014, 2.7% in 2015, -1.6% in 2016, 2.2% in 2019 and 3.3% in 2022 (World Bank, 2024). This has made this phenomenon an important element for research. Due to the increasing rate of brain drain, some significant part of Nigeria's human resources has been lost which has had a strong impact on productivity in the country. This is the backdrop of this paper as it has become empirically significant to investigate the impact of human capital flight on economic growth in Nigeria in the last three decades taking into consideration other significant developmental factors that may contribute to human capital flight and hinder economic growth.

## 2. Literature Review

For a comprehensive insight into the impact of human capital flight on economic growth in Nigeria from 2012 to 2022, this study

thematically discussed some empirical literature as follows:

**Human Capital Flight and Economic Growth in Nigeria**

Bashir and Abubakar (2022) used time series secondary data covering the years from 1970 to 2017 and examined the relationship between net migration and economic growth in Nigeria. They employed the Autoregressive Distributed Lag (ARDL) Bounds testing approach. Together with other control variables, the cointegration test results indicate that net migration and economic growth have a long-term cointegrating connection. In particular, the study's conclusions showed a substantial inverse association over the long term between net migration and economic growth. Consequently, the authors' work is relevant to this study as they suggested that it is necessary to address the push factors in Nigeria, such as the inadequate salary and incentive structure. Furthermore, Nigeria must offer the pull factors—such as a high standard of living abroad—to deter citizens from emigrating. Massive infrastructural growth, an open hiring procedure, and an incentive-based compensation structure that recognizes performance and diligence can all help achieve the latter.

The relationship between human capital flight and output growth was examined by Adeosun and Popogbe (2021) using data from Nigeria. By concentrating on the migration rate, remittances, population growth, and secondary school enrolment, the study investigated the relationship between migration from Nigeria and the rise of economic production. The authors used the autoregressive distributed lag (ARDL) technique of analysis for time series data between 1986 and 2018 to examine the relationship between the human capital flight and output growth variables, drawing on the macro-level approach to migration, remittances, and the economy. Despite the significant amount of foreign income (remittances), the empirical study revealed that the net migration rate from Nigeria was more detrimental to the economy due to its negative correlation with economic growth. Additionally, and as related to this study, it demonstrates that secondary school enrolment has a long-term, favourable, and considerable impact on Nigeria's economic growth rate.

Brain drain and sustainable development in Nigeria were also studied by Enibe, Umeh, and Eze(2021). The authors amongst other research objectives, determined how the sustainable depletion of healthcare and education professionals due to brain drain affects sustainable development, since one of the main concerns regarding brain drain is the erosion of highly skilled professionals, particularly in the health and education

sectors of Nigeria and analysed the steps the Nigerian government has made to stop the brain drain from the nation. The push-pull theory of migration served as the theoretical basis for the investigation. According to the theory, socioeconomic circumstances have played a significant role in the developing phenomenon of brain drain in Nigeria. It was recommended, among other things, that enhanced remuneration and a good working environment would help to reduce the level of brain drain and hence enhance sustainable development. However, the wealthy nations' components of prosperity—dubbed "greener pastures" by Nigerian professionals who relocate there—are the draw factors. A supplementary method of data collecting was used in the study. The study's conclusions show that Nigeria's ineffective health care system is a direct result of the ongoing brain drain that is reducing the country's pool of medical and educational experts. The crop of academics that are available have been working hard to raise the calibre of education in Nigeria, despite the fact that it has also contributed to the country's declining educational standards.

Anetoh and Onwudinjo (2020) empirically investigated emigration and the problem of brain drain in Nigeria: a philosophical evaluation. The study examined emigration and the problem of brain drain in Nigeria with the question of emigration implying the indicting problem of brain drain in Nigeria. The study argued that this peculiar problem has to do with leadership problem and poor economy as well as environmental structure which inhibit personal growth and development in Nigeria. Employing the philosophical method of analysis, the study appraised this issue with the hope of adding voice to the growing list of available literature on the subject in combating the cankerworm that is affecting and killing Nigeria's progress. The study concluded that for Nigeria to retain her best brains, there has to be good structures in place, quality education delivery, career opportunities and job prospects as well as an enabling and conducive environment that allows intellectualism and innovativeness to thrive. Most importantly, the problem of leadership in Nigeria must be properly addressed so as to enable the citizens actualize their potentials.

Another empirical study on brain drain and national development in Nigeria was conducted by Nwozor (2015). The main goal of this research was to assess how the brain drain is stealing Nigeria's essential human resources and what it means for the country's overall development. The focus of this research is on the development of various sectors of the Nigerian economy, including health, domestic investment, and technology transfer and acquisition. They created pertinent data through secondary sources and

analysed it in the tradition of qualitative descriptive methodology using a one-group time series research design, combining public choice and modern world system theories synthesized from the political economy theoretical framework. According to the study, ineffective healthcare delivery is caused by the brain drain that is reducing the number of health professionals in Nigeria.

Mba and Ekeopara (2012) looked into the implications of brain drain for Nigeria's economic growth. The study examines brain drain, its causes, and its connection to Nigeria's economic growth. They discovered that the actual sector (industry and agriculture) needs to be invested in, as well as individuals possessing professional technical knowledge, entrepreneurial spirit, and management prowess, in order to achieve sustained economic growth. Nigeria's economic growth has been negatively impacted by the brain drain that has caused many experts to leave the country. The Nigerian government should establish an investment-friendly climate that would guarantee job opportunities and lower poverty in order to stop brain drain and accelerate economic growth. It should also maintain zero tolerance for corruption and establish a strong institutional structure. It must offer essential infrastructures including a reliable health care system, well-maintained roads and transportation networks, reasonably priced and effective education, a steady energy supply, water supply, security, and information and communication technology (ICT) services. These are the fundamental components that give life meaning.

**Human Capital Flight and Economic Growth in Overseas**

Zeeshan and Ahmad (2020) examined the impacts of human capital flight on economic growth in Pakistan. Relating to specific objectives, the authors examined the consequences of international migration and its associations with poverty, economic growth, and human development. They employed the ARDL approach on three different models for the period of 1975 to 2017. Empirical evidence describes that international migration is positively associated with economic growth and human development while negatively associated with poverty level. The study concluded that there are enormous potential benefits exists in international migration process because it boosts the economic growth of Pakistan via personal remittances inflow. This monograph is also suggesting some useful policy recommendations for instance, they export their manpower to highly developed countries then reverse brain drain will encourage the innovation practices along with improvement in economic growth.

Adewumi, Ogbodo and Onoh (2019) studied remittances, human capital flight, and the

challenge of facilitating sustainable economic growth in Africa. Twenty African countries were used in the study. They include Nigeria, Ghana, Benin, Senegal, Niger, Cote d'Ivoire, Gambia, Rwanda, Tanzania, Sudan, Kenya, Ethiopia, Tunisia, Morocco, Egypt, Algeria, Zambia, South Africa, Namibia, and Mozambique. The variables used in the study included real GDP, labour force, stock of physical capital, remittances received, per capita income, human capital flight (proxied by net migration), education (proxied by secondary school enrolment), and technology (proxied by total factor productivity). For forty years (1977-2016), statistics were gathered. The findings indicate that while human capital flight has an insignificant relationship with economic growth, remittances, per capita income, labour force, physical capital stock, education, and overall technology all have positive relationships with growth.

An empirical investigation by Adeyemi, Joel, Ebenezer and Attah (2018) looked at data from a few African countries to determine how brain drain affects emerging nations' economic progress. Using the pool ordinary least squares technique, the study investigates the causes, consequences, and implications of brain drain on the economic development of Africa, focusing on Ethiopia, Kenya, and Nigeria. The study found a negative correlation between economic development, remittances, and brain drain. However, in Ethiopia, Kenya, and Nigeria, there is a favourable association between the development of human capital and economic growth. The report suggests the following strategies as solutions to the brain drain issue in the African region based on its results; that in order for migrants and their families to spend remittances in capital-accumulation initiatives that would benefit the entire economy, governments must set up adequate incentives and channels. Once more, African nations ought to design initiatives that help young people realize their potential.

Mago (2018) conducted an empirical investigation regarding the reliability or falsity of migration as a means of livelihood in Ethiopia. Mago (2018) investigated whether Ethiopian migrants are able to achieve the economic benefits of migrating. The migrants, who were primarily stationed in South Africa, provided some fascinating insights through the use of primary data and descriptive analysis. Many respondents said that migration had improved living conditions for migrants, decreased unemployment, and raised the possibility of them sending money home as remittances. The results also demonstrate that, in line with earlier research, a sizable portion of remittances was used for consumption; yet, some other receivers also used the funds for business-related endeavours. The study also suggests putting

in place a framework that will improve remittance inflows into Ethiopia.

## 3. Methodology

### Theoretical Framework

The theoretical foundation, on which the relationship between human capital flight and economic growth is based, evolves from the doctrine of the endogenous growth theory utilising the Uzawa-Lucas model and relating it to Nigeria. The endogenous growth model according to Uzawa-Lucas states that the economic growth of any nation is an outcome of internal factors like human capital, knowledge, and innovation. This principle stresses internal factors and not exogenous forces. Furthermore, Robert Lucas proposed internal training of workers (to improve production). The Uzawa-Lucas Model is presented as follows:

$$\mathbf{Y_i = A(K_i) \text{ x } (H_i) \text{ x } H^e} \qquad (3.1)$$

where, A resembles the technical coefficient; $K_i$ is the physical capital; $H_i$ is the human capital and $H^e$ denotes the economy's average level of human capital.

### Empirical Model Specification

In order to examine the impact of human capital flight on economic growth, a model is specified by Adeosun and Popogbe (2022) which states that output growth depends on human capital flight. The functional relationship is expressed in econometric form;

$$RGDP = \beta 0 + \beta 1NETMIG + \beta 2REM + \beta 3PGR + \beta 4SSE + \varepsilon t \qquad (3.2)$$

Where: Real GDP = annual growth rate in time t; NETMIG = Net migration rate in time t; REM= Workers' remittances in time t; PGR= Population growth rate in time t; SSE= Secondary school enrolment in time t;

Our model is concerned with investigating the human capital flight and economic growth in Nigeria and we adopt the model used by Adeosun and Popogbe (2022) and the theoretical framework for our model. From the foregoing, our model will be specified to incorporate relevant variables so as to reflect the objective of the current study.

Thus, the model for the study is specified in the functional form as:

$$RGDP = f(HCFL, UNEMP, GFCF, PHR, AEDU) \qquad (3.3)$$

The econometric form is;

$$RGDP = \beta 0 + \beta 1HCFL + \beta 2UNEMP + \beta 3GFCF + \beta 4PHR + \beta 5AEDU + \varepsilon t \qquad (3.4)$$

RGDP = Real gross domestic product; HCFL = Human capital flight; UNEMP = Unemployment; INFRA = Gross fixed capital formation; PHR = Poverty headcount ratio; AEDU = Access to education

### 3.2 Explanation of the variables

**Real Gross domestic product:** Real gross domestic product (GDP) is an inflation-

adjusted measure that reflects the value of all goods and services produced by an economy in a given year. Real GDP is expressed in base-year prices. As used in this study, it is the real measure of the economic growth of an economy and serves as a good proxy of economic growth since the growth of an economy is determined by the productivity of the country of which Real GDP shows. It is the dependent variable in our model.

**Human Capital Flight:** In this study, human capital flight was proxied with net migration. According to the United Nations Population Division (2022), net migration is the number of immigrants minus the number of emigrants, including citizens and noncitizens. As used in this study, it is the net total of migrants during the period, that is, the number of immigrants minus the number of emigrants, including both citizens and noncitizens.

**Unemployment Rate:** The unemployment rate is the percentage of people in the labour force that is unemployed, (World Bank, 2021). The labour force includes people who are either employed or unemployed. The β2 coefficient in our model (UNEMP) was adopted because an increase in unemployment rate will force unemployed human capital to source for means of livelihood outside the country, thus encouraging migration or human capital flight outside the domestic country. However, when there is a reduction in unemployment rate, this human capital would be otherwise engaged in productive activities, thereby reducing migration since they are able to afford their basic needs and promoting productivity.

**Infrastructure/ Gross fixed capital formation:** The World Bank (2022) defined gross fixed capital formation (gross domestic fixed investment), to include the construction of roads, railroads, and similar infrastructure, such as private residential homes, offices, hospitals, schools, and commercial and industrial buildings; the purchase of plant, machinery, and equipment; and land improvements. It is relevant to the study on the basis that if government provides good infrastructural facilities, it can aid production and discourage human capital flight since there is productivity in the economy and the rate of unemployment is low. It is represented as β3GFCF in the model.

**Poverty Headcount Ratio:** The poverty rate is the number of people whose income is less than the poverty line divided by half of the entire population's median household income. Therefore, if the Poverty headcount ratio of persons living below $2.15 per day is high, the rate of migration and human capital flight will be large, due to unfavourable economic environment. Poverty headcount ratio (PHR) was adapted to proxy poverty rate because it

shows the percentage of individuals or households within a specific population that fall below a certain income threshold, known as the poverty line. Thus, an increase in the number of persons living below poverty line, there will be an increase in human capital flight and a decrease in productivity in the country. It is represented as β4PHR in the model.

**Access to education:** To capture access to education, the study utilised gross enrolment in education. This was adopted in this study because gross enrolment can be used to track educational trends and monitor educated populations. It provides valuable information about the number of students enrolled, their demographic characteristics, and other relevant factors that explains access to education. It is represented as β5AEDU in the model.

### 3.4. Techniques and procedures of Data Analysis

This study adopted the Autoregressive Distributed Lag (ARDL) Model to estimate the parameters. The ARDL model employed in this study is efficient in establishing significant relationship and impact between the variables of the study. The Augmented Dickey-Fuller (ADF) unit root test was used to test for stationarity of the time series data while Johansen co-integration was used to test the long run relationship between dependent and independent variables.

## 4. Empirical Result and Discussion

### (a) Descriptive Statistics of the model

The descriptive statistics aid in understanding time series data and its properties. It displays information such as the mean, median, mode, standard deviation, skewness, and kurtosis. The descriptive statistics of the base model of this study is presented in Table 4.1.

**Table 4.1: Summary of Descriptive Statistics Result of the model**

| | RGDP | NETMIG | UNEMP | GFCF | PHR | AEDU |
|---|---|---|---|---|---|---|
| **Mean** | 44709.07 | 964.6364 | 4.167727 | 5.46E+10 | 43.20788 | 89.98872 |
| **Median** | 41126.68 | 15016.00 | 3.900000 | 5.53E+10 | 43.70000 | 89.65340 |
| **Maximum** | 74567.88 | 107212.0 | 5.999000 | 1.76E+11 | 59.00000 | 102.1081 |
| **Minimum** | 20657.90 | -145917.0 | 3.700000 | 1.23E+10 | 29.70000 | 78.66348 |
| **Std. Dev.** | 20266.03 | 61670.08 | 0.658597 | 3.94E+10 | 10.31382 | 6.524052 |
| **Skewness** | 0.194081 | -0.465681 | 1.841951 | 1.319958 | 0.082075 | 0.210876 |
| **Kurtosis** | 1.393348 | 2.469534 | 5.053900 | 4.501498 | 1.426622 | 2.143944 |
| **Jarque-Bera** | 3.756501 | 1.579639 | 24.46075 | 12.68253 | 3.440886 | 1.252222 |
| **Probability** | 0.152857 | 0.453927 | 0.000005 | 0.001762 | 0.178987 | 0.534667 |
| **Sum** | 1475399. | 31833.00 | 137.5350 | 1.80E+12 | 1425.860 | 2969.628 |
| **Sum Sq. Dev.** | 1.31E+10 | 1.22E+11 | 13.88001 | 4.97E+22 | 3403.994 | 1362.024 |
| **Observations** | 32 | 32 | 32 | 32 | 32 | 32 |

Note: RGDP: Real Gross Domestic Product; NETMIG: Net Migration; UNEMP: Unemployment rate; GFCF: Goss Fixed Capital Formation; PHR: Poverty Headcount Ratio; AEDU: Access to Education

**Source: Author's computation with E-Views 10 and Excel 2019 (2023)**

From Table 4.1, the mean values of all the variables, which coincidentally fell between the maximum and minimum values, revealed the mean values of the variables across the years. The standard deviation values provided insight into the variables' annual variability with regard to their corresponding long-term mean values.

Skewness quantifies how asymmetrical the series is. Positive skewness has a long right tail and implies values higher than the sample mean, whereas negative skewness has a long-left tail and implies values lower than the sample mean. Normal skewness implies that the distribution is symmetric about its mean and the skewness value is roughly zero (0). Thus, from the foregoing analysis results, RGDP, PHR, AEDU are normally skewed, UNEMP and GFCF are positively skewed while NETMIG is negatively skewed.

Kurtosis is a statistical measure that indicates the shape of the distribution of a variable. A value of approximately 3 represents a mesokurtic distribution, which is similar to a normal distribution. When the kurtosis value is higher than 3, it is referred to as leptokurtic or positive kurtosis, indicating a distribution with a more peaked shape and heavier tails compared to a normal distribution. On the other hand, when the kurtosis value is smaller than 3, it is called platykurtic or negative kurtosis, indicating a distribution with a flatter shape and lighter tails compared to a normal distribution. From Table 4.1, UNEMP and GFCF showed a leptokurtic or positive kurtosis with values greater than 3 while RGDP, NETMIG, PHR and AEDU all have negative kurtosis values, indicating that they are platykurtic. This means that their distributions are flatter than a normal distribution and have relatively fewer extreme values or outliers compared to the sample mean. It suggests that the values tend to cluster more closely around the mean, and there is less variability in the tails of the distributions.

The Jarque-Bera test compares the data's kurtosis and skewness to determine whether it is normal. According to the findings, each variable's likelihood of the Jarque-Bera test statistics shows that they are all normally distributed.

**(b) Stationary or Unit Root Test**

The summary of ADF unit root test result is presented in Table 4.2.

**Table 4.2: Summary of Unit Root Test for the variables**

| Variables | Adf Statistics | Adf Critical Value (At 5%) | Probability Values | Order Of Integration |
|---|---|---|---|---|
| **RGDP** | -2.921103 | 02.960411 | 0.0543 | Level (1) |
| **NETMIG** | -2.963972 | -6.377315 | 0.0000 | Level (1) |
| **UNEMP** | -3.372882 | -2.986225 | 0.0220 | Level (1) |
| **GFCF** | -3.436222 | -2.960411 | 0.0172 | Level (1) |
| **PHY** | -4.179149 | -3.562882 | 0.0128 | Level (1) |
| **AEDU** | -4.416172 | -2.960411 | 0.0015 | Level (1) |

**Source: Researchers' Computation using E-views 10.0 (2023)**

Since the decision rule is to reject the null hypothesis if the ADF statistic value above the critical value at a selected level of significance (in absolute terms), evidence from the unit root in Table 4.2 demonstrates that all the variables are stationary at first difference. The rule of thumb is to accept stationarity when ADF statistics is greater than criteria value (see appendices) and also if the probability values are less than or equal to 0.05 (Herranz, 2017). Having obtained stationarity at first difference, the Johansen co-integration can now be conducted as this meets the condition under which the test could be applied.

### (c) Co-integration Test

This step seeks to identify the number of co-integrating relationships that exist among these variables. Empirical results from the Johansen cointegration analysis are presented in table 4.3.

**Table 4.3: Summary of Co-integration Test for base model**

**Unrestricted Cointegration Rank Test (Trace and Max- Elgen)**

| Hypothesized No. of CE(s) | Elgen value | Trace Statistics | | Maximum Elgen Statistics | | Probability Values | |
|---|---|---|---|---|---|---|---|
| | | Trace Stat | 0.05 Critical Value | Max-Eigen Stat | 0.05 Critical Value | Trace | Max-Elgen |
| **None *** | 0.800501 | 135.2647 | 95.75366 | 49.97035 | 40.07757 | 0.0000 | 0.0028 |
| **At most 1** | 0.603021 | 85.29436 | 69.81889 | 28.64001 | 33.87687 | 0.0018 | 0.1855 |
| **At most 2** | 0.553837 | 56.65435 | 47.85613 | 25.01922 | 27.58434 | 0.0060 | 0.1029 |
| **At most 3** | 0.409273 | 31.63514 | 29.79707 | 16.31845 | 21.13162 | 0.0304 | 0.2068 |
| **At most 4** | 0.389492 | 15.31669 | 15.49471 | 15.29736 | 14.26460 | 0.0532 | 0.0342 * |
| **At most 5** | 0.000623 | 0.019324 | 3.841466 | 0.019324 | 3.841466 | 0.8893 | 0.8893 |

**Source; Researcher's computation using E-views 10**

Table 4.3 shows that the trace test indicates 2, 3, and 4 cointegrating equations at the 0.05 level of significance for the model. The trace and Max-Eigen statistics give similar results. There is an asterisk sign for probability values of the trace statistics for none and at most 4.

Since the trace statistics is greater than the critical value at 5%, we reject the null hypothesis that there is no cointegrating equation. Thus, from the outcome of the Johansen cointegration for the trace statistics, we conclude that a long run relationship exists among the variables and they can be combined in a linear form. Agreeing with the Trace and Max-Elgen statistics test, we say there is a long run relationship between at most 2, 3, and 4 variables.

(d) The Granger causality test showing the relationship between human capital flight (NETMIG) and unemployment, gross fixed capital formation, poverty headcount ratio and access to education

The relationship between human capital flight (NETMIG), productivity (RGDP), unemployment, gross fixed capital formation, poverty headcount ratio and access to education is investigated using the Granger causality test, to generate the causal relationship that exist between the variables concerned. The result is presented in Table 4.4.

**Table 4.4:** Granger Causality Test Result

| Null Hypothesis: | Obs. | F-Statistic | Prob. |
|---|---|---|---|
| **UNEMP does not Granger Cause NETMIG** | 31 | 1.04429 | 0.3662 |
| **NETMIG does not Granger Cause UNEMP** | | 3.09828 | 0.0621 |
| **GFCF does not Granger Cause NETMIG** | 31 | 3.66632 | 0.0396 |
| **NETMIG does not Granger Cause GFCF** | | 1.34093 | 0.2791 |
| **PHR does not Granger Cause NETMIG** | 31 | 4.16115 | 0.0270 |
| **NETMIG does not Granger Cause PHR** | | 1.60407 | 0.2203 |
| **AEDU does not Granger Cause NETMIG** | 31 | 0.49576 | 0.6147 |
| **NETMIG does not Granger Cause AEDU** | | 1.25025 | 0.3031 |
| **NETMIG does not Granger Cause RGDP** | | 1.21991 | 0.3116 |
| **RGDP does not Granger Cause NETMIG** | | 5.33185 | 0.0115 |

**Source; Researcher's computation using E-views 10**

Evidence from the result in Table 4.4 imply that with values above 0.05 at 0.3662 and 0.0621 respectively, unemployment does not cause human capital flight and human capital flight does not cause high unemployment rate. More so, with a probability value below 0.05, at 0.03, the granger causality test shows that infrastructural deficiencies will cause human capital flight. In line with this, at a probability value of 0.0270, this shows that poverty rate causes human capital flight but human capital flight does not cause increase in poverty at a value of 0.2203. Furthermore, evidence from the granger causality test shows that human

capital flight and access to education do not have any causal relationship with probability values of 0.6147 and 0.3031 which are above 0.05. Lastly, the test shows that net migration does not granger cause output growth and/or productivity however productivity has a significant impact on net migration.

## 5. Conclusion and Policy Recommendations

Increase in investment, productivity and consumption among others may help in reducing the rate of emigration and instead increase the rate of immigration evidenced from the positive relationship from our ARDL results, whereas, an opposite outcome could increase brain drain or human capital flight in Nigeria. Similarly, policy measures (monetary and fiscal policies) that could promote investment and infrastructure by the private sector will also lead to an increase in economic growth in Nigeria. In a bid to address the issue between human capital flight and RGDP, the government should improve the availability of basic amenities and infrastructure so as to make the country conducive for living. This may also include increasing its spending on providing security amenities and infrastructure to ensure the safety of lives and properties. We also recommend that the government should implement more poverty eradication policies like redefining the National Economic Empowerment and Development strategies which would afford the masses skills needed to provide basic services so they can see income to provide their basic needs. In line with the causal relationship between real gross domestic product (RGDP) and human capital flight, investment, productivity and government spending in the country.

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