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Is Sustainable Education a way forward to Brain Drain in Nigerian Economy? Evidence from Non-linear Autoregressive Distributed Lag Model (NARDL)

Mohammed A. M. Usman*[1], Abubakar Hammawa Kojoli[2], Hamisu Ali[3] & Ikeh Frank Emeka[4]

[1,3]*Department of Economics, Adamawa State University, Mubi*
[2]*Department of Business Administration, Adamawa State University, Mubi-Nigeria.*
[4]*Department of Economic and Development Studies, Faculty of Social Sciences, Federal University Kashere, Gombe State-Nigeria*
[1]*auwal724@adsu.edu.ng*, [2]*hammawa853@adsu.edu.ng*, [3]*hamisu682@adsu.edu.ng*, [4]*campro12@yahoo.com*
Corresponding Author: *hamisu682@adsu.edu.ng*

Abstract

Many developing nations in the contemporary world understand that sustainable education must promote sustainability in order to advance the concepts of sustainable development. At the same time, sustainable development itself turns into a crucial component of high-quality education. Therefore, this study examines whether sustainable education is a way forward to brain drain in the Nigerian economy. Non-linear ARDL model was used to explore the asymmetric relationship between sustainable education and brain drain. The variables employed include gross domestic product per capita (lnGDPc), Current education expenditure (lnCEED), brain drain (lnBRDN), personal remittances received (lnPREM), corruption (lnCRPT), income inequality (lnINCQ). The research was guided by push pull theory of migration and education for sustainable human development theory. The NARDL result showed that, current education expenditure and personal remittance have positive and significant influence on per capita growth. Whereas, brain drain, corruption and income inequality have negative effect on economic growth of Nigeria. The coefficient of the error correction term of (-0.26) as well as equivalent (0.000) probability value signifies a convergence to equilibrium disorder. Furthermore, for Nigeria to achieve the designed SDG's 2030 target, current education expenditure must attain a share of at least 26% annually from national budget which is in line with UNESCO recommendation in order to solve Nigerian problem of brain drain. Therefore, Nigerian government should allocate 26% of its budget to the educational sector (UNESCO). Also for the efficient implementation of sustainable education, the government should provide sufficient funds to the relevant organizations. Therefore, initiatives that would encourage formal improvements to lower income inequality and corruption, which were plainly having large negative effects on Nigeria's economic progress, should be encouraged. Lastly, Nigerian government must enhance its financial and monetary sector to handle the massive inflow of remittances into the economy, as is seen from the short and long run coefficients, which have a positive and notable impact.

Keywords: Sustainable Education, Brain Drain, Remittances, Corruption, Nonlinear ARDL, Economic Growth, and Nigeria.

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1.1 Introduction

Real chances for a variety of social reforms that make it feasible to create socially equitable societies, accomplish sustainable development in societies, and progress toward achieving developmental capabilities should be provided by sustainable education promoted in the interests of sustainable development (Tokarev, 2019). Researchers nowadays are focusing on the problems of sustainable education and brain drain in order to understand how they contribute to the concept of sustainable development in society and how to best execute its ideas and principles via education, Ursul et al. (2015) Rodina et al. (2014) Nemtsev, (2014) Melnik (2014). Over 910,000 publications regarding the topic were found when "sustainable education" was entered as a search term in the scholarly academic database (elibrary.ru), demonstrating the importance of this study topic. Ever since late 2000s, there has been ongoing international effort on education for sustainable development.

Moreover, "Worldwide Program of Action for Education for Sustainable Development," that UNESCO endorsed earlier in 2013, seeks to expand the scope of this effort on a global basis. The 2030 Agenda for Sustainable Development, which was established on a global scale and went into effect in 2015, features a specific aim for sustainable development within section that pertains to education."Ensuring accessible and egalitarian quality education and fostering possibilities for continuous learning" is the stated objective. It's critical to acquire the abilities necessary to execute the idea of sustainable development over the long run in order to achieve this aim. Along with 192 other nations, the government of Nigeria Federation has agreed to this message. And the President issued comparable directives in 2017. They speak of "the incorporation of prerequisites for the acquisition of fundamental knowledge in the sphere of sustainability and environmental protection in Federation of states Educational Objectives."

Furthermore, it is explained that sustainable education is a procedure that is carried out all throughout a human being's life. As a result, education is provided beginning at a young age and continuing through higher education. In furthermore, a system of extra education is offered and is also directed at the older population. It should be highlighted that training presently falls outside the purview of the available official education system. A different chance exists to create a unique trajectory utilizing internal programs including elearning. The purpose of higher education is to develop the kind of knowledge base and level of proficiency that will influence graduates' employment prospects (including by focusing educational standards on professional ones).

There is also an acknowledgement of the necessity of conducting scientifically empirical investigation in numerous areas that are pertinent to sustainable education. Such studies focus on developing appropriate concepts, life values, as well as attitudes, using new, efficient teaching techniques, and creating techniques to assess how well the training is working. The overall goal of the plan is to be implemented over a lengthy period of time; the first stage was carried out until 2009, the second stage until 2012, and the third stage through 2015 and beyond.

However, over decades, the macroeconomic situation of various developing economies has deteriorated due to high rate of brain drain which has an effect on labor system of their countries. Additionally, this limits the resources available to construct a nation at the same time as a nation wants to develop, which limits the performance of the economy's output and growth, according to the World Bank (2019).

Although, Africans living outside of Africa have consistently made a considerable contribution to the continent's foreign exchange revenues but the negative effect in return is otherwise. According to Aravossitas and Sugiman (2019), the act's net worth is sometimes referred to as a "brain drain" to the home countries, despite the fact that the net benefits of human capital flight to the nations being relocated to are frequently referred to as "brain gain". In actuality, households with domestic and international migrants are frequently better educated and wealthier than families without migrants (Foods and Agriculture Organization, 2017).

On the other hand, brain drain is much more detrimental to the growth and development of African nations. The ongoing emigration of skilled workers could cause a financial loss in the area because of the lack of capital. There is need for close attention to the issue of brain drain in Africa,World Bank (2019).It is especially alarming that Nigeria is losing qualified people. Because the economy is marked by socioeconomic challenges such rising poverty, income inequality, and poor educational quality. One of Africa's most mobile populations, Nigerians were said to reside on almost every continent (Adeagbo and Ayandibu, 2014). Particularly, a sizable proportion of migrants go to high-income nations. The reverse is true, despite expectations that authorities and other stakeholders will rise to the occasion and develop and put into action policies that will improve the economy by lowering immigration out of the country.

In Nigeria, for instance, emigration has outpaced immigration for the past thirty years, maintaining a negative figure. More worrisome is the fact that the negative number has gotten worse over time. The net emigration rate decreased from -0.2 in 1990 to -0.3 in 2018. 2019 (World Bank). This demonstrates how desperate Nigerians are to leave their country. Remittances from abroad are a key justification for migration. According to the World Bank, Nigeria is the fifth-largest recipient of remittances globally and the top recipient in Africa (World Bank 2016; 2019). On the other hand, less has been written about the actual impact of sustainable education on brain drain. Scholars have also expanded the idea of brain drain and looked into its impact on the economies of receiving countries as a result of the recent stability and growth of migrant outflows. On the other hand, the majority of empirical studies are contradictory. Brain drain, according to certain studies, all significantly contribute to economic growth in recipient countries (Iheke, 2012; Akinpelu et al., 2013; Akonji and Wakili, 2013; Ukeje and Obiechina, 2013; Oshota and Badejo, 2015; Onyike et al., 2020).

However, very few studies have looked at how sustainable education may prevent the brain drain of Nigerians in order to achieve the 2030 aim for sustainable economic growth and the SDG goal of universal education. Additionally, as was already mentioned, the actual data that was available was highly contradictory. In light of these factors, this research attempts to add to the body of knowledge by evaluating whether sustainable education might help Nigerians combat the issue of brain drain using a nonlinear ARDL technique.

As a result, there are 5 sections in this research. Introduction, Facts on Nigeria's Sustainable Education and Brain Drain are discussed in Section 1. The literature review and theoretical framework are presented in Section 2. The methodology is discussed in Section 3. Section 4 presents the empirical findings and discussion. The study's conclusion and policy recommendation are presented in Section 5.

Facts on Nigeria’s Sustainable Education and Brain Drain

However, the claim that there is ambiguity over the likelihood that people will leave their country may lead to a bias in the other direction. The perception that education is a

ticket to emigration increases the incentives for people to pursue higher education. However, in certain conditions, this might be transformed into a benefit for the home nation if young people are unsure of their prospects for future migration when they make decisions about their educational pursuits (Beine, et al., 1997; Giesenbauer, et al.; Mountford, 2008). The problem of brain drain can be ascribed to a variety of causes that compel competent individuals to leave their home countries in search of better educational opportunities. The pull factors are as follows. The brain drain from Nigeria is caused by the following draw factors. For instance, Nigeria's economy, which blossomed with petrodollars in the 1960s and 1970s, has been mismanaged by the country's deteriorating economic situations without considering the uncertain future. Money was plentiful during this period of Udoji, thus no plans were made to invest the money properly in each sector of the economy. Nigeria therefore lacks the most fundamental necessities of existence, including water, electricity, and proper roads.

Additionally, there is a dearth of government support for education. According to Gbamwuan, et al. (2022), poor governance in developing nations is a factor in the brain drain. According to the World Bank, UNDP, and other bilateral donors, governance in poor nations is not as effective (Das, 2018). Academic independence has been severely curtailed, especially in terms of financial autonomy, according to Okoroma (2001). The demands of academics that might enhance colleges are not honored by successive leadership. Ineffective leadership caused the 8-month ASSU strike that shut down the educational system in 2022.According to TVC News, the Nigeria National Industrial Court ordered the lecturers to return to the classroom on September 21. Nobody desires a workplace in which institutions' rights to engage in union activity are overridden by the government. This circumstance may deter instructors from leaving if better possibilities arise elsewhere. The distribution of budgetary resources per sector does not prioritize education. Nigeria repeatedly failed to adhere to the UNESCO recommendation that a minimum of 26% of the national budget be set aside for education. According to data from Figure 3, just 7.31 percent of the national budget from 2015 to 2022 was allotted to education, falling short of the UNESCO recommendation of 26 percent.

Figure 1. Trend of Current Educational Expenditure

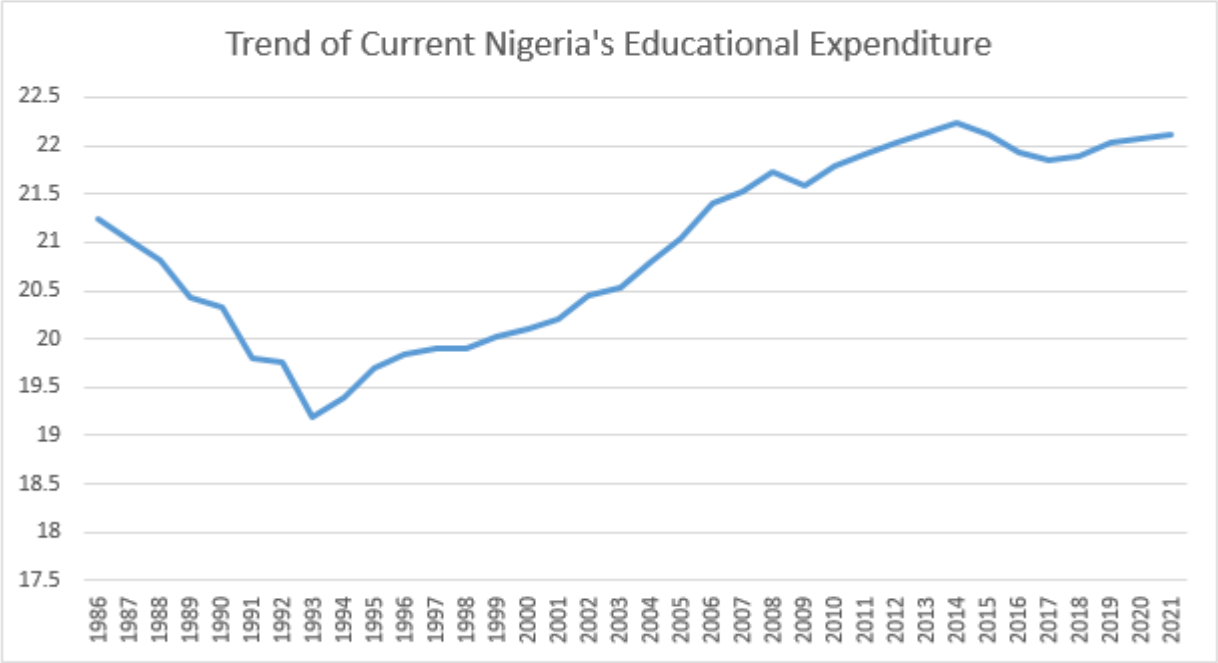
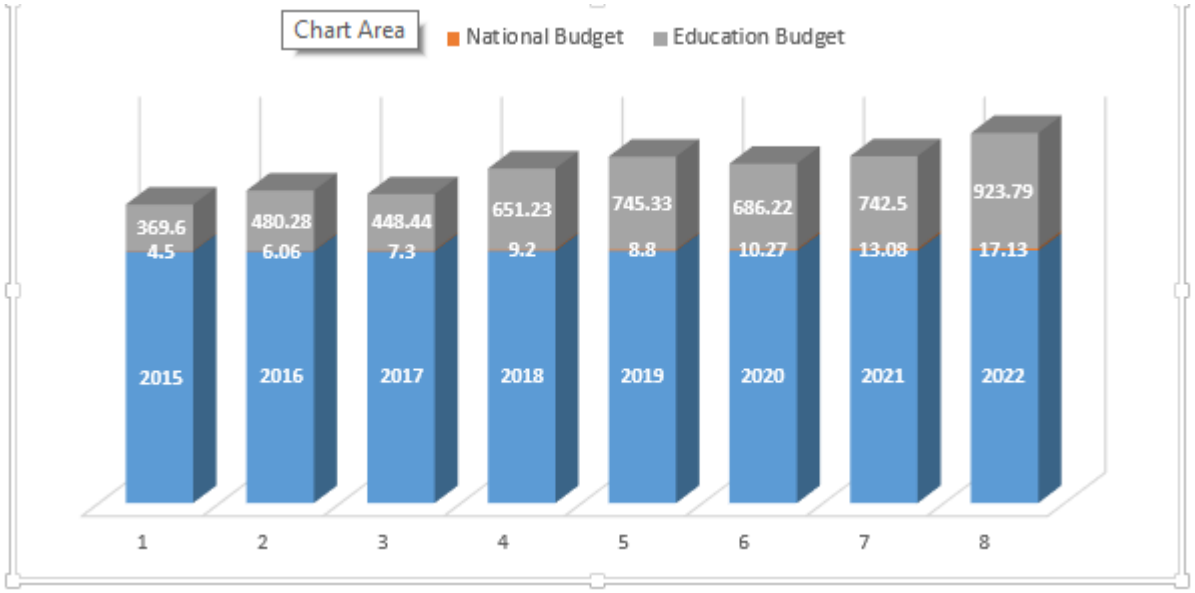


Figure 1 depicted the trend of the Nigerian current educational expenditure from 1986-2021. From the figure, the current expenditure continued to decline from 1986 until 1993. This may be as a result of less allocation to educational sector from the military authority. However the current expenditure continued to increase from 1993 up 2009 through 2014 and 2021 respectively.

Figure 2 Percentage of Nigerian Educational Budget from National Budget 2015-2022



Percentage of Nigerian budgetary allocation to education sector from 1986-2021 was shown in figure 2. From the figure, in 2015 from the national budget of 369.6 trillion, 4.5% was allocated to the education sector. However, in 2016, 2017, 2018, 2019, 2020, 2021 and 2022, 6.06% of 480.28, 7.3% of 448.44, 9.2% of 651.23. 8.8% of 745.33, 10.27% of 686.22, 13.0% of 742.5 and 17.13% of 923.79 respectively. Despite all the share given to the educational

sector, it does not rhyme with the UNESCO's recommendation of over 20% to educational sector particularly to developing economies like Nigeria.

Figure 3.Trend of Nigerian Brain Drain from 1986-2021

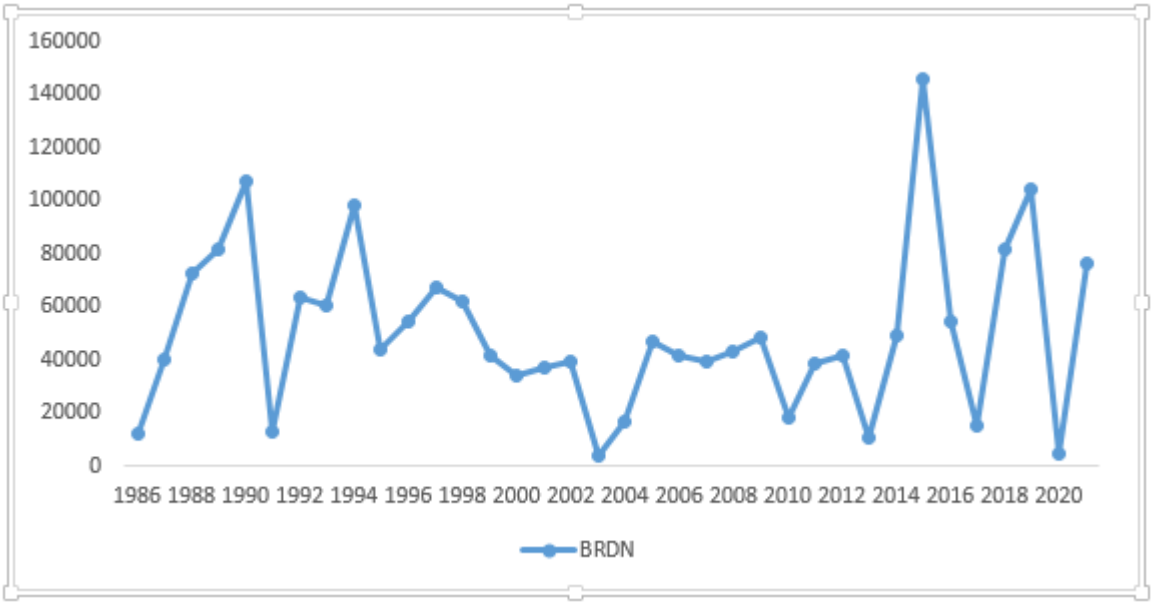


Figure 3 depicted the trend of brain drain in the Nigerian economy from 1986-2021 per t5haousand of people. From the figure, the rate of brain drain continued to increase from 1986 until 1990. Nigeria experienced it least rate of brain drain in last phase of 2002 through 2004. This might be as a result of higher expectation from military regime to democratic transition in 2000. However, the economy in 2014 through 2015 faced with highest rate of brain drain. This may be as a result the then pre and post electoral violence including the insurgencies such as Boko-haram among others. Moreover, the rate decline in 2019 through 2020 due to covid-19 pandemic.

2.0 Literature Review

In Nigeria, there is little literature on sustainable education and brain drain. Poor working conditions in the educational industry are a persistent problem in growing economies like Nigeria, which is why many academic and non-academic staff members are abandoning the field. Ogunode (2020) cited the Tribune online paper, which claims that the Academic Staff Union of Universities (ASUU) has warned the Federal Government against promoting brain drain with a protracted strike and a casual approach toward ASUU's aspirations. Ethiopia has indeed hired 200 academics from Nigeria, according to Prof. Biodun Ogunyemi (ASUU President), while there are also a great amount of Nigerian professors in South Africa, Ghana, Egypt, and other countries.

Olusegun Akinsanya, a former Nigerian ambassador to Ethiopia, claims that in 2006, 600 professors were employed by Ethiopia. He continued by saying that there existed over 3,000 Nigerians residing in Ethiopia, the most of whom were professionals who have been succeeding greatly in their respective career. Ethiopia visited Nigeria a few months ago to hire 200 teachers. I'd prefer not to discuss South Africa. You can see them in Egypt and Ghana. We have a poor attitude toward our students.

Those who are highly regarded and expensive every time they leave the country (Ogunode, Tribuneonline, and Ehichoya (2020) acknowledged that several knowledgeable academic

staff, professors in particular, have been leaving Nigeria's higher educational institutions for developed nations like the USA, Germany, UK, and other countries for better offers. The level of instruction at the nation's higher educational institutions is being impacted by this. Every higher education institution needs enough qualified professionals with relevant experience to teach effectively. According to Smah (2007), Professor Joseph Stilglitz, 2001 Nobel Laureate in Economics, said that there is a specific American university with over 25 Nigerian professors when he spoke at the first Dr. Pius Okadigbo Memorial Lecture Series in Enugu, Nigeria, at the age of 50.

He said that the aforementioned tip is instructional for any administration that really is serious about addressing the brain-drain problem. According to Ogunode & Abubakar (2020), Nigerian university administration has a variety of challenges. Several of these issues include: insufficient lecturers, lack of funding, unsatisfactory physical infrastructure, ongoing university union strikes, systemic corruption, insecurity issues, sluggish administrators and insufficient capacity development lecturers, political intervention in the administering of the universities, indiscriminate licensing of new universities, the autonomy dilemma facing universities, and poor Internally Generated Revenue (IG).

However, Cha'ngom (2020) examines the winners and victims of the brain drain in African nations. Past remittances in this work, benchmarking and calibration methods based on the Lucas Urzawa Model were employed. The results show that brain drain hurts those who are left behind since it reduces their income by 0.6 to 1.8 percent. On the other hand, natural laborers gain from BD because it increases their pay by 0.4 to 3.0% as a result. Only 32 to 54 percent of nations experience a net loss as a result.Human Capital Flight, Remittances, and the Challenge of Achieving Sustainable Economic Growth in Africa: An Analysis by Adewumi, et al. (2019). In this study, the co-integration test was used. A more advanced version of the Solow model of economic growth was used to conduct the Hausman test. Remittances, per capita income, labor force, physical capital stock, education, and overall technology all show positive associations with economic growth, however human capital flight has no statistically meaningful relationship with it. In their examination of Diaspora and Economic Development in Africa, Gnimassoun and Anyanwu (2019). The study employed both a GMM approach based on internal instrumentation and a gravity-based 2SLS technique with external equipment depending on the geographical characteristics of the countries. The results show that while high-skilled emigrants have a greater overall influence on economic development and democracy, those with less education make greater contributions to remittances to Africa.

Similarly, Remittances and the Brain Drain: Evidence from Micro Data for Sub-Saharan Africa was examined by Bredtmann, et al. (2019). The study employed the OLS, Base Line Modeling method. The results reveal that while migrants' levels of education have no bearing on their propensity to send remittances, it does have a positive impact on the amount of money sent when they do. The Effect of Brain Drain on the Economic Development of Developing Countries: Evidence from Selected African Countries is the subject of a 2018 study by Adeyemi, Ebenezer, and Attah. In the investigation, the pool ordinary least squares method was used. The study found a negligible correlation between brain drain, remittances, and economic growth. However, there is a considerable correlation between the expansion of human capital and economic growth in Ethiopia, Kenya, and Nigeria.

2.1.1 Theoretical Framework

The push-pull theory of migration and the paradigm of education for sustainable human development serve as the theoretical foundation for this study. Early 19th-century geographer Ravenstein served as an inspiration for the push-pull theory. He contends that migration is influenced by the push and pull process, which, on the one hand, causes unfavorable circumstances in one place, such as governmental oppression and economic hardship, to "Push" people out, and, on the other hand, causes favorable circumstances in an external location to "Pull" them in. This is similar to the theory put forth by Ravenstein (1885) (Vassilopoulou, et al, 2014). The underlying presumptions is that migration will occur given inequities and that migration will occur ever more disadvantaged an area is. Secondly,the economic performance of the sending and receiving countries can be used to describe migration. Thirdly, the common driving forces are poor economic situations, a lack of opportunity for advancement, the depletion of resources, and natural calamities. They also include low productivity, unemployment, and underdevelopment. Fourthly, pull factors are elements that draw people to a region. Better career prospects, greater income, facilities, better working conditions, and enticing attractions are all draw factors for a place.

However, the theory of ESD as initially presented by Sen (1989), Landorf, Doscher, and Rocco (2008) provides a framework for evaluating ESD-related learning outcomes, instructional strategies, courses, and the transfer of information and skills. Thus effort to underline that education should be focused on promoting well-being, centered on a philosophy of democratic discussion, and forms of learning that reflect local cultural and societal realities, they re-define ESD as education for sustainable human development (ESHD). As a result, the educator must assess the context-related factors that will affect the students' wellbeing and implement a teaching strategy that helps students recognize their own strengths.It necessitates that teachers pay close attention to their pupils' needs and provide an environment in which they can discover and develop as individuals. The instructor and learners' "democratic reasoning" enables them to "identify fundamental skills and socially significant functioning in the communities wherein they practice." In other words, to establish agency. Through the integration of enhanced pedagogical, curriculum, including assessment frameworks, the TESHD enables a relationship between required ESD skills and the development of capacities and learning goals.

3.0 Methodology

In an effort to draw conclusions for this research's time series analysis, the Augmented Dickey-Fuller (ADF), Dickey and Fuller (1981), test of stationarity was used to determine whether Sustainable Education is a solution to the Nigerian Brain Drain. In order to assess the impact of the variables employed in this research, the Nonlinear Autoregressive Distributive Lag (NARDL) method is combined with the Error Correction Model (ECM).

3.1.1 Data Sources, Description and Model Specification

This research employed annual time-series data which is sourced from fragile states index by United State of America (2020), index mundu, UNESCO data base and WDI (World development indicator, world bank data 1986-2021. The variables employed include gross domestic product per capita (GDPc), Current education expenditure (CEED), brain drain (BRDN), personal remittances received (PREM), corruption (CRPT), income inequality (INCQ). Current education expenditure (CEED) is a proxy to education sustainability, while gross domestic product per capita (GDPc) is the dependent variable, brain drain (BRDN),

personal remittances received (PREM),corruption (CRPT), income inequality (INCQ). The model is specified as follows:

$$lnGDPc = \alpha_0 + \alpha_1 lnCEED_t + \alpha_2 lnBRDN_t + \alpha_3 lnPREM_t + \alpha_4 CRPT_t + \alpha_5 INCQ_t + \varepsilon_t \quad (1)$$

Where:
lnGDPc= GDP per capita growth (annual %).
LnCEED= Current education expenditure, total (% of total expenditure in public institutions).
BRDN = Number of people leaving their country for political or economic reason particularly skilled and voluntary migrants.
lnPREM= Personal remittances, received (% of GDP)
CRPT= CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high).
INCQ=, Income inequality (The Gini index is measured from 0–1).
ε_t is stochastic Error term.
α_0 Is a constant term whereas α_1 ….. and α_5 are the coefficients of the parameters.
t = indicate time period, respectively.

3.1.2 Unit Root Test (Augmented Dickey-Fuller)

To identify the variable unit root process, a stationarity test is utilized. The evaluation of the parameters is impacted by several econometric issues when employing time data. In a similar vein, stationarity needs to be separately verified for each piece of time series data. The most basic and often used unit root testing method is the ADF tests. The ADF model is as follows:

$$\Delta X_t = \beta_0 + \gamma \delta_{t-1} + \beta_{2t} \sum_{i=1}^{p} \alpha i \, \Delta \delta_{t-i} + u_t \quad (2)$$

Where: t is the time trend, u indicates stochastic error term, α_i is the intercept, Δ represents differencing operator, and δ_t is the coefficient of the dependent variable at time t.

3.1.3 Non Linear Autoregressive Distributed Lag (NARDL)

Numerous structural economic relationships are hence complicated and nonlinear. Any unit increase or decrease in the x parameter does not always translate into the same changes in the y parameter. As implied by their name, non-linear relations are not linear, therefore doubling one parameter does not transform the other variable into a linear relationship. A nonlinear relationship is a type of relationship between two variables in which a change in one variable does not necessarily correlate to a steady change in the other variable. This can suggest that the relationship between the two variables is unanticipated or absent.

In order to find asymmetric influence in both the short and long terms, Shin, Yu, and Greenwood-Nimmo (2014) suggested a non-linear ARDL framework that makes use of both positive and negative component total principal component analysis. Compared to conventional ARDL and cointegration methods, these models have a lot of advantages. They are initially better at detecting cointegration relationships in smaller samples (Romilly, Song, & Liu, 2001). Secondly, these function whether or not one of the explanatory variables belongs to the unit root process's I (0) or I (I) variables.

Unfortunately, it is worthless if the regressors' coefficients are I (2). Another advantage of NARDL, according to Greenwood-Nimmo et al. (2014), is that it enables us to not only evaluate short- and long-run asymmetry but also to identify hidden cointegration. This makes the asymmetric NARDL framework especially suitable to our study topic.

A brain drain and sustainable education may have a greater absolute impact in the short term. A negative shock could, however, also have a greater absolute impact over time. However, in order to evaluate their asymmetric relationship with GDP per capita, which is used in this study as a proxy for economic growth, sustainable education and brain drain, two of the most significant variables in equation one above, would be decomposed. As a result, the general characteristics of nonlinear ARDL of order p and q are as follows:

$$\Delta\gamma_t = \pi_0 + \sum_{i=1}^{p} \pi_1 \ \Delta\gamma_{t-1} + \sum_{i=0}^{q} \pi_2 \, \Delta Z_{t-1}^{+} + \sum_{i=0}^{q} \pi_3 \, \Delta Z_{t-1}^{-} \ldots\ldots + p\gamma_{t-1} + \delta_1^{+} Z_{t-1}^{+} + \delta_2^{-} Z_{t-1}^{-} + \mu_t$$

(3)

Where γ_t is the coefficient of the dependent variable, π_0 constant, Z represent the independent variables, p is the coefficient of the dependent variable in the long run, δ is the coefficient of the independent variable, π_1,π_2, and $\pi\beta_3$ are the coefficient of the independent variables while μ_t is the stochastic error term. However, by inserting our variables of the study into the above equation, the equation becomes:

$$\begin{aligned}\Delta lnGDPc_t = \ & \alpha_0 + \sum_{i=1}^{p} \alpha_1 \ \Delta lnGDPc_{t-1} + \sum_{i=0}^{q} \alpha_2 \, \Delta CEED_{t-1}^{+} + \sum_{i=0}^{q} \alpha_3 \, \Delta CEED_{t-1}^{-} \\ & + \sum_{i=0}^{q} \alpha_4 \, \Delta lnBRDN_{t-1}^{+} + \sum_{i=0}^{q} \alpha_5 \, \Delta lnBRDN_{t-1}^{-} + \sum_{i=0}^{q} \alpha_6 \, \Delta lnPREM_{t-1} \\ & + \sum_{i=0}^{q} \alpha_7 \, \Delta CRPT_{t-1} + \sum_{i=0}^{q} \alpha_8 \, \Delta INCQ_{t-1} + plnGDPc_{t-1} + \delta_1^{+} CEED_{t-1}^{+} \\ & + \delta_2^{+} CEED_{t-1}^{-} + \delta_3^{-} BRDN_{t-1}^{+} + \delta_4^{-} BRDN_{t-1}^{-} + \mu_t\end{aligned}$$

(4)

However, the sum of partial process of positive and negative changes in remittances inflow (lnRMTR) and human capital flight (HCFB) is given as:

$$POS = CEED_t^{+} = \sum_{i=1}^{t} \quad \Delta CEED_i^{+} = \sum_{i=1}^{t} MAX \qquad + (\Delta CEED_i, 0),$$

$$NEG = CEED_t^{-} = \sum_{i=1}^{t} \quad \Delta CEED_i^{-} = \sum_{i=1}^{t} MIN \qquad + (\Delta CEED_i, 0),$$

(5)

$$POS = lnBRDN_t^{+} = \sum_{i=1}^{t} \quad \Delta lnBRDN_i^{+} = \sum_{i=1}^{t} MAX \qquad + (\Delta lnBRDN_i, 0),$$

$$NEG = lnBRDN_t^{-} = \sum_{i=1}^{t} \quad \Delta lnBRDN_i^{-} = \sum_{i=1}^{t} MIN \qquad + (\Delta lnBRDN_i, 0),$$

(6)

However, the dynamic asymmetric reproduce effects in respect to the positive and negative shocks in long run including cumulative multiplier effects of both current education expenditure and brain drain is given as:

$$N_g^+ = \sum_{j=0}^{n} \frac{\delta lnGDPc_{t+j}}{\delta CEED_t^+}$$

$$N_g^- = \sum_{j=0}^{n} \frac{\delta lnGDPc_{t+j}}{\delta CEED_t^-}$$

(9)

$$N_g^+ = \sum_{j=0}^{n} \frac{\delta lnGDPc_{t+j}}{\delta lnBRDN_t^+}$$

$$N_g^- = \sum_{j=0}^{n} \frac{\delta lnGDPPc_{t+j}}{\delta lnBRDN_t^-}$$

(10)

Where g= 0, 1, 2…. Given equation 9 and 10, if g→∞ then $N_g^+ \rightarrow \frac{-\delta^+}{p}$ and $N_g^- \rightarrow \frac{-\delta^-}{p}$ where p is the coefficient of the dependent variable in the long run form in equation (6).

4.0 Results and Discussion

Table 1. Descriptive Statistics

	lnGDPC	lnCEED	lnBRDN	lnPREM	lnCRPT	lnINCQ
Mean	13.37610	8.102413	-1.553779	19.62576	9.802683	52.33488
Median	12.39489	7.183097	0.485664	18.62186	9.590000	57.53000
Maximum	14.66190	9.600000	3.117688	20.14406	17.69000	63.40000
Minimum	11.20126	7.000000	-4.321916	17.11176	3.800000	35.30000
Std. Dev.	0.340632	0.310753	2.354949	0.407971	2.822070	7.688024
Skewness	0.337824	0.422142	-0.724085	0.019683	1.198956	-0.820190
Kurtosis	1.376332	2.528616	1.800380	1.914591	6.405513	2.391463
Observations	36	36	36	36	36	36

Typically, a descriptive statistical analysis is carried out and is displayed in Table 1 in order to better understand the trends of the overall lnGDPc in the economy. Based on historical trends, the annual lnGDPc rate of growth for the Nigerian economy is predicted to be 13.37%, with maximum and minimum values of 14.66% and 11.20%, respectively. This is because of the early effects of 1987, the structural adjustment program (SAP), as well as solid national policies and a favorable economic environment, which may be responsible for the greatest growth rate.

lnCEED, lnBRDN, and lnPREM, on the other hand, have mean values of 8.102%, -1.55%, and 19.62%, respectively, with maximum and minimum values of 9.60%, 3.11%, 20.14%, and 7.0%, -4.32%, and 17.11%. Additionally, the mean values for lnCRPT and lnINCQ are 9.80% and 52.33%, respectively, with the highest and minimum values being 17.69%, 63.40 and 3.80%, and 35.30, respectively. With the exception of corruption lnCRPT, which had a positive skewness of 1.19% when taking into account the symmetrical nature of the data crossways observation, zero skewness was realized. Because of the leptokurtic structure of the distribution, the indicators that are accompanied by average kurtosis values of 1.37% and 2.59% signify a normal distribution, suggesting increase in per capita GDP growth.

Table 2. ADF Unit root Result Estimates

	At level		At First Difference	
Variables	Stats	Prob.	Stats	Prob.
GDPC	-1.794907	0.3775	-4.044713	0.0031**
CEED	-2.320319	0.1708	-5.096386	0.0001***
BRDN	-1.123001	0.6976	-7.369942	0.0000***
PREM	-4.835609	0.0025***	-0.589638	0.0417**
CRPT	0.404390	0.9808	-4.668454	0.0005***
INCQ	-1.885519	0.3346	-2.490596	0.0145**

***, ** indicates 1%, 5% level of significance.

To check if the variables under examination were stationary, this study used an ADF unit root. Table 2 shows that all variables are non-stationary at level, with the exception of PREM, whose probability ad t-statistic value indicates stationarity at level and implies rejection of the non-stationary null hypothesis at 1% level of significance. However, at the 1% and 5% level of significance of significance, all the variables reach stationarity at first difference. Therefore, one of the prerequisites for the use of nonlinear ARDL is made possible by the level of cointegration of the aforementioned variables (I (0), I (I)).

Table 3. Short run Estimates of Non Linear ARDL (NARDL)

Variables	Coefficients	t-statistics	Probability
D(CEED_POS)	0.01420	-0.34135	0.0411
D(CEED_NEG)	-0.03985	-2.27411	0.0294
D(CEED_NEG(-1))	-0.02459	-2.41618	0.0184
D(LBRDN_POS)	-0.06659	3.29801	0.0202
D(LBRDN_NEG)	-0.04659	4.23629	0.0352
D(LBRDN_NEG(-1))	-0.05630	2.36054	0.0241
D(LPREM)	0.57572	4.59716	0.0100
D(LPREM(-1))	4.17914	-3.23030	0.0410
D(CRPT)	-0.31748	-4.28542	0.0301
D(INCQ)	-0.40435	1.40922	0.0227
$ECT_{(t-1)}$	-0.26321	-6.03002	0.0000

***, **, * indicate significance level at 1%, 5% and 10%

According to Table 3, which displays the short run estimates of nonlinear ARDL, the coefficient of positive asymmetric of D (CEED POS) has a positive impact on Nigeria's per capita GDP. This suggests that a unit increase in the country's current education expenditure will statistically significantly increase per capita GDP by 0.0142%. A unit fall in current education expenditure will also result in a -0.039% decrease in per capita GDP, according to the negative asymmetry of D (CEED NEG) coefficient. However, the prior asymmetric lag values D (HCFB NEG (-1)) shown that a reduction in one unit of current educational

expenditure will likewise result in a statistically significant decline in per capita GDP of -0.024%.

As a result, the coefficient D (lnBRDN POS) has a detrimental and statistically significant impact on Nigeria's per capita GDP. Therefore, a unit increase in brain drain will result in a -0.066% reduction in the per capita growth rate. A unit drop in BRDN will increase per capita growth rate by the same percentage (-0.066%), according to the D (lnBRDN NEG) coefficient, which becomes statistically significant at a level of 5%. Furthermore, a negative impact on GDPc is indicated by the lagged negative asymmetric value of brain drain.

Inferentially, a reduction in the brain drain will result in a sharp decline in per capita GDP growth of -0.056% yearly. However, due to its lag value and the coefficient of personal remittances received, Nigeria's growth rate is positively impacted. Additionally, corruption significantly and statistically negatively affects Nigeria's per capita growth. While the growth of Nigeria's GDP per capita is negatively and significantly impacted by income disparity.

Lastly, the coefficient of error correction ($ECT_{(t-1)}$) requires a sign of a statistically significant probability value that is both negative and zero (i.e., -0.26 and (0.000)). Consequently, the genuine determinants of GDPc in the short and long run coefficients are lnCEED, lnBRDN, lnPREM, lnCRPT, and lnINCQ. Therefore, the disequilibrium condition requires about 26.3% yearly for it to converge over time. Inferring from this, it can be said that Nigeria's nonconformity in per capita growth may be corrected over time as a result of shock waves from present education spending, brain drain, remittances received, corruption, and income disparity.

Table 4. Long Run Coefficients Estimates

Variables	Coefficients	t-statistics	Probability
LCEED_POS	0.046011	-2.934278	0.0460
LCEED_NEG	0.053181	-1.371012	0.0314
LBRDN_POS	-0.074912	-3.958988	0.0249
LBRDN_NEG	0.031013	-4.542250	0.0193
LPREM	0.039346	2.618885	0.0421
LCRPT	-0.041831	-2.117764	0.0376
LINCQ	-0.201271	-3.186502	0.0281

***, ** indicate significance level at 1%, and 5%.

Similar to table 3, table 4 showed the nonlinear ARDL's long run coefficients. GDPc is positively and statistically significantly impacted by the LCEED POS coefficient, which measures the asymmetry of current education spending. This suggests that increasing current educational spending will eventually result in an increase in lnGDPc of about 0.046%. Additionally, the (LCEED NEG) negative asymmetry coefficient has a statistically significant positive impact on lnGDPc.

However, BRDN (lnBRDN POS) significantly and negatively affects Nigeria's GDP. This means that if the brain drain increases, the per capita growth rate of the Nigerian economy will also decline. Additionally, lnBRDN NEG has a detrimental impact on Nigeria's per capita lnGDP. This is true since a decline in BRDN will result in a roughly 0.031% gain in per capita GDPc. Additionally, the GDP is negatively and significantly impacted by the coefficients of income inequality (lnINCQ) and corruption (CRPT), respectively.

However, looking at tables 5 and 6, it was clearly demonstrated that both in the short and long run coefficients probability are statistically significant at 1%, 5%, and 10% respectively. This supports the existence of an asymmetric relationship between education spending and brain drain in the context of Nigeria's growth performance. This indicates that there is an asymmetric relationship between the key research variables.

Table 5. Bound Test cointegrating Result

Model		ARDL(1, 1, 2, 1, 2, 2, 1, 0)		
Optimal lag		4		
F-statistic		5.321265***		
Critical Values	1%	2.5%	5%	10%
I(0) Bound (lower bound)	2.6	2.3	2.2	1.8
I(1) Bound (Upper bound)	3.8	3.6	3.4	2.7

*** indicate significance level at 1%, 2.5%, 5% and 10%

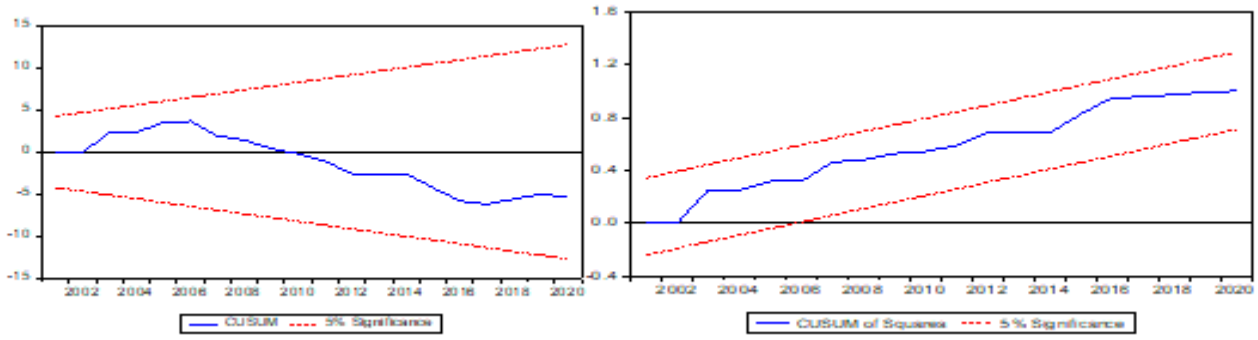
Now that the requirements for carrying out the nonlinear ARDL bounds test have been specified, Table 5 displays the results of the ARDL Bounds testing technique. Even the similar upper bound tabular values at all levels (1%, 2.5%, 5%, and 10%) are less than the computed value of F- statistics of 5.32, as shown in Table 5. The research concludes that there is cointegration between lnGDPc and lnCEED, lnBRDN, lnPREM, lnCRPT, and lnINCQ since the null hypothesis that there is no cointegration is rejected.

Table 6. Diagnostic Checks Results

Diagnostic Test/Stats			**Probability**
Serial Correlation LM Test (Breusch-Godfrey)			
F-statistics	1.43211	Prob. F(3,19)	0.1563
Heteroskedasticity Test (Breusch-Pagan-Godfrey)			
F-statistic	1.354010	Prob. F(16,23)	0.4070
Obs*R-squared	18.54463	Prob. Chi-Square(15)	0.3690
Ramsey RESET Test			
F-statistics	4.723194	d.f (1, 19)	0.0753

The results of the diagnostics check for this study model are displayed in Table 6. The overall residuals from the models were homoscedastic and serially unrelated. The null hypothesis that there is no serial correlation or heteroskedasticity is consequently rejected. Additionally, the linear equation of the model is correctly represented, and its errors have the same distribution. Not to mention, the model's coefficients are also stable. As a result, the null hypothesis of specification bias and atypical distribution was rejected. Due to the distributed mean of zero and constant variance implied by the model.

Figure 4.Cusum and Cusum Square



Structural Breaks

Plotting the cusum and cosum square is one method for spotting structural breaks. When the plots depart from the 5% level of significance, a structural break in the model is present. In order to determine the stability of the parameters, the study, following Adedoyin et al., examined the structural fractures using the cumulative sum of squares (2021).Therefore, from the result, the coefficients of the model are within the stated boundaries which implies the parameters are stable and statistically significant at 5% level.

5.0 Conclusion and policy recommendations

The impact of sustainable education as a countermeasure to brain drain in the Nigerian economy was evaluated using a nonlinear ARDL throughout the annual period from 1986 to 2021. Although indicators of brain drain and sustainable education may be vital for attaining the SDGs by 2030, they are rarely looked at in this current research. However, the majority of earlier studies on sustainable education, brain drain, and growth performance were conducted on a panel basis, and some studies also failed to apply efficient criteria and techniques, both of which are significant policy problems. In order to lessen the negative effects of brain drain, particularly within the internal education sector, this research explores and uses pertinent variables that may improve understanding of growth performance in relation to sustainable education. These variables include corruption and income inequality inefficiencies.

However, according to Table 3, which displays the short run estimates of nonlinear ARDL, the coefficient of positive asymmetric of D (CEED POS) has a positive impact on Nigeria's per capita GDP. This suggests that a unit increase in the country's current education expenditure will statistically significantly increase per capita GDP by 0.0142%. A unit fall in current education expenditure will also result in a -0.039% decrease in per capita GDP, according to the negative asymmetry of D (CEED NEG) coefficient. However, the prior asymmetric lag values D (HCFB NEG (-1)) shown that a reduction in one unit of current educational expenditure will likewise result in a statistically significant decline in per capita GDP of -0.024%.As a result, the coefficient D (lnBRDN POS) has a detrimental and statistically significant impact on Nigeria's per capita GDP. Therefore, a unit increase in brain drain will result in a -0.066% reduction in the per capita growth rate. A unit drop in BRDN will increase per capita growth rate by the same percentage (-0.066%), according to the D (lnBRDN NEG) coefficient, which becomes statistically significant at a level of 5%. Furthermore, a negative impact on GDPc is indicated by the lagged negative asymmetric value of brain drain.

Inferentially, a reduction in the brain drain will result in a sharp decline in per capita GDP growth of -0.056% yearly. However, due to its lag value and the coefficient of personal remittances received, Nigeria's growth rate is positively impacted. Additionally, corruption significantly and statistically negatively affects Nigeria's per capita growth. While the growth of Nigeria's GDP per capita is negatively and significantly impacted by income disparity.

Moreover, the coefficient of error correction ($ECT_{(t-1)}$) requires a sign of a statistically significant probability value that is both negative and zero (i.e., -0.26 and (0.000)). Consequently, the genuine determinants of GDPc in the short and long run coefficients are lnCEED, lnBRDN, lnPREM, lnCRPT, and lnINCQ. Therefore, the disequilibrium condition requires about 26.3% yearly for it to converge over time. Inferring from this, it can be said that Nigeria's nonconformity in per capita growth may be corrected over time as a result of shock waves from present education spending, brain drain, remittances received, corruption, and income disparity.

However, fromthe nonlinear ARDL's long run coefficients, GDPc is positively and statistically significantly impacted by the LCEED POS coefficient, which measures the asymmetry of current education spending. This suggests that increasing current educational spending will eventually result in an increase in lnGDPc of about 0.046%. Additionally, the (LCEED NEG) negative asymmetry coefficient has a statistically significant positive impact on lnGDPc.

However, BRDN (lnBRDN POS) significantly and negatively affects Nigeria's GDP. This means that if the brain drain increases, the per capita growth rate of the Nigerian economy will also decline. Additionally, lnBRDN NEG has a detrimental impact on Nigeria's per capita lnGDP. This is true since a decline in lnBRDN will result in a roughly 0.031% gain in per capita lnGDPc. Additionally, the GDP is negatively and significantly impacted by the coefficients of income inequality (lnINCQ) and corruption lnCRPT, respectively.

Based on the above result, by looking at tables 5 and 6, it was clearly demonstrated that both in the short and long run coefficients probability are statistically significant at 1%, 5%, and 10% respectively. This supports the existence of an asymmetric relationship between education spending and brain drain in the context of Nigeria's growth performance. This indicates that there is an asymmetric relationship between the key research variables.

Furthermore, for Nigeria to achieve the designed SDG’s 2030 target, current education expenditure must attain a share of at least 26% annually from national budget which is in line with UNESCO recommendation in order to solve Nigerian problems of brain drain including other negative parameters influencing Nigerian economy.

Therefore, in accordance with the United Nations Educational, Scientific, and Cultural Organization's mandate, the Nigerian government should allocate 26% of its budget to the educational sector (UNESCO). For the efficient implementation of sustainable education, the government should provide sufficient funds to the relevant organizations. Therefore, initiatives that would encourage formal improvements to lower income inequality and corruption, which were plainly having large negative effects on Nigeria's economic progress, should be encouraged.

Additionally, it is necessary to stabilize the political and economic environments in order to prevent brain drain. Doing so would significantly lower the rate of brain drain within the economy by providing infrastructure like good roads, reliable sources of water and electricity, as well as quality housing. Last but not least, the Nigerian government must enhance its financial and monetary sector to handle the massive inflow of remittances into the

economy, as is seen from the short and long run coefficients, which have a positive and notable impact.

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