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A Simulation Analysis Of Shock Effects Of School Enrolment On Nigeria's Agricultural, Industrial, And Services Sectors

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Abstract
Empirical literature has focused on the effects of human capital development (HCD) on aggregate macroeconomy while little attention was devoted to its multi-sectoral dimensional effects. Our paper examines the effects of education on Nigeria's activity sector output from 1981 to 2019 with data from Central Bank of Nigeria's Statistical Bulletin, United Nations Development Programme Annual Statistical Report and World Development Indicators. A macro-econometric model, predicated on the endogenous growth theory was estimated with an ordinary least square technique which distinguishes between the roles of different variables in affecting output as well as allows coefficients to be interpreted in terms of how inputs contribute to output. Model simulation was performed for both ex-post and ex-ante forecasting under different policy scenarios. Results show that a 1% increase in HCD significantly led to diverse effects on the activity sectors through public spending channel - agricultural output dropped (9.9%), industrial output improved (6.6%) and services sector increased (15%). A 2.0% increase in number of schooling years improved service (9.3%) and industry (3.7%) while agriculture output shrunk by 2.0% deviation. A 2% decrease in schooling year's worsened services and industry output by 74.5% and 42.4%, respectively and improved agriculture output (24.1%). The study therefore recommends that quality education should be made available to all so that Nigeria's service and industrial sectors can be revolutionized.

Key Words: *agricultural, industrial, macro-model, school enrolment, sectoral output, services, simulation*
JEL Codes: *C5, E2, I2, Q4*

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I. Introduction

Fostering structural changes in the activity sector of the economy is the surest way of achieving Nigeria's long desire for economic diversification and for remaining relevant in Africa and beyond (Nwokoye, Igbanugo, & Dimnwobi, 2019). The activity sector of the Nigerian economy incorporates the agricultural, industrial and services sectors as recognized by the Central Bank of Nigeria (CBN, 2010). The sector has unarguably remained the powerhouse of the Nigeria's economic renaissance over the years although its performances are hampered by a multiplicity of challenges ranging from infrastructural gaps, inefficiencies in the public sector project management and service delivery, the resource curse of oil exploration, dysfunctional macroeconomic policy environment, among others (CBN, 2019).

In developed and developing countries, the place of human capital development in the growth of an economy has been the subject of a growing literature. Back in the early 1950s, physical capital was identified as the single most important driver of economic growth and developmental efforts were geared towards improvement in physical capital. Economists had earlier recommended that the rate of physical capital formation in developing countries must be increased to accelerate economic growth rate and raise the living standard of the people (Ahuja, 2013). Notably, since the 1990s, a growing number of studies have established that human capital development is the basic driver of economic growth (Dawud 2020; Nwokoye, Onugha, & Kalu, 2020; Ogunniyi, 2017; Osoba & Tella, 2017; Jaiyeoba, 2015). Thus, the current trend among global economies has dynamically moved from mere economic development to recognizing human capital development as a central issue in the area of sustainable development due to its indispensable role in the enhancement of sustainable development objectives (Asian Development Bank, 2015).

Gyang (2011) cited in Sowunmi, *et al.* (2015) noted that without adequate investment in developing human capital which is the process of increasing knowledge, skills and the capacities of people in the country, the possibility of the growth of that nation might be minimal. Therefore, it is rational to aver that a globally

competitive and vibrant economy will continually elude any country that has not found it necessary to sufficiently invest in the promotion of its human capital development. This is understandable because development incorporates much more than physical capital, as it views people as key in all economic, social, political and environmental considerations. Tan (2014) defines human capital as productive wealth which is embodied in labour, skills and knowledge as well as any stock of knowledge or the innate acquired characteristics a person has that contributes to his or her economic productivity. Human capital influences economic growth and can contribute to the development of an economy by increasing the knowledge and skills of its people (Ali, et al., 2018). Human capital development is therefore a process of enlarging people's choices and strengthening human capacities in a way that enables them to live longer, healthier and fuller lives (United Nation Development Report (UNDR), 2015). In other words, human capital development encompasses multiple elements of a people's wellbeing, from their health status to their economic and political wellness.

The UNDR (2015) reiterates that human development- by promoting health, knowledge, skills and awareness- enlarges human capital and improves opportunities and choices. It breeds a better qualified workforce with better technical and managerial capacity in usage of time; creates a favourable economic atmosphere for sprouting of new businesses; more promising jobs; rids population of poverty; supports human rights through greater democracy at different levels. The Human Development Index (HDI) that measures human capital development is a composite index of three core indicators: health index; education index and per capita income index. Theoretically, the impact of human capital development on economic growth has been clearly explained in endogenous growth theories (Romer, 1986; Lucas, 1988); and its implication is that man becomes the creative and productive input for economic growth and development when investment is made in him. Nigeria's activity sector has been active prior to its detach from colonial rule. Although the agriculture sector, which was the mainstay of the Nigerian economy pre-oil discovery, still remains a core contributor to livelihood and subsistence living for majority of Nigerians, its contribution to output has been on the decline over the years (Price Water Coopers, PWC 2017; Shitu, 2017). For instance, available data show that its contribution which stood between 57% and 64.5% of the Gross Domestic Product (GDP) between 1960 and 1969 has rapidly declined to its current state of 23.6 percent of GDP (CBN, 2018). This poor performance is explained by the shift in focus to the petroleum sector, led to excessive depreciation of the exchange rate, reduced competitiveness of agricultural outputs and encouraged rent seeking behaviour in the economy (Osigwe, 2014).

The Nigerian economy has over the years been subjected to prolonged economic stagnation, increased poverty rate, infrastructural decays and worsened social vices. Thus, the United Nation Human Development Indicators (UNHDI) for Nigeria remain low when compared with those of other developing countries like Malaysia and Indonesia that hitherto were at similar level of development like Nigeria in the 1960s. The reoccurring global oil crisis and consequent fluctuation in crude oil prices has necessitated a re-think about the diversification strategy to stem down the negative effects of the oil price oscillation on the entire economy. The performance of the Nigerian industry sector has remained unimpressive as it has neither contributed substantially to both GDP growth and employment generation. Bagshaw (2012) reiterates that the challenges faced by the manufacturing sector have restrained it from optimizing its potentials of wealth creation, employment generation and poverty alleviation. The sector has continued to underperform due to erratic power supply, insecurity, port congestion, inadequate infrastructure, among others. Industrialists have had to install generators to reduce frequency of production stoppages caused by the irregular public power supply (Osigwe, *et al.*, 2019). Intuitively, such efforts as the installation of private generators to shore up production will invariably increase the cost of manufactured goods, which will be cascaded to the final consumer, thus making it difficult for Nigerian goods to compete favourably with the imported ones.

The service sector presents the fastest growing sector in the world, contributing significant proportion to both GDP and share of total employment (Khanna, *et al.*, 2016). Specifically, the sector is poised to strengthen the performance of other sectors in the economy, such as the agriculture and industry, supplying most of their needed functions such as banking, accountancy, information, and technology. Accordingly, World trade Organization (WTO, 1997) reiterates that the services sector provides important auxiliary outputs to manufacturing firms that increasingly depend on external sourcing of such basic inputs as design, financing, communication and transportation. Intuitively, developing human capital would create positive ripple effects on Nigeria's activity sector and by extension the overall economy. The activity sector of the Nigerian economy broadly incorporates agriculture, industry and services sectors (Central Bank of Nigeria, CBN, 2010). The sector has arguably remained the powerhouse of the country's economic renaissance over the years although its performances are hampered by a multiplicity of challenges ranging from infrastructural gaps, inefficiencies in the public sector project management and service delivery, the resource curse of oil exploration, dysfunctional macroeconomic policy environment, among others (CBN, 2019).

There is ample evidence in the literature that make suggestions for the prioritizing of investment in human capital development as one certain way of catalyzing improvement in economic performances of the activity sector (Anyanwu *et al,* 2015, Nwokoye *et al,* 2019; 2020, Ogunleye *et al,* 2017; Ogunniyi, 2017). A healthy and better educated workforce will not only affect the GDP position of the economy, but its effects (direct and indirect) will transcend to the entire economy. It is certain that an improvement in the human capital development in a country will cause an improved consumer spending which will arguably create a positive multiplying effect leading to improved employment and thus increased GDP (Nwokoye *et al,* 2019). The improved GDP leads to enhanced business conditions resulting to favourable balance of trade and higher per capita income for the citizenry. Panda (2012) reconfirms that human capital plays a critical role in economic growth and development because human beings occupy the centre of production, distribution and consumption chain, and from a macroeconomic perspective, the accumulation of human capital productivity facilitates technological innovations, increases returns to capital and makes growth in agriculture more sustainable.

Government spending on education includes direct expenditure on educational institutions as well as educational related public subsidies given to households and administrated by educational institutions. Data on federal government expenditure on education in Nigerian from the World Bank (2018) show that between 1970 and 2017, expenditure on education increased by 95.6 while 5% of 15–24-year-olds have not completed primary school ages or out of school; approximately 29% of boys of primary school age are out of school compared to 35% of girls of the same age. The biggest disparity for children of primary school age in Nigeria can be seen between the poorest and the richest children (Ihugba, Ukwunna & Obiukwu, 2019).

In an attempt to shore up its human capital position and place the economy on the path of growth, the Nigerian governments have invested in health and education as well as embarked on several growth policies. These efforts exemplified in various development plans such as the National Economic Empowerment and Development Strategy (NEEDS), the Seven-Point Agenda, the VISION 20:2020 and the Economic Growth and Recovery Plan, with the purpose of expanding its stocks of human capital which are central to overall economic development aspirations (Nwokoye *et al.,* 2019; 2020). The authors conclude that despite the increase in investment of the health and education sectors, the Nigerian economy is still characterized by underdevelopment as evidenced in the 2018 World Human Development Indicator. Understandably, harnessing human capital development is pertinent in the Nigerian economy. Issues or policies relating to education and health sub-sectors, as well as, how these can be harmonized with other enabling infrastructure to achieve sustainable growth and development should be of utmost importance to Nigerian policymakers. The extent to which these issues are adequately understood and effectively addressed will determine the country's future activity sector performances and Nigerian economic growth in general.

There have been previous research efforts similar to the current study in Nigeria, for example Ogunleye et al, (2017); Anyanwu *et al,* (2015); Ogunniyi, (2017); Adelakun (2011). However, these earlier attempts at analyzing the effects of human capital development on economic growth employed impact and channel approaches. Interestingly, there is the need to examine human capital development indicators (education, health and per capita income) and simulate responses to shocks to each human capital component against the activity sector of the Nigerian economy to reveal if disaggregation of economic growth really matter in explaining the effects of human capital development in Nigeria. Also, the techniques and methods of study adopted by these preceding research efforts could only permit for the estimation of the direct effects of the studied variables neglecting the possibility of simultaneous bias. This current research effort differs by evaluating human capital development vis-à-vis sectoral output performances of the activity sector. In addition, this study also employs the structural equation method of analysis so as to account for both the direct, indirect and simulation effects of human capital development on the activity sector of Nigerian economy.

The macro-model we used enabled us to build alternative policy evidence, and thus, this approach proves to be superior to the alternative approaches based on intuitive or judgmental criteria. These are the gaps that this present research fills in the literature. The central research question of the paper is: How do outputs of Nigeria's agricultural, industrial and services sectors react to shocks in school enrolment? In broad terms, our paper attempts at estimating the effects of shocks in Nigeria's school enrolment on its agricultural, industrial and services sectors. The relevance of the paper to the existing body of knowledge is in its theoretical, methodological and pragmatic dimensions. Theoretically, it espouses the applications of economic theories of human capital development, thereby reinforcing the relevance of these theories in economic policy making. Unlike most previous studies which were preoccupied with studying the impact of human capital development on aggregate economic growth (Adeyemi & Ogunsola, 2016; Ogunleye *et al,* 2017; Ogunniyi, 2017; Dawud, 2020), our paper is contributes to knowledge by focusing on school enrolment and adopting the simulation modeling approach which involves the use of econometric recursive algorithm to solve and obtain parameters for policy simulations/forecasts.

The rest of the paper is structured as follows: Following the Introduction is the section on empirical literature review. The theoretical framework and model specification are presented in Section three while our results are contained in Section four. Section five concludes the paper with policy recommendations.

II. Empirical Literature Review

In an attempt to identify the gaps in literature, our review was carried out thematically on human capital development and each of agricultural, industrial and service sectors.

Human Capital Development and Agricultural Sector Performance

Leshoro and Leshoro (2013) examined the impacts of literacy rate and human development indices on agricultural production in South Africa. Employing the autoregressive distributed lag (ARDL) bounds test approach to co-integration, the study finds that there is a long run relationship among agricultural production, literacy rate and human development indices. Literacy rate had a positively significant effect on agricultural production in the long run, whereas the human development indices had positively significant effect on agricultural production in the short run.

Kifordu (2015) evaluated the effect of human capital development on the agricultural productivity in Nigeria employing the ordinary least square method of analysis with data obtained from 1981 to 2016. The results established that human capital has a positive effect on agricultural production in Nigeria.

Using Quantile regression approach, Nyamekye et al (2016) employed a Cobb Douglas production function within a quantile regression framework to investigate the productivity effects of human capital and other inputs of production over an entire distribution of maize yields across three ecological zones in Ghana. Capturing human capital using education of household heads, access to extension services and experience defined by the number of years spent in farming, the study estimated the economic effects of these variables at three points: the first quartile (25th percentile), the second quartile (50th percentile) and the third quartile (75th percentile) of the distribution of maize yields to analyze the category of farmers who are most efficient. The results suggest that although human capital has no significant effect on maize yields, its effect on productivity varies across quantiles.

Human Capital Development and Industrial Sector Performance

Karim and Shabbir (2012) examined the components of human capital and discussing their roles in achieving sustainable industrial development. For analysis purpose, a single-equation regression model of Malaysia's development of manufacturing sector was formed, which covers the period from 1981 to 2010. The findings highlighted the significance of human capital in which the variable of employment has the highest elasticity in contributing to the share of gross domestic product (GDP) of manufacturing sector. This was followed by labour productivity and human capital investment in education and health. Increasing in the number of job creations is expected to increase production of out- put to meet the market demand of local people and for ex- ports. Moreover, increasing in labour productivity reduce cost of production and investment in education and health programmes assist in strengthening the skills, knowledge and capabilities of individual workers in the sector.

Widarni and Malang (2015) examined the influence of human capital elements on performance of the manufacturing sector in West Java, Indonesia. The survey involved 250 Small Medium Enterprises (SMEs) and 897 respondents. Correlation and regression analysis were used for data analysis. Result reveals that employee educational level and experience are associated with SME`s performance.

Ugbam and Ozioma, (2016) assessed the state of human capital development in Nigeria with a view to determining the extent to which it can support the Nigerian manufacturing sector in achieving the objectives established for it by the countries policy document, vision 2020. It relied on existing secondary data and used OLS techniques to achieve its objectives. It was found that there is a very strong positive relationship between human capital development and global competitiveness; that mainly as a result of inadequate funding, the state of human capital development in the country must improve significantly in order provide the manufacturing sector with the quantity and quality of human capital that will enable it to achieve the objectives prescribed for it by vision 2020.

Asghar, Danish, and Rehman, (2017), discussed human capital and labour productivity. This study was designed to investigate the role of human capital and labour productivity in district Lahore. For analyzing this relationship, cross sectional study was conducted, and data was collected from 243 firms, which include manufacturing, trading and service sector. The empirical analysis reveals that all the sectors have heterogeneous effect of human capital on labour productivity. Education appears to be significant and positively related to labour productivity in all the sectors with greater effect in manufacturing sector. Skills and training have also noticeable effect on labour productivity.

Adejumo and Adejumo, (2017) in order to address the direction of causality between human capital and productivity growth in Nigeria, investigated the pattern of productivity growth in Nigeria between 1970 and 2010. This study empirically determined the productivity growth in Nigeria, as well as the causal relation between human capital development and productivity growth in Nigeria using the Engle-Granger causality test. The results revealed that productivity growth has been very low and unstable in Nigeria. In addition, the nexus between human capital and productivity growth was examined. The findings revealed that while productivity growth caused human capital development, human capital development did not cause productivity growth.

In the study, the dynamics of human capital development and industrial growth in Nigeria, Okumoko et al (2018) analysed time series data of relevant variables- recurrent expenditure on education and health, oil prices, gross capital formation inflation and exchange rate employing both descriptive and econometric techniques. The results show that recurrent expenditure on education and health has a negative impact on industrial growth.

Hena, Jingdong and Zhang (2019) discovered that in Pakistan, human capital has played very significant role in the growth and development of the manufacturing sector. Measuring human capital using secondary school enrolment, infant mortality rate, and life expectancy, and employing the autoregressive distributed lag (ARDL) bounds testing approach, the authors report that for the period 1972–2015, human capital has positive and significant impact on the growth of manufacturing sector in Pakistan

Obikwelu (2019) investigated the impact of human capital development on the manufacturing sector in Nigeria. It spanned through the period 1982 through 2016. The data used for the study were: manufacturing value as % of GDP, government expenditure on education, government expenditure on health, foreign direct investment, exchange rate, lending interest rate and population growth rate. Ordinary Least Square statistical method was employed using a time-series analysis in the study. The results reveal that human capital development has a positive relationship with manufacturing output, though the two variables are not statistically significantly different from zero.

Uzochukwu, Matthew and Olohi (2020) examined the effect of human capital development on manufacturing companies, using Innoson Vehicle Manufacturing Co. Ltd in Anambra State and Ibeto Group of Companies Ltd. in Rivers State, Nigeria as case studies. Data were collected from 269 participants in the companies, using questionnaire instrument. The data were analysed with pearson product moment correlation. The result indicates that training and development correlate positively and significantly with the performance of manufacturing firms in the study area.

Saka and Olanipekun (2021) investigated the role that human capital plays in the relationship between the industrialization process and growth in Nigeria spanning the period 1980 to 2016. Employing two simultaneous equation models, one with growth as a dependent variable and the other, industrialization as a dependent variable, the study disaggregated human capital into male and female literacy rates, male and female life expectancies and other control variables to explain the growth and industrialization process. The two-stage least squares adopted gives the expected outcome in most cases for the two model estimations. Results show that the human capital development is germane for industrialization.

Olayemi (2012) investigated the relationship between human capital investment and industrial productivity in Nigeria using secondary data spanned through 1978 to 2008. Co-integration and error correction mechanism (ECM) were employed to examine the nexus between human capital investment and industrial productivity. Granger causality test was also adopted as a supplementary estimation method to explore the nature of causality among the variables (Index of industrial production, total expenditure on education, total expenditure on health and gross capital formation) established in the model. The study finds government expenditure on education maintained a positive long run relationship with index of industrial production while government expenditure on health and gross capital formation exhibits long run negative relationship with the dependent variable.

Human Capital Development and Services Sector Performance

The relationship between service sector's productivity and living standards was examined in a study by Eichengreen and Gupta (2009) in Asia. Using descriptive statistics, they found a positive correlation between output share of services and income per capita, but such a relationship holds only for service activities that are usually a combination of traditional and modern services consumed majorly by households. Furthermore, their study finds that modern services not only have the highest productivity growth among the service industries, but their share in output tends to rise rapidly at high income levels.

In another related study carried out in the banking industry by Oyinlola and Adeyemi (2014) on human capital development and organizational performance. Primary source of data was used with questionnaire as research instrument. A total of 302 bankers in Osun State were involved in the survey with the use of judgmental and simple random sampling techniques. Data analysis was carried out through descriptive statistics, particularly with the use of means and standard deviations, while ANOVA and Pearson Correlation Analysis

were employed to examine the relationship between the explanatory and dependent variables and the level of significance of the relationship. It was found that significant relationship exists between human capital development and organizational performance in the banking industry.

Bingilar and Etale (2014) examined the impact of human resources development on performance of academic staff in Nigerian Universities in Nigeria. Through a survey of two Universities in Bayelsa State, data were obtained from the annual reports of the Universities covering the period from 2010 to 2014. The relevant data were subjected to statistical analysis using the multiple regression technique. The study established a positive significance between human resource development and performance of academic staff in Nigerian universities.

Bhuiyan, Ahmad, and Hoque (2017) examined the impact of investment in human resource development on the financial performance of the banking sector of Bangladesh. Using the economic data as well as survey data collected from purposively selected 120 bank executives of 20 private commercial banks of Bangladesh. The study through regression models finds that there is a significant positive correlation between human resource development investment (in salaries and allowances, provident fund and gratuity, bonus and incentives, staff welfare and training, workshop, and seminar) and financial performance of the sample banks.

Gidado, Kusairi and Muhamad (2014) examined how investing in human resource development can affect the performance of banks in Malaysia and Nigeria. Using the cross-country data (profit (after tax) as a proxy for bank performance while expenditure on training, salaries & wages of employees, and directors' remuneration represent the independent variable- investment in human resource development) from the banking institutions of Malaysia and Nigeria which were analyzed using the regression method, the results confirm that a significant and positive relationship exists between investment in human resources and banks performance for both economies.

Worlu and Omodero (2016) investigated the effects of human capital development on financial performance of banks in Nigeria. Study utilized time series data drawn from personnel development welfare, profit after tax, total revenue and net assets of quoted commercial banks from Nigeria stock exchange and estimated the data using linear regression. Estimation results show that human capital development has no effect on profit after tax and total revenue but displays a negative effect on net assets.

Ejemeyovwi, Osabuohien and Osabohien (2018) traced the link between investment in information and telecommunications technology (ICT) and human capital development on economic transformation in Economic Communities of West African States (ECOWAS). Study engaged the Generalised Method of Moments (GMM) to analyzed HDI, investments in telecoms, primary school enrolment, institutions, domestic credit by financial institutions and gross domestic product per capita growth rate variables. Outcome establishes that investment in telecoms does not have a significant relationship with HCD.

Empirically, among all reviewed empirical works, there has not been any that attempted to investigate the effects of human capital- education on the activity sector in Nigeria. Such studies Saka and Olanipekun (2021), Fawehinimi and Ilugbemi (2020) and Kifordu (2015) concentrated on only one component of the activity sector in Nigeria and their implications on human capital development. A major shortcoming among these studies is that they ignored the possible indirect effects of human development on the entire economic sector. Hence, the studies adopted single equation modeling which treats only the direct effects of variables of the study. This current study adopts the structural equation modeling/approach. The aim is to empirically overcome the challenges of the previous studies as mentioned, hence ensuring the added advantage of obtaining the cumulative and indirect effects of the exogenous variables on each of the endogenous variables. Based on this, the current study contributes to the literature on human capital development and Nigerian activity sector.

Our paper attempts at examining the effects of education on the activity sector in Nigeria. This understanding is vital for policy formulation and implementation. Our paper is justified considering the limited attention given to the effect of human capital development Nigeria's activity sector. Given the likely asymmetric effect education could have on Nigeria's activity sector in addition to the paucity of studies on potential non-linearity effects of human capital development on Nigeria's activity sector performances, adopting a simulation modeling approach accounts for a novel contribution to empirical literature as previous studies employed the single equation approach which yielded only direct effects and ignored the possibility of simultaneity bias. Exposing the cumulative and indirect effects of human capital development variables will expose alternative policy evidences and evidently prove to be superior to other alternative approaches.

III. Theoretical Framework And Model Specification

3.1 Theoretical Framework

A plethora of studies exist which analyzed the effects of human capital development on the macro economy (Anyanwu *et al*, 2015; Ogunleye *et al*, 2017; Saka & Olanipekun 2021). These authors assert that growth rate of output is endogenously determined within the economic environment. The implication of these models is that human capital is the driving force in the growth process of an economy. This idea is encapsulated

in the endogenous growth theory. Leaning on the theoretical literature review, this study, therefore, adopts the endogenous growth theory. The basis for the choice stems from the generalization of the human capital production technology as determinants of growth and the accessible channels of human capital investment in developing countries. The framework is therefore suitable for Nigeria as a developing country.

According to Jhingan (2012), Romer took three elements in his model – externalities, increasing returns in the production of output and diminishing returns in the production of new knowledge, stressing that it is the spillovers from research efforts by a firm that leads to creation of new knowledge by other firms. Therefore, in Romer's model, new knowledge is the ultimate determinant of long run growth which is driven through increase in knowledge. Thus, the theory assumes creation of knowledge as a side product of investment and takes knowledge as an input in the production function of the following form:

$$Y = A(R)\ F\ (Ri, K_i, L_i) \qquad 3.1$$

where Y is aggregate output: A is the public stock of knowledge from research and development R; R_i is the stock of results from expenditure on research and development by firm $_i$: and K_i and L_i are capital stock and labour stock respectively. Theory assumes the function F homogenous of degree one in all its inputs R_i, K_i and L_i and treats R_i as a rival good.

3.2 Empirical Model Specification.

The model of this study is formulated using the above theoretical framework. The structure of the small macroeconomic model (SMM) is based on the activity sectors (agriculture, industry and services) as defined by the CBN (2010). The model considered measures of investment and output of the aforementioned activity sectors as dependent variables and captured Human Capital Development (HCD) as one of the key explanatory variables in the four sectors. The behavioral equations in the SMM are estimated using ordinary least square (OLS) with the inclusions of lags for both dependent and independent variables in each behavioral equation. Fair (1984) describes the possible use of OLS in estimating a SMM as macroeconomic models are normally nonlinear, simultaneous, and very large, thus they tend to have serially correlated error terms. The features of the SMM allows for the correction of these problems and provides convenient ways for correcting problem of serial correlation by treating its coefficients as structural coefficients and modeling the equations with serially uncorrelated error terms. We stated the variations in sector outputs as functions of HCD and other control variables stated as:

$$YG + f(HCD, C) \qquad 3.2$$

where YG is total output, HCD is human capital development and C is control variables

3.2.1 The Behavioral Equations

This block is primarily concerned with modeling the impact of human development index on productive activities in Nigeria. The key dependent variables captured in the output models are; YGRA (agricultural sector output), YIND (industrial sector output) and YS (services sector output). All variables in the model were captured in log form except variables in rate and percentage.

Agricultural Output Model

We recognize that agricultural output is influenced by rainfall, human capital, private sector credit, government capital expenditure, real exchange rate and agricultural investment. Hence,

$$LogYAGR_t = \theta_{0,1} + \theta_{1,1}LogYAGR_{t-2} + \theta_{2,1}RF_t + \theta_{3,1}RF_{t-2} + \theta_{4,1}LogINVI_t + \theta_{5,1}LogINVI_{t-2} + \theta_{6,1}LogPSC_t + \theta_{7,1}LogGCE_t + \theta_{8,1}LogGCE_{t-2} + \theta_{9,1}YG + \theta_{10,1}HCD + \mu_1 \qquad 3.3$$

Industry Output Model

We assert that industry output is influenced by index of energy consumption, human capital index, private sector credit, government capital expenditure, real exchange rate, capacity utilization rate and manufacturing sector investment.

$$LogYIND_t = \beta_{0,2} + \beta_{1,2}LogYIND_{t-2} + \beta_{2,2}IEC_t + \beta_{3,2}LogPSC_{t-2} + \beta_{4,2}LogGCE_t + \beta_{5,2}LogGCE_{t-2} + \beta_{6,2}LogINVI_t + \beta_{7,2}LogINVI_{t-2} + \beta_{8,2}NER_t + \beta_{9,2}YG + \beta_{10,2}HCD + \mu_2 \qquad 3.4$$

Services Sector Output Model

Output of the service sector is influenced by private consumption, maximum lending rate, total government expenditure, real exchange rate, manufacturing output and human development index.

$$LogYS_t = \delta_{0,3} + \delta_{1,3}LogYS_{t-2} + \delta_{2,3}LogCON\_H_t + \delta_{3,3}RM_t + \delta_{4,3}LogTGE_t + \delta_{5,3}LogTGE_{t-1} + \delta_{6,3}LogYIND_t + \delta_{7,3}LogYIND_{t-2} + \delta_{8,3}YN_t + \delta_{9,3}HCD_t + \delta_{10,3}YG_t + \mu_3 \qquad 3.5$$

Other Behavioral Equations

Oil Exports Equation

$$LogXO_t = \lambda_{0,4} + \lambda_{1,4} LogXO_{t-2} + \lambda_{2,4} PO_t + \lambda_{3,4} PO_{t-2} + \lambda_{4,4} OPEC_t + \lambda_{5,4} OPEC_{t-2} + \lambda_{6,4} LogYF_t + \lambda_{7,4} LogYF_{t-1} + \mu_4 \quad 3.6$$

Non - Oil Exports Equation

$$LogXN_t = \Phi_{0,5} + \Phi_{1,5} LogXN_{t-2} + \Phi_{2,5} RER_t + \Phi_{3,5} LogYF_t + \Phi_{4,5} LogYF_{t-2} + \Phi_{5,5} YN_t + \Phi_{6,5} LogYN_{t-2} + \mu_5 \quad 3.7$$

Service Export Equation

$$LogXS_t = \Pi_{0,6} + \Pi_{1,6} LogXS_{t-2} + \Pi_{2,6} YG_t + \Pi_{3,6} LogX_t + \Pi_{4,6} LogX_{t-2} + \Pi_{5,6} RER_t + \Pi_{6,6} RM_{t-1} + + \mu_6 \quad 3.8$$

Import Equation

$$LogM_t = \Omega_{0,7} + \Omega_{1,7} LogM_{t-2} + \Omega_{2,7} YD_t + \Omega_{3,7} YD_{t-2} + \Omega_{4,7} RER_t + \Omega_{5,7} RM_t + \Omega_{6,7} RM_{t-1} + \Omega_{7,7} LogRES_t + \Omega_{8,7} LogRES_{t-1} + \mu_7 \quad 3.9$$

External Reserves Equation

$$LogRES_t = \psi_{0,8} + \psi_{1,8} LogRES_{t-2} + \psi_{2,8} RER_t + \psi_{3,8} PO_t + \psi_{4,8} EDS_t + \psi_{5,8} EDS_{t-1} + \psi_{6,8} LogM_t + \psi_{7,8} LogM_{t-2} + \mu_8 \quad 3.10$$

Nominal Exchange Rate Equation

$$NER_t = \chi_{0,9} + \chi_{1,9} NER_{t-2} + \chi_{2,9} LogRES_t + \chi_{3,9} LogRMT_t + \chi_{4,9} LogRMT_{t-1} + \chi_{5,9} IRD_t + \chi_{6,9} IRD_{t-1} + \chi_{7,9} X\_M_t + \chi_{8,9} CPI_t + \chi_{9,9} CPI_{t-1} + \chi_{10,9} LogTGE_t + \chi_{11,9} LogTGE_{t-1} + + \chi_{12,9} Po_t + \chi_{13,9} Po_{t-2} + \mu_9 \quad 3.11$$

Foreign Direct Investment Equation

$$FDI_t = \eta_{0,10} + \eta_{1,10} FDI_{t-2} + \eta_{2,10} LogPCGDP_t + \eta_{3,10} PCGDP_{t-2} + \eta_{4,10} LogXN_t + \eta_{5,10} LogXN_{t-2} + \mu_{10} \quad 3.12$$

Foreign Portfolio Investment Equation

$$FPI_t = \rho_{0,11} + \rho_{1,11} FPI_{t-2} + \rho_{2,11} LogYG_t + \rho_{3,11} LogYG_{t-1} + \rho_{4,11} LogYF_{t-2} + \rho_{5,11} SMR_t + \rho_{6,11} INTF_t + \rho_{7,11} INTF_{t-2} + \rho_{8,11} NER_t + \rho_{9,11} NER_{t-2} + \mu_{11} \quad 3.13$$

Foreign Debt Equation

$$FDF_t = \sigma_{0,12} + \sigma_{1,12} FDF_{t-2} + \sigma_{2,12} LogM_t + \sigma_{3,12} LogMT_{t-2} + \sigma_{4,12} IRD_t + \sigma_{5,12} IRD_{t-1} + \sigma_{6,12} NER_t + \sigma_{7,12} NER_{t-2} + \sigma_{8,12} LogYF_t + \sigma_{9,12} LogYF_{t-2} + \mu_{12} \quad 3.14$$

Remittances Equation

$$LogRMT_t = \Gamma_{0,13} + \Gamma_{1,13} RMT_{t-2} + \Gamma_{2,13} LogYUS_t + \Gamma_{3,13} LogNER_t + \mu_{13} \quad 3.15$$

Government Recurrent Expenditure Equation

$$LogGRE_t = \omega_{0,14} + \omega_{1,14} LogGRE_{t-2} + \omega_{2,14} LogGCE_t + \omega_{3,14} CG_t + \omega_{4,14} FDF_t + \omega_{5,14} LogYG_t + \mu_{14} \quad 3.16$$

Government Revenue (Non-Oil) Equation

$$LogGRVN_t = \Sigma_{0,15} + \Sigma_{1,15} GRVN_{t-2} + \Sigma_{2,15} LogYN_t + \Sigma_{3,15} LogM_t + \Sigma_{4,15} LogM_{t-2} + \Sigma_{5,15} TAR_t + \Sigma_{6,15} TAR_{t-2} + \mu_{15} \quad 3.17$$

Government Revenue (Oil) Equation

$$LogGRVO_t = \Delta_{0,16} + \Delta_{1,16} GRVO_{t-2} + \Delta_{2,16} LogYO_t + \Delta_{3,16} LogYO_{t-2} + \Delta_{4,16} NER_t + \Delta_{5,16} PO_t + \Delta_{6,16} PO_{t-2} + \Delta_{7,16} LogPPT_t + \Delta_{8,16} LogPPT_{t-2} + \Delta_{9,16} LogXO_t + \Delta_{10,16} LogXO_{t-2} + \mu_{16} \quad 3.18$$

Human Capita Development Equation

$$HCD_t = \Theta_{0,17} + \Theta_{1,17} HCD_{t-1} + \Theta_{2,17} LE_t + \Theta_{3,17} LE_{t-2} + \Theta_{4,17} SCH_t + \Theta_{5,17} GNI_t + \Theta_{6,17} GNI_{t-2} + \Theta_{7,17} LogYG_t + \Theta_{8,17} LogGCE_t + \Theta_{9,17} LogGCE_{t-2} + \mu_{17} \quad 3.19$$

Oil Output Equation

$$LogYO_t = \Lambda_{0,18} + \Lambda_{1,18} LogYO_{t-2} + \Lambda_{2,18} PO_t + \Lambda_{3,18} OPEC_t + \Lambda_{4,18} OPEC_{t-2} + \mu_{18} \quad 3.20$$

Non-Oil Output Equation

$$LogYN_t = \acute{Y}_{0,19} + \acute{Y}_{1,19} LogYN_{t-2} + \acute{Y}_{2,19} LogPSC_t + \acute{Y}_{3,19} RM_t + \acute{Y}_{4,19} IEC_t + \acute{Y}_{5,19} TAR_t + \acute{Y}_{6,19} LogMt_t + \acute{Y}_{7,19} HCD_t + \mu_{19} \quad 3.21$$

3.3 Definition of Variables and Software for Data Analyses

The variables used in the model were sourced from the Central bank of Nigeria Statistical bulletin (2019) except data on remittances which came from the World Development Indicators (2019). Data computations were done using the econometrics view version 10.

IV. Result Presentation, Analyses and Discussion of Findings

4.1 Result Presentation

4.1.1 Correlation among the Variables

This section presents the preliminary results including the correlation and the unit root results, the macroeconomic model validation results and simulation exercises carried out to ascertain the suitability of the model for forecast and future policy analysis.

Table 1: Correlation Matrix of Shock Variables and Endogenous Variables

Endogenous Variable	GNI	HCD_UN	LE	SCH	Endogenous Variable	GNI	HCD_UN	LE	SCH	Endogenous Variable	GNI	HCD_UN	LE	SCH
CA_M	0.16	-0.10	-0.06	0.20	GRE	0.79	0.93	0.93	0.79	TGE_M	0.71	0.91	0.89	0.69
CF_M	0.28	0.35	0.30	0.26	GRV_M	0.71	0.60	0.66	0.74	X	0.83	0.64	0.68	0.84
CGF	0.26	0.54	0.49	0.24	GRVN	0.80	0.73	0.77	0.81	XN	0.89	0.81	0.82	0.87
FD_M	-0.71	-0.91	-0.89	-0.69	GRVO	0.56	0.39	0.45	0.58	XO	0.81	0.61	0.66	0.82
FDF	0.70	0.74	0.71	0.67	HCD_UN	0.92	1.00	0.98	0.91	XS	0.96	0.89	0.93	0.96
FDI	0.55	0.39	0.49	0.58	LE	0.94	0.98	1.00	0.94	YAGR	0.95	0.98	0.88	0.94
FPI	0.55	0.61	0.61	0.54	M	0.95	0.91	0.94	0.94	YG	0.96	0.98	0.87	0.95
GNI	1.00	0.92	0.94	1.00	ODF_M	-0.71	-0.91	-0.89	-0.69	YIND	0.96	0.90	0.91	0.95
SCH	1.00	0.91	0.94	1.00	RER	-0.90	-0.79	-0.84	-0.92	YN	0.95	0.99	0.86	0.94
RMT	0.94	0.93	0.96	0.95	RES	0.63	0.55	0.58	0.66	YS	0.97	0.97	0.99	0.96
										YO	0.97	0.98	0.99	0.96

Table 1 presents the correlation matrix of the shock and endogenous variables used in this study and their basic characterization. The index of number of schooling years is relatively highly associated with the external sector variables and fiscal variables. However, unlike the index for life expectancy but like with the index of per capita incomes, the association of number of school years with the balance of payments variables is very low. Lastly, the correlation between the index of life expectancy and the endogenous variables is consistent with those already established with the indexes of schooling and per capita income. However, when the three indexes are combined to have the HCD, the results indicate a high level of association with the output variable.

4.1.2 Results of Unit Root Test

Table 2 presents the results for the Augmented Dickey Fuller (ADF) test for unit roots in each variable used in estimating the SMM. These tests are based on the null hypothesis that there is the existence of unit root in the variables against an alternative hypothesis of the variables being stationary. The decision rule on the test statistic is based on its absolute values. Thus, we reject the null hypothesis of a unit root, if the computed test statistic in absolute values is greater than the critical (table) value, and accept the alternative of no unit root in the variables. The results from the ADF unit root test indicates that all variables of interest are integrated at order one, I(1) with exception of Output from Service Sector (YS), Stock Market Returns (SMR), and Index of Energy Consumption (IEC), which is stationary at levels, I(0).

Table 2: Augmented Dickey-Fuller Unit Root Test

Variables	Level	1st Diff	Conclusion
YAGR	0.131311	-2.963325**	I(*1*)
YIND	--0.637174	--4.803992***	I(1)
YS	-6.046031***	---------	I(0)
XN	-0.493587	-11.38690***	I(1)
XO	-0.778057	-12.06029***	I(1)
XS	0.335892	-11.11741***	I(1)
M	0.104227	-8.965740***	I(1)
RES	-0.982161	-4.134495***	I(1)
NER	-0.590496	-11.28325***	I(1)
FDI	-1.531964	-10.67598***	I(1)
FPI	-1.895755	-7.069068***	I(1)
FDF	-1.895755	-7.069068**	I(1)
RMT	0.385520	-5.429930***	I(1)
GRE	-0.704251	3.964591***	I(1)
GRVN	0.327090	-4.867700*	I(1)
GRVO	-0.717744	-4.735901***	I(1)
HCD	-1.090336	-0.941950**	I(1)
YO	-0.366399	-4.680094***	I(1)
YN	-0.504485	-6.818670***	I(1)
RER	-2.060609	-3.422871***	I(1)
PSC	3.015922	-8.282731***	I(1)
RMT	0.385520	-5.429930***	I(1)
SMR	-8.496941***	---------	I(0)
TGE	1.438086	-4.538406***	I(1)
X	-0.755872	-12.14331***	I(1)
YG	0.450553	-2.218502**	I(1)

X_M	-2.109021	-14.60570***	I(1)
RF	-3.284214	-10.58916***	I(1)
IEC	0.0773*	----------	I(0)
YN	-0.504485	-1.633409**	I(1)
YD	0.456963	-2.310420*	I(1)
YF	0.755630	-3.748156***	I(1)
CPI	-0.113648	-12.76183***	I(1)
LE	0.871514	-2.580475*	I(1)
SCH	-1.050744	-5.176292**	I(1)
GNI	-1.100692	0.074278***	I(1)
OPEC	1.594865	-5.460647***	I(1)
PO	-0.521565	-4.726179***	I(1)
PCGDP	0.802230	-5.914532***	I(1)

**

Note: The assumption of "intercept" and/or "trend" is assumed using the graphs of each variable. *. **, and *** indicates significance level at 10%, 5% and 1% respectively.

Table 3: Summary Statistics of Validation of the Macroeconomic Model

Variables	**Theil's inequality**	**Bias proportion**	**Variable proportion**	**Covariance proportion**	**Root mean square error**
FDF	0.4	0.004	0.28	0.7	210.94
FDI	0.24	0.03	0.03	0.92	234.61
FPI	0.3	0.000	0.11	0.87	415.7
GRE	0.03	0.003	0.11	0.88	173.59
GRVn	0.14	0.000	0.008	0.99	156.99
GRVo	0.16	0.009	0.08	0.90	114.13
HCD_Un	0.003	0.000	0.01	0.98	0.003
M	0.08	0.09	0.3	0.5	852.23
NER	0.13	0.02	0.04	0.92	27.60
RES	0.18	0.03	0.02	0.94	264.73
RMT	0.2	0.000	0.21	0.78	138.98
Xn	0.19	0.002	0.000	0.99	167.04
Xo	0.12	0.01	0.02	0.96	167.16
Xs	0.09	0.01	0.02	0.96	343.03
Yagr	0.004	0.006	0.001	0.99	128.21
Yind	0.01	0.003	0.003	0.99	293.64
Yn	0.01	0.06	0.02	0.90	183.22
Yo	0.03	0.02	0.06	0.90	238.83
Ys	0.000	0.3	0.01	0.62	0.018

The graphs for the simulated values of variables on actual values of some endogenous variables are as shown in Figure 1. As the figures showed, most of the simulated values closely mirror the actual values, suggesting the possibility of a low bias in the model. Hence, it could be inferred that the model's dynamic performance is considerably good and considered adequate for analyzing the effects of Human Capital Development on the activity sector performances in Nigeria.

The percentage deviation of the baseline from the actual is presented in Table 4. Between 2003Q1 to 2019Q4, on the average, the simulated values of agricultural output from its actual was a marginal value of 0.07%. Similarly, the deviation for Industry output was -0.27%, while the deviation of the Services output was the highest at 0.40%. Markedly, the result showed a positive deviation in agricultural output (0.07%) and Services output (0.04%) from their actual values respectively, while the Industry output (-0.27%) turned out negative. From the results, the Services output was revealed to have the highest deviation, compared to the other sectors. In addition, a closer look at Table 4 further showed that the highest deviation of the simulated values of agricultural output from its actual was recorded in Q2017 (0.83%) and lowest in 2010Q1 (-0.104%). In the industry output, the highest deviation of the simulated values from its actual was in 2013Q1 (0.19%) and lowest in 2017Q4 (-0.45%). Similarly, that of services output was shown to be highest in 2013Q1 (0.16%) and lowest

in 2011Q1 (-0.21). Overall, the seemingly low average deviation of the simulated values from the actual suggests that the model of the study has a good fit.

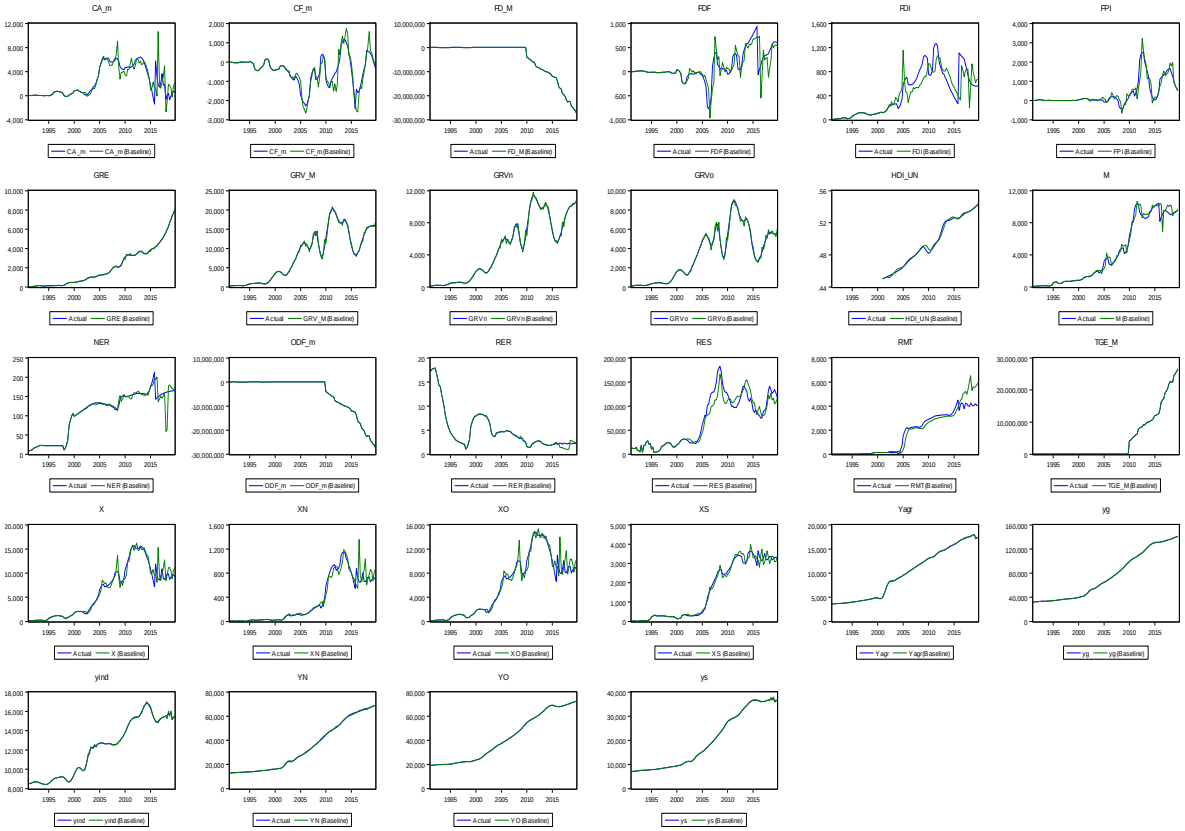

Table 4: Statistics for the Historical Simulation of Baseline Deviation from the Actual (Selected Years)

YEAR	Agricultural output	Industry Output	Services Output
2003Q1	-0.07	0.08	0.03
2004Q1	-0.07	0.01	0.14
2005Q1	-0.09	0.06	-0.09
2010Q1	-0.104	0.04	-0.001
2011Q1	0.2	0.02	-0.21
2012Q1	-0.18	-0.23	-0.05
2013Q1	0.05	0.19	0.16
2015Q4	0.12	-0.16	-0.06
2016Q4	-0.05	-0.06	0.004
2017Q4	0.83	-0.45	-0.69
2018Q4	-0.17	-1.26	-1.51
2019Q4	0.34	-1.89	-2.6

Note: The figures are in percentage deviation of the baseline from the actual. Hence, a minus implies a decrease and a positive sign implies an increase in the endogenous variable

4.2.1 Changes in Number of Schooling Years Simulation Results

Table 5 shows the SMM simulations for positive and negative shocks of number of schooling years on the endogenous variables. In simulating the effects of this shock, it is assumed that the number of schooling years will increase and decrease by its 5 years average percentage change and that all the other exogenous variables will continue on their trend path and not deviate within the forecast period. Scenario 1 represents the benchmark – if nothing changes, Scenario 3 represents a 2% increase in Number of schooling years and Scenario 6 represents a 2% decrease in number of schooling years.

From the forecast results, it is observed that over the 3year forecast period (2020Q1 to 2022Q4), services output and industry output appeared to be better under a scenario of 2% increase in number of schooling years than in the baseline, with a maximum deviation of 9.3% and 3.7% respectively. On the contrary, the baseline of agricultural output was better than under the scenario of 2% increase in number of schooling years which shrunk the sector by 2.0% deviation. Similarly, the baseline relating to service output and Industry output was better than under the scenario of 2% decrease in number of schooling. In particular, it is

noticed that 2% decrease in number of schooling years worsened service and Industry output by 74.5% and 42.4% maximum deviation respectively. The results for the service output and Industry output sector were procyclical with scenarios 3 and 6- both sectors showed a positive deviation when there was a 2% increase in number of schooling years and also a negative deviation when there was a 2% decrease in number of schooling years. On the other hand, 2% decrease or increase in number of schooling years was shown to be countercyclical with the agriculture output. Thus, given the moderate deviations in these sectors, if improving service output and industry output sector is the goal, then short to medium term policies that increase the number of schooling years should be pursued. Whereas, if the goal is to enhance the agriculture output, then short to medium term policies that decrease the number of schooling years should be given priority.

Further, the forecast result showed that, a decrease of 2% in number of schooling years was shown to have permanent shock to capital finance flows with a deviation of 500%, while an increase of 2% have a temporal but negative impact with a deviation of 2.8% from the baseline. Meanwhile, increasing the number of schooling years was revealed to have a moderate and positive impact on; non-oil export, foreign direct investment and human capital development (8.9%), with a deviation of 29%, 20.4% and 8.9% respectively, from the baseline. However, the effect of a 2% decrease in the number of schooling years exerted more negative impact on non-oil export and foreign direct investment with a maximum deviation of 94% and 88.4% respectively. Given the magnitude of these deviations, it could be suggested that a short to medium term policy response could be deployed to address deviation in non-oil export and foreign direct investment due to an increase in number of schooling years, while it will take medium to long term policy response to address deviation in non-oil export and foreign direct investment in the event of a decrease in number of schooling years. The forecasted results under these scenarios are presented in Table 6. The graphs of scenarios 3 and 6 are presented in the appendix.

Table 6: Forecast Results for Scenarios 3 and 6

Variable	Scenario 3 (Increase by 2%) % Maximum Difference from Benchmark	Scenario 6 (Decrease by 2%) % Maximum Difference from Benchmark
Capital Finance Flows	-2.8%	500%
Non-oil Export	29%	-94.2%
Foreign Direct Investment	20.4%	-88.4%
Service Output	9.3%	-74.5%
Human Capital Development	8.9%	-46.1%
Non-oil Output	7.2%	-56.8%
Industry Output	3.7%	-42.4%
Total Output	2.8%	-34.9%
Foreign Portfolio Investment	-3%	78.4%
Agriculture Output	-2.0%	24.1%
Capital Account Balance	2.2%	-60.7%
Non-Oil Government Revenue	0.7%	-11%
Government Revenue	0.4%	-6.8%
Service Export	0.6%	-20.9%
Government Recurrent Revenue	0.4%	-6.9%
Exports	0.5%	-27.7%
Total Government Expenditure	0.0000016%	-0.000028%
Fiscal Deficit	-0.00000065%	0.0000094%
Other Deficit Financing	-0.00000065%	0.0000094%
Real Exchange Rate	0	0.00000083%
Imports	0	0.00000071%
Nominal Exchange Rate	0	0.00000070%
Fiscal Deficit Financing	0.0000002.8%	0.00000073%
Remittances	0	-0.00000039%
Reserves	0	0
Oil government Revenue	0	0
Oil Exports	0	0
Oil Output	0	0

Figures are in percentage deviation from the baseline with positive sign indicating that the scenario favours the sector more than the baseline, vice versa.

* Note: Higher percentage deviation implies that the shock has a permanent deviation from the normal trend of the variable or the variable may take a longer time to revert to its initial trend; indicating that the shock has a significant effect on the variable, vice versa.

V. Conclusion and Policy Recommendation

This paper empirically examined the effects of education indicators on the activity sector of the Nigerian economy. First, the study estimated the effects of HCD on outputs of agriculture, industry and services in Nigeria. Second, the study forecasted the future output performances of agriculture, industry and services based on changes in human capital development (HCD) in Nigeria. To tackle the aforementioned issues, a small macroeconomic model was built. The structure of the macroeconomic model is based on the activity sectors (agriculture, industry and services) as defined by the CBN (2010). The model considered measures of investment and output of the aforementioned activity sectors as dependent variables and captured human capital development (HCD) as one of the key explanatory variables in the four sectors. In the model, the variations in the output of the sectors were stated to be a function of HCD and other control variables. The evaluation of the model focused on three related issues; how well the endogenous variables tracked the historical data series; the model's forecasting potential; and the ability of the model to simulate turning points in the endogenous variables. The simulation statistics relevant to answering these questions were obtained and presented. Ex-ante forecast was conducted to peep into the future effects of the different time paths assigned to HCD. A number of interesting and important results were obtained. First, the results of the effects of HCD on the individual activity sectors are summarized. The results revealed HCD is a significant determinant of agricultural output. Specifically, a unit increase in HCD brings about 0.099 decreases in agricultural output. It was found in this study that HCD does not have significant effect on industrial output, though its relationship with the sector emerged to be positive. The results that emerged from the calibration of the services output equation reveals that HCD is one of the significant determinants of output in the services sector. A unit increase in HCD brings about a 0.15 increase in services sector.

The results relating to the evaluation of the model's performance presented in Section 4.4 indicated that the model's dynamic performance is reasonably good. It was found from the results that virtually in every case, the simulated values tracked actual series very well. The variance proportion of the simulation error, captured in Table 3 shows that the ability of the model to replicate the degree of variability in the endogenous variables is reasonably high. The covariance proportion generated from the model which measured the remaining unsystematic forecasting errors also pointed to the better fit of the model. The graphs for the simulated values of variables on actual values of some endogenous variables showed that most of the simulated values closely mirrored the actual values, which indicated the possibility of a low bias in the model. Hence, it was inferred that the model's dynamic performance was considerably good and served as an adequate framework for analyzing the effects of human capital development on the activity sector performances in Nigeria.

The result of the ex-post forecast showed that the model has a high predictive power as the forecasted values virtually match the actual values. On the average, the forecasted value of agriculture output for 2019 only deviated from the actual by -0.26% (that is, the forecasted value marginally dropped from the actual). Similarly, the average forecasted percentage difference for Industry output and Services output were 1.4% and 2.6% respectively. Services output and Industry output were better under a scenario of 2% increase in number of schooling years than in the baseline, with a maximum deviation of 9.3% and 3.7%, respectively. On the contrary, the baseline relating to Agriculture output was better than under the scenario of 2% increase in number of schooling years which shrunk the sector by 2.0% deviation. Similarly, the baseline relating to Service output and Industry output was better than under the scenario of 2% decrease in number of schooling. In particular, it is noticed that 2% decrease in number of schooling years worsened Service and Industry output by 74.5% and 42.4% deviations, respectively. On the other hand, 2% decrease in number of schooling years was shown to be countercyclical with the Agriculture output

The research findings that emerged from this paper were considered satisfactorily robust, and have significantly achieved the objectives of the study. Based on the empirical findings of this study vis-à-vis the effects of HCD on the individual activity sectors, the following conclusions were made: human capital development is a significant determinant of agricultural output in Nigeria; human capital development does not have significant effect on industrial output, though its relationship with the sector is positive; and human capital development is a significant determinant of output in the services sector.

Our paper analyzed the effects of HCD on activity sector performance in Nigeria. Several major findings emerged and lay the basis for policy lessons summarized in this section.

- Services output and Industry output were better under a scenario of increase in number of schooling years. Based on this finding, it is recommended that education is one of the key means through which the Service and Industry sectors of Nigeria can be revolutionized. Putting few years in schooling does not support increased output in both sectors. On the contrary, if there are guanine reasons why people may not spend longer years in schooling, the government through the ministries of agriculture and labour and employment should ensure that such people are engaged into Agricultural activities.

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Table 3.1: Data Sources and Variable Definitions

S/NO	VARIABLE	DEFINITION/DESCRIPTION	SOURCE
ENDOGENOUS VARIABLES			
1	XO	Oil Export	CBN 2019
2	XN	Non - Oil Export	CBN 2019
3	XS	Services Export	CBN 2019
4	M	Imports	CBN 2019
5	RES	Reserves	CBN 2019
6	NER	Nominal Exchange Rates	CBN 2019
7	FDI	Foreign Direct Investments	CBN 2019
8	FPI	Foreign Portfolio Investments	CBN 2019
9	FDF	Foreign Debt Flow	CBN 2019
10	RMT	Remittances	World Bank (WDI), 2015
11	GRE	Government Recurrent Expenditure	CBN 2019
12	GRVN	Government Revenue (Non-Oil)	CBN 2019
13	GRVO	Government Revenue (Oil)	CBN 2019
14	HCD	Human Capital Development	UNDP 2019
15	YAGR	Output From Agriculture	CBN 2019
16	YIND	Output from Industries	CBN 2019
17	YS	Output from Service Sector	CBN 2019
18	YO	Oil Output	CBN 2019
19	YN	Non-Oil Output	CBN 2019
SHOCK VARIABLES			
20	LE	Index of Life Expectancy	UNDP 2019
21	SCH	Index of Number of School Years	UNDP 2019
22	GNI	Index of Per Capita Income	UNDP 2019
EXOGENOUS VARIABLES			
23	PO	World Oil Prices	UNDP 2019
24	OPEC	World Oil Supply	UNDP 2019
25	YUS	Output from United States of America	UNDP 2019
26	YF	Foreign Output (OECD)	OECD Data, 2017
27	X	Value of Exports	CBN 2019
28	RER	Real Exchange Rates	World Bank (WDI), 2019

29	YD	Personal Disposable Income	CBN 2019
30	EDS	External Debt Services	CBN 2019
31	IRD	Interest Rate Differentials	World Bank (WDI) 2019
32	X_M	Terms of Trade	World Bank (WDI)2019
33	CPI	Consumer Price Index	World Bank (WDI) 2019
34	TGE	Total Government Expenditure	CBN 2019
35	PCGDP	Per Capita Gross Domestic Product	CBN 2019
36	SMR	Stock Market Returns	CBN, 2019
37	INTF	Foreign Interest rates (OECD)	OECD Data, 2019
38	RM	Interest Rates	CBN, 2019
39	INVI	Investment Income	CBN, 2019
40	GCE	Government Capital Expenditure	CBN, 2019
41	YG	Total Output	CBN, 2019
42	FDF	Fiscal Deficit Financing	CBN, 2019
43	PPT	Petroleum Profit Tax	CBN, 2019
44	TAR	Tariffs	CBN, 2019
45	PSC	Private Sector Credit	CBN, 2019
46	CG	Credit to Government	CBN 2019
47	RF	Rainfall	CBN 2019
48	IEC	Index of Energy Consumption	NBS, 2019
49	CON_H	Consumption	CBN, 2019

Source: Researchers' Compilation, 2021

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