Financial Liberalization and Health Outcomes in Nigeria: A Case of Infant Mortality

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Abstract

This study empirically examines the effect of financial liberalization on health outcomes, taking on the case of infant mortality in Nigeria. The time series data adapted for the study spanned between 1980 and 2016. This was with a view to assessing the effects of monetary policies within this period on infant mortality. Diagnostic tests from the data show that all variables were integrated at order two [1(2)] as indicated by Augmented Dickey Fuller (ADF) unit root test statistics. The trace statistic shows two co-integrating equations. On the other hand, the maximum Eigen value shows one co-integrating equation. The Granger causality test shows that interest rate, as an instrument of financial liberalization, granger causes infant mortality rate. The VECM satisfied the a-priori expectation and was statistically significant at 5% level. It was found, among other things, that one period lag value of exchange and literacy rates, respectively, had non-significant positive effect on the current year value of infant mortality rate. Interest rate as a financial instrument is statistically significant at 5% level and correctly signed. Broad money supply and trade openness are also correctly signed but not statistically significant in their impact on infant mortality rate. Recommendation from the foregoing was that policy effort should be intensified on monetary policy instrument as they indicate desirable potentials to mitigating infant health in the economy.

Keywords: *Financial liberalization, Literacy, Infant Health and Granger causality*

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Introduction

Financial liberalization is a policy process that eradicates controls that restrict financial operations and enables market forces serve as the price mechanism for financial services. (Sukar, 2007) Generally economic theory affirms that financial liberalization is essential to specific sectors of the economy like the health sector and this boils down to total economic growth (Levine and Rothman, 2006). WHO, (2013), noted that the benefits of financial liberalization affect the country macro economy by promoting economic growth and these benefits are anticipated to translate to various sectors of the economy of which the health sector is one. The correlation between the health outcomes and financial liberalization via trade openness, money supply, interest and exchange rates has been conceptualized in many ways. Serrano, Lopez-Bazo and Garcia-Sanchis (2002) for instance opined that "liberalization facilitates the spread of knowledge and the adoption of more advanced and efficient technologies, which hastens total factor productivity growth and, hence, per capita income." Deaton (2014) asserts that trade and financial liberalization enhance the consumption of medical goods and international spillovers of medical knowledge.

Economist Intelligence Unit, (2012) observes that the numerous structural reforms implemented across Sub-Saharan African countries including, Nigeria, has influenced the region's (SSA) economic positioning in the committee of world trade. In fact, the Sub-Saharan region is second among other regions in the world, in the adoption of financial liberalization policy. In 2014, Trade, interest and exchange rates liberalization in the sub region, has been estimated to be 61.04% on the average, which is meaningfully greater than the world average of 59.20%. It is however, noticed that, the improved financial liberalization of trade, interest and exchange rates performance have not translated into the health sector. As Nigeria and other Africa countries in SSA region have continually seen a slow progress in population health status. Nigeria and other SSA countries continue to face and battle with high HIV prevalence that accounts for over 69% of adults living with HIV (WHO, 2012). High level of under-five years' mortality in SSA was estimated to be 89.2 per 1,000 live births in 2013 (World Bank 2014). In the same vein, infant mortality rate in Nigeria is placed at 71.2 per 1,000 live births as at 2017 (World Bank, 2016). Coupled with the fact that Millennium Development Goal (MDG) targets on health was missed by majority of countries in the region including Nigeria.

Tremendous financial booms and busts in the short-run are generated by financial liberalization; however, these booms and busts have not intensified in the long-run. Considerable numbers of studies have been carried out on financial liberalization but most of such studies focused on financial liberalization and economic growth. So far, the search efforts reveal that a few studies like Novignon and Atakorah (2016), Arestis and Caner (2009) have shown efforts at investigating the effect of financial liberalization on health and poverty respectively, and these studies were

cross country based, carried out in Ghana and England. Meanwhile no empirical study is found on financial liberalization and health outcomes in the case of Nigeria. The anticipated benefits of financial liberalization are to expand economic activities and productivity. By effect, it is expected to have a bearing on the health of the labor force as critical element of human capital development. Thus the pertinent questions answered in this study are: 1). What are the effects of interest rate and exchange rates liberalization on health outcomes in Nigeria? 2). What is the effect of trade openness on health outcomes in Nigeria? Hence from the foregoing the paper intends to examine the effect of financial liberalization on health outcomes in Nigeria. The outcome of the study would enhance the relevance of financial policy on the maximization of the health of the populace. It will also highlight the notion that financial policies can work through interactive variables like interest rates to affect health of the economy and therefore inform robust monetary policy engineering that will maximize the welfare of the populace through the health sector.

2. Literature Review

In the attempt to present a comprehensive and acceptable review of literature within the ambit of standard time and space, effort has been made to fragment this section into conceptual, theoretical and empirical literature. Thus what follows is the presentation of the study literature review in the above order.

2.1 Conceptual Literature

Financial liberalization is one of the short-run determinants that have been put forward as a potentially important prerequisite for successful financial development. This view rests on the belief that liberalizing financial markets allows interest rates to reach their competitive market equilibrium, which will boost savings, investments and ultimately economic growth (Akcay, 2019). In the word of Aigbovo and Igbinosa (2016) financial liberalization has become an important economic policy package in both developed and developing countries. For more than a decade now, financial liberalization in developing countries has been cited as a necessary and significant part of an economic policy package promoted by what used to be called the "Washington Consensus". Most governments in Africa region embarked on financial sector liberalization in the mid-80s as their financial sector were highly repressed before the reform with selected credit controls and fixed interest rates. African countries like Nigeria are working towards integrating with the world economy with liberalized financial system as the key policy instrument for engendering high growth performance (Marc, 2018). The stock of human capital in terms of education and health in a country has been perceived to be an important determinant of welfare, productivity, and economic growth in the world's poorest countries (Huay & Bani 2018; Ogundari & Awokuse 2018).

Different frontiers and emerging markets in developed and developing countries like Nigeria have lifted restrictions on cross-border financial transactions during the last few decades. Adam (2011) opines that financial

openness and liberalization are among the regarded growth ingredients in developing countries. Tekin (2012) asserts that in developing countries, financial liberalization that took place in the late 1970s up to the early 1990s was part of government plans to free and enable domestic markets play essential roles in the economic development process. A broader concept was provided by Ayanwale and Bamire (2007) that financial liberalization is the deregulation of the domestic financial, foreign capital account and the capital market sector seen separately from the domestic financial sector. It thus, concludes that when two of the three sectors are fully liberalized and the third one is partially liberalized a full financial liberalization is established. According to Sukar, (2007) it is obvious that financial liberalization places emphasis on eradicating controls that restrict financial operations and to also enable market forces serve as the price mechanism for financial services. Such measures can be linked to internal or external regulations. Adu (2013) opines that financial liberalization is a measure aimed at removing regulatory control over the institutional structures, instruments and activities of agents in different segments of the financial sector. A group of operational reforms and policy agenda targeted to liberalized and transform a country's financial system with the view to achieving a deregulated market-oriented system within an appropriate regulatory framework (Bennett, 2005).

Health generally has been seen by Grossman, (1972) as the total stock of health of an individual can be seen as a reflection of total ability to perform tasks such as ability to read, do physical tasks such as physical work, emotional stability, ability to exert and benefit from the use of the five senses of hearing, seeing, tasting, touching and smelling. Grossman in his study declared that an individual's stock of health is exgenously determined. Mofizul M., (2019), Marmot., (2018) and Raphael D., (2018, on their part, showed that the health stock of an individual can be endogenously determined by a number of factors such as education, health habit formation such as smoking, exercise to name but two

On health outcomes, Grossman (1972) defines health as a durable capital stock. Modern literature on health promotion defines health as having two distinct dimensions of positive health (well-being) and negative health (ill-health) (Downie, 1996). The positive dimension of health consists of the qualitative aspects of health and human life in general, and is strongly associated with the concept of "fitness" which is a critical ingredient of productivity. The negative dimension is determined by the presence or absence of disease, illness, deformity, unwanted states, injury, disability and handicap. The relationship between the two dimensions is not clear-cut (Downie, 1996), and they may not be systematically related at all (Seedhouse, 1997)

The term health outcome refers to the impact healthcare activities have on people — on their symptoms, ability to do what they want to do, and ultimately on whether they live or die. Health outcomes include whether a given disease process gets better or worse, what the costs of

health care are, and how satisfied patients are with the care they receive. It focuses not on *what is done* for patients but *what results* from what is done. Canadian Institute for Health Information (CIHI), (2017) perceived Health outcomes as changes in health that result from measures or specific health care investments or interventions. Daniel K. and S. Adrianna, (2013) emphasized that infant mortality and birth outcomes are critical indicators of health outcome. WHO, (2012) stresses that among the crucial indicators used in measuring the health of any population are infant and maternal mortalities.

Health outcomes can also be seen as the benefits of interventions (e.g., the number of hospitalizations prevented). Cost-effectiveness analyses typically use life years or quality-adjusted life years. Life years are obvious and simple to measure it is simply the number of years' people stay alive. It does not account for quality of life. Quality-adjusted life years (QALYs) address this by measuring the number of years in a perfect health status *(Barnsbee & Nghiem, 2018). Oleske and Islam (2019) defined h*ealth outcomes as those events occurring as a result of an intervention. Some health outcomes require complex assessments to determine if they are present or absent. In general Beaton and Tugwell (2017) submitted that health outcomes provide information on an aspect of health across many conditions. Jambroes, Nederland, Kaljouw, Vliet, Essink-Bot and Ruwaard (2016) define health outcome as t*he ability to adapt and to self-manage, in the face of social, physical and emotional challenges.*

Globally, rates of infant (child) mortality fell by as much as 53% between 1990 and 2015 (You, 2015). Despite this progress as many as 5.9 million children under the age of five died in 2015 globally (UNICEF, 2015). A majority of these deaths were attributable to treatable and preventable causes and occurred in low- and middle-income countries (UNICEF, 2015). A large number of studies have identified how trade liberalization could impact on infant mortality, for better or for worse, through myriad and complex pathways (Kentikelenis, 2017). Trade and financial liberalization can also lead to higher rates of economic growth and government tax revenue, providing fiscal resources for funding public health-services, thereby expanding access to care and increasing quality (McNeill, 2017).

2.2 Theoretical Literature

2.2.1 Monetary Policy Instrument

John Maynard Keynes, (1939) traced the transmission nexus between variables of monetary instrument and productivity. Productivity on its part is normally proxied by gross domestic product of the affected economy. In the Keynesian postulation, two sectors are of critical concern here and they are the monetary and real sectors. Quantitatively these are sited as;

$$Y = C(Y, r) + I(Y, r) + G \quad ------1$$

$$L_0 + L(Y, r) = \frac{M}{P} \quad ----------2$$

Equation 1 is the real or goods sector model stating that aggregate output is the sum of aggregate consumption, investment and government expenditure. Consumption and investment are on their own dependent on income (Y) and rate of interest (r) while government expenditure is taken as exogenously given. In equation 2, the left hand side shows the money demand which is the sum of autonomous demand (Lo) and the endogenous demand which is dependent on income (Y) and interest rate (r). On the right hand side of equation 2 is the real money supply relation $\left(\frac{M}{P}\right)$. Thus equations 1 and 2 are the real and monetary sectors equilibrium respectively. According to the Keynesian postulation, as real money supply increases, interest rate decreases. This creates decrease in the cost of capital which spurs up aggregate demand. This in turn spurs up investment. Increase in investment culminates in increase in aggregate output or income. This theory forms the basis for easy monetary policy meant to bail out a typical economy out of recession. Thus the transmission mechanism between easy financial liberalization and health can be traced to the nexus between increase in real money supply increased in aggregate income which is normally proxied by the gross domestic product of the economy in view. At the core of the definition of economic development of any nation is the GDP. Daniel K. and S. Adrianna, (2013) and WHO (2012) indicate that infant mortality is a critical measure of health outcome. Qadir and Majeed, (2018) and Olper Curzi and Swinnen, (2018) in their respective studies capture health outcome with infant mortality. Meanwhile one critical indicator for development of any nation is the health of the populace. In this study health is measured by infant mortality. Below is the schematic connection running from increase in real money supply and improved economic development.

$\frac{M}{P}\uparrow \rightarrow r \downarrow \rightarrow Investment \uparrow \rightarrow AD \uparrow \rightarrow$ GDP$\uparrow \rightarrow$ Economic Development$\uparrow$ $\rightarrow$ Infant Mortality decreases$\downarrow$

2.2.2 *Grossman Health Investment Concept*

Grossman (1972) asserts that individuals are assumed to derive utility from consuming a commodity (Z) and disutility from 'sick time' (t s), which is a function of their stock of health capital according to the inter-temporal utility function (3):

$$\int_0^T e^{-\rho t} U\left[t^s\left(H_t\right) Z_t\right], \qquad \text{.....(3)}$$

With $\frac{\partial U_t}{\partial t^s} < 0,\ \frac{\partial U_t}{\partial Z_t} > 0,\ \frac{\partial t^s}{\partial H_t} < 0,\ and\ \rho\ a\ time\ discount\ factor$

The dynamics of H are given by equation (4):

$$H_t = I_t\left(M_t, t^i\right) - \delta_t H_t, \qquad \text{.....(4)}$$

With $\frac{\partial I_t}{\partial M_t} > 0,\ \frac{\partial I_t}{\partial t^i} > 0,$ this means that investment in health capital (I) is produced by medical care (M) and own time spent (t^i), for instance, on

sporting activities. On the other hand, health capital depreciates at a rate of δ. In Grossman's formulation, δ depends only on the individual's age (t_i) and is hence exogenous, but others have made δ endogenous by adding lifestyle variables like tobacco and alcohol intake (Gerdtham et al. 1999), or pollution (Erbsland et al. 1995) and unemployment (Gerdtham and Johannesson 1999). See also Mofizul M (2019), Marot M. (2018) and Raphael D. (2018)

Asset accumulation is given by equation (5)

$$\dot{A} = rA_t + Y\left[t^s\left(H_t\right)\right] - \pi_t^H I_t - \pi_t^Z Z_t \quad \text{..... ....} (5)$$

where A is the stock of financial assets, r is the rate of interest, Y is earned income as a function of 'sick time', and π^H and π^Z are the marginal (and average) cost of investment in health and consumption, respectively. The boundary conditions are $H(0) = H_0$, $A(0) = A_0$, $H_t \geq H'$ and $A_t \geq 0$, where H' is the 'death stock' of health capital.

The individual has to solve the control problem to choose the time paths for H_t and Z_t that maximize the inter-temporal utility function (1) subject to the dynamic constraints (2) and (3) and the boundary conditions. The solution for this problem is given by equation (6):

$$\left\{\frac{\partial U_t/\partial t_s}{\lambda(0)} e^{-(\rho - r)t} + \frac{\partial Y^t}{\partial t^s}\right\}\frac{\partial t_s}{\partial H_t} = \left\{r + \partial t - \frac{\dot{\pi}_t^H}{\pi_t^H}\right\}\pi_t^H \quad \text{..... ....} (6)$$

where $\lambda(0)$ is the shadow price of initial assets.

Equation (4) states that the marginal benefit of additional health capital on the left-hand side must be equal to the marginal cost of holding it on the right-hand side. Additional health capital reduces 'sick time', which provides direct utility (the first summand on the left hand side representing the 'pure consumption' effect) in addition to increasing labor income (the second summand representing the 'pure investment' effect). A rise in the depreciation rate δ raises the marginal cost of investing in health capital. So does a rise in the interest rate because opportunity cost increases. On the other hand, if health capital rises in value in the future, π_t^H >0 this lowers the relative cost of investing today.

Equation (4) is the center-piece of the Grossman model. However, in the empirical literature starting with Grossman (1972a) it is not equation (4) that is tested. Instead, the model is split into a 'pure consumption' (PC) sub-model in which the term $\frac{\partial Y_t}{\partial t_s}\frac{\partial t_s}{\partial H_t}$ on the left-hand side of equation (4) is set to zero and a 'pure investment' (PI) sub-model in which the term $\frac{\partial U_t / \partial t^s}{\lambda(0)} e^{-(\rho - r)t}\frac{\partial t^s}{\partial H_t}$ is dropped. Grossman (2000) argues that this is necessary because it "is difficult to obtain sharp predictions concerning the effects of changes in exogenous variables in a mixed model in which the stock of health yields both investment and consumption benefits".

Grossman also, asserts that the monetary returns are large relative to the 'psychic' returns and therefore focusses on the PI model. Thus from equation (4) above, imagine dropping the first term on the left-hand side and take logs what follows below is the result:

$$\ln\left[-\partial t_s \big/ \partial H^t\right] + \ln w_t = \ln \delta_t + \ln \pi_t^H - \ln \psi_t \quad \text{..... ....(7)}$$

where the nominal wage rate w_t equals $-\frac{\partial Y_t}{\partial t^s}$, and

$$\psi_t = \partial t \Big/ \left[r + \partial t - \frac{\dot{\pi}_t^H}{\pi_t^H} \right]$$

The PC relation is derived from equation (4) by dropping the second term on the left-hand side and taking logs:

$$\ln\left[\frac{\partial U^t}{\partial t^s}\frac{\partial t^s}{\partial H_t}\right] - \lambda(0) - (\rho - r)t = \ln \delta_t + \ln \pi_t^H - \ln \psi_t \quad \text{..... ....(8)}$$

In order to estimate equations (5) and (6), assumptions must be made about the functional forms of

$t^s(\cdot), \delta(\cdot), \pi^H(\cdot)\ and\ U(\cdot)$. Following Grossman (1972a) we assume that:

$$t_i^s = \beta_1 H_{it}^{\ -\beta_2}, \quad \text{..... ....(9)}$$

Where β_1 and β_2 are positive constants and

$$\ln \delta_{it} = \ln \delta_0 + \beta_3 t_i, \quad \text{..... ....(10)}$$

with $\beta_3 > 0$, where subscript i denotes the i th person.

Investment in health capital is assumed to be affected by combining time (ti) and medical care (M) according to a Cobb-Douglas production function with constant returns to scale. Furthermore, Grossman assumes that education (E) raises the efficiency of the production process in the household sector. This gives rise to the investment function (9):

$$I_{it} = M_{it}^{\ \beta_4} t^{i^{1-\beta_4}} E_{it}^{\ \beta_5}, \quad \text{..... ....(11)}$$

with $0 < \beta_4 < 1$ and $\beta_5 > 0$.

The demand for medical care follows from equations (2), (9) and the cost-minimizing condition for health investment, $\frac{P_{it}^M}{w_{it}} = \frac{\beta_4}{1-\beta_4}\frac{t_i^i}{M_{it}}$

$$\ln M_{it} = \beta_{10} + \ln H_{it} + (1-\beta_4)\ln w_{it} - (1-\beta_4)\ln P_{it}^M + \beta_3 t_i - \beta_5 E_{it} + u_{2it} \text{.....(12)}$$

With $\beta_{10} = -(1-\beta_4)\ln[(1-\beta_4)/\beta_4]$ and $u_{2it} = \ln \delta_0 + \ln\left[1 + \frac{H_{it}}{H_{it}\delta_{it}}\right]$, Wag staff (1986) treats u_{2it} as an error term.

The stock of health capital H enters the demand for medical care equation with a coefficient equal to +1. This reflects the basic idea of the model that medical care is demanded in order to build up health capital. Thus there is a positive relationship between the stock of health capital an individual aim at, and the demand for medical care. The main critique of Zweifel et al. (2009) and Zweifel (2012) directed against the Grossman model is that most empirical studies found a negative relation between health status and the demand for medical care, not a positive one. In other words: the sick demand medical care, not the healthy. In this study health status is proxied by infant mortality. This is due to the availability of time series data on the variable.

2.3 Empirical Literature

The correlation between liberalization policies, population health outcome and health financing in Nigeria, has received limited attention in the empirical literature. Prior studies have focused mostly on the trade health status, government expenditure and poverty relationship. Meanwhile, the nexus between financial liberalization and health outcomes has been largely ignored. Owen and Wu (2002) examine the relationship between international trade liberalization and population health (captured by infant mortality and life expectancy) from 1960 to 1995. Using panel data techniques for 139 developed and developing countries and the fixed effects result showed a significant positive relationship between international trade and population health. Interestingly, the authors showed that while population health in both rich and poor countries benefited from international trade openness, poor countries benefited more relative to their rich counterparts. Ramzi (2012) investigates trade openness, financial liberalization and health outcome proxy by infant mortality and life expectancy, using panel data from oil rich countries between 1980 and 2009. The fixed effect estimation method result, reveals that a positive and significant relationship exist between trade openness and life expectancy while a significant negative relationship was reported between trade openness and infant mortality. Levine and Rothman, (2006) study the effect of trade openness on child health, using the two-stage least square regression (2SLS) technique and panel data from 134 developed and developing countries. The researcher reported a coefficient of -0.63, which implies that a 1% increase in trade openness would lead to about 63% reduction in infant mortality. In the same vein, Stevens, Urbach, and Wills, (2013) investigate the relationship between financial liberalization and health. Their empirical findings revealed that free trade is correlated with better health and this becomes clearer when dealing with low income countries. Hudak, (2014) examines the relationship between trade openness and differential health outcomes from 1960 to 2012, with panel data methodology for thirty (30) low and high income countries. Result from the study indicates that at 10% significance level, an increase in trade openness leads to 14.09% increase in life expectancy. Olper (2014) used Synthetic Control Method to estimate the effect of trade liberalization on health

outcomes in South Africa for the periods 1960 to 2010. Findings show a significant short run and long run reduction in child mortality. Herzer, (2014) also estimated the long run relationship between trade and population health using a panel time series data from 1960-2010 for seventy-four (74) developed and developing countries. The study found a positive relationship between life expectancy and trade openness while a negative relationship between infant mortality and trade openness. The study also found a long-run causality running from both directions. Maryam and Hassan (2013) studied the nexus between trade openness and health financing, using Autoregressive distributed lag (ARDL) Bound test on time series data that spanned between 1976 and 2011 in Pakistan. The result showed that per capita health expenditure had positive relationship with trade openness both in the short and long runs.

Pierce and Scott (2016) in their study discovered that countries more exposed to changes in trade policy exhibit higher rates of suicide and related causes of death. The study of McManus and Schaur (2016) finds that import competition from China increases the injury rates and the injury risk in the competing US industries. Chinese import competition not only affect workers in the trade-exposed industries, but also impacts other family members. Atakorah (2016) studied the linkages of increased trade integration on health sector of the economies of forty-two Sub-Saharan African countries. The study used three indicators of health that are life expectancy rate, infant mortality rate, and under five mortality rate. The results found that all health indicators improve with increased trade integration. Ali and Audi (2016) studied the effect of income inequality, environmental degradation, and globalization on life expectancy in Pakistan. By using ARDL approach, the results indicate that with increase in income inequality and environmental degradation there is decrease in life expectancy while with increase in globalization there is increase in life expectancy.

Ray and Linden (2018) specified a simultaneous three-equation model to examine the effect of inequality and income on infant mortality rate for 194 countries from 1990 to 2014.the study adopted GMM-2SLS estimation techniques. Findings revealed that in poorest countries, the possible Kuznets' hypothesis and involved low-income high-inequality trap can be eliminated by raising health expenditures to GDP ratio and with cost-effective health technology. Qadir and Majeed (2018), examined the impact of trade liberalization on health in Pakistan from 1975-2016. Regression estimation methodology was adopted and findings show that 1% increase in trade to GDP ratio significantly decreases life expectancy by 0.05 years and significantly increases infant mortality by 0.47 deaths. Thus, trade liberalization causes adverse effects on health indicators in the case of Pakistan. Dhrifi (2018) investigates the effects of health-care expenditures on child mortality rates using a simultaneous-equation model for 93 developed and developing countries with data spanning the period 1995–2012. The findings show that health expenditure has a positive effect on

reducing child mortality only for upper-middle-income and high-income countries.

Olper, Curzi and Swinnen (2018) study the effect of trade liberalization on child mortality using data from emerging and developing countries over the 1960–2010 period. The Synthetic Control Method (SCM) techniques were adopted to cater for possible heterogeneity effects because it is a comparative study. Findings show that on the average, trade liberalization significantly reduced child mortality. The average reduction is around 9% ten years after the liberalization with significant heterogeneity in the impact. In the most of the significant cases, the reduction in child mortality was more than 20%. Specifically, infant mortality is reduced more on the average in countries with democratic rule, higher income and reduced taxation on farmers. Barlow (2018) used the Synthetic Control Method (SCM) to analyzed the impact of trade liberalization on child mortality in 36 low- and middle-income countries from 1963–2005. The study tests the hypothesis that trade liberalization decreases the rates of infant mortality and whether this correlation varies between countries and over time. Findings indicate that that, on average, trade liberalization had no impact on child mortality in low- and middle-income countries between 1963 and 2005.

From the reviewed literature so far, it can be observed that the focus has been mostly on trade liberalization which is a part of financial liberalization and health outcome while studies on the link of financial liberalization with health outcome has been minimal. What is more, where effort was made, such studies appear to be far away into time, such that searching further into the study in the face of contemporary policy development is seriously pertinent. It is also, noted that, no study explicitly explains the link between financial liberalization and health outcomes in the context of Nigeria. This study therefore seeks to examine the effect of financial liberalization on health outcome in Nigeria within the context of Vector Error Correction Model (VECM).

2.4 Theoretical Framework

The theoretical framework of this study derives from Grossman (1972) investment model as already summarized in section two above. In the model, investment in health capital is assumed to be affected by combining time (ti) and medical care (M) according to a Cobb-Douglas production function with constant returns to scale. Furthermore, Grossman assumes that education (E) raises the efficiency of the production process in the household sector. This gives rise to the investment functions 11 and 12.

Recall that, as earlier stated, the stock of health capital H enters the demand for medical care equation with a coefficient equal to +1 and that it reflects the basic idea of the model that medical care is demanded in order to build up health capital. This creates the positive relationship between the stock of health capital of an individual and the demand for medical care.

3. Model Specification

Following Grossman (1972) the empirical model for this study is given as follows:

IMR = f (BMS, TOPNS, INTR, EXCR, LTL) ……..(13)

The VECM with standard assumptions indicating interrelationship between financial liberalization and health outcome is given as;

$$IMR_t = \alpha_{1t} + \sum_{j=i}^{n} \beta_{1j} IMR_{t-1} + \sum_{j=i}^{n} \beta_{2j} BMS_{t-1} + \sum_{j=i}^{n} \beta_{3j} TOPNS_{t-1} + \sum_{j=i}^{n} \beta_{4j} INTR_{t-1} + \sum_{j=i}^{n} \beta_{5j} EXCR_{t-1} + \sum_{j=i}^{n} \beta_{6j} LTL_{t-1} + \delta_1 \gamma_{t-1} + \epsilon_{it} \ldots\ldots\ldots\ldots (14)$$

$$BMS_t = \alpha_{1t} + \sum_{j=i}^{n} \beta_{1j} IMR_{t-1} + \sum_{j=i}^{n} \beta_{2j} BMS_{t-1} + \sum_{j=i}^{n} \beta_{3j} TOPNS_{t-1} + \sum_{j=i}^{n} \beta_{4j} INTR_{t-1} + \sum_{j=i}^{n} \beta_{5j} EXCR_{t-1} + \sum_{j=i}^{n} \beta_{6j} LTL_{t-1} + \delta_1 \gamma_{t-1} + \epsilon_{it} \ldots\ldots\ldots\ldots (15)$$

$$TOPNS_t = \alpha_{1t} + \sum_{j=i}^{n} \beta_{1j} IMR_{t-1} + \sum_{j=i}^{n} \beta_{2j} BMS_{t-1} + \sum_{j=i}^{n} \beta_{3j} TOPNS_{t-1} + \sum_{j=i}^{n} \beta_{4j} INTR_{t-1} + \sum_{j=i}^{n} \beta_{5j} EXCR_{t-1} + \sum_{j=i}^{n} \beta_{6j} LTL_{t-1} + \delta_1 \gamma_{t-1} + \epsilon_{it} \ldots\ldots\ldots\ldots\ldots (16)$$

$$INTR_t = \alpha_{1t} + \sum_{j=i}^{n} \beta_{1j} IMR_{t-1} + \sum_{j=i}^{n} \beta_{2j} BMS_{t-1} + \sum_{j=i}^{n} \beta_{3j} TOPNS_{t-1} + \sum_{j=i}^{n} \beta_{4j} INTR_{t-1} + \sum_{j=i}^{n} \beta_{5j} EXCR_{t-1} + \sum_{j=i}^{n} \beta_{6j} LTL_{t-1} + \delta_1 \gamma_{t-1} + \epsilon_{it} \ldots\ldots\ldots\ldots (17)$$

$$EXCR_t = \alpha_{1t} + \sum_{j=i}^{n} \beta_{1j} IMR_{t-1} + \sum_{j=i}^{n} \beta_{2j} BMS_{t-1} + \sum_{j=i}^{n} \beta_{3j} TOPNS_{t-1} + \sum_{j=i}^{n} \beta_{4j} INTR_{t-1} + \sum_{j=i}^{n} \beta_{5j} EXCR_{t-1} + \sum_{j=i}^{n} \beta_{6j} LTL_{t-1} + \delta_1 \gamma_{t-1} + \epsilon_{it} \ldots\ldots\ldots\ldots (18)$$

$$LTL_t = \alpha_{1t} + \sum_{j=i}^{n} \beta_{1j} IMR_{t-1} + \sum_{j=i}^{n} \beta_{2j} BMS_{t-1} + \sum_{j=i}^{n} \beta_{3j} TOPNS_{t-1} + \sum_{j=i}^{n} \beta_{4j} INTR_{t-1} + \sum_{j=i}^{n} \beta_{5j} EXCR_{t-1} + \sum_{j=i}^{n} \beta_{6j} LTL_{t-1} + \delta_1 \gamma_{t-1} + \epsilon_{it} \ldots . (19)$$

Where:

EXCR = Exchange Rate

TOPNS = Trade Openness

INTR = Interest Rate

LTL = Literacy Level

BMS = Broad Money Supply

n = Maximum level of Lag

α = autonomous term

β_1, β_2, β_3, β_4, β_5 and β_6 = parameter of explanatory variables to be estimated.

γ_{t-1} = Error correction term

ϵ_{it} = Stochastic term

3.1 Data Source and Diagnostic Test

All variables are sourced from Central bank of Nigeria (CBN) statistical bulletin, World Bank and National Bureau of Statistics (NBS). The variables considered are two financial variables of Interest Rate (INTR) and Exchange rate (EXCR), two macroeconomic variables of Broad Money Supply (M_2) and Trade Openness (TOPNS) and one health and social variable of Infant Mortality Rate (IMR) and Literacy level (LTL) Observations of the variables are annual data from 1980 to 2016. This period is actually focused because of its immediate closure on the Millennium Development Goal (MDG). The total number of variables in the empirical model therefore is six with; health outcome as the dependent variable and the remaining variables as explanatory variables.

To comply with econometric theory and procedure, the normality properties of the variables were summarized and presented in a convenient form using descriptive statistics. To prevent spurious regression output, first, the test for the presence or absence of unit root was carried out using Augmented Dickey Fuller (ADF) statistic (1979) This is given as;

$$\Delta\partial_1 = \alpha_0 + \beta_1 t + \emptyset \partial_{t-1} + \sum_{i=1}^{n} \alpha_1 \Delta\partial_{t-1} + \varepsilon_i \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (20)$$

Where: ∂_1 = The series

t = time trend factor

Δ = the first difference operator

n = maximum lag length of the dependent variable

Second, the Johansen and Juselius, (1990) trace and maximum Eigen statistics were adopted to determine and establish co-integrating relationship. This method became imperative because our equation is a systematic type. The functions are given as;

$$Z\ trace\ (r) = -A\sum ln\ [1 - Z_t] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (22)$$

Where

Z = the minimum value of eigenvectors (p-r)

A = the number of observations

$$Z\ Max\ (r.r+1) = -Aln\ (1 - Z)_{r+1}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (23)$$

The above equations tested the null hypothesis of no co-integrating relationship between the variables. However, if co-integrating association is detected, the parsimonious vector error correction model is then estimated.

3.2 Estimation Procedure

Whether co-integrating relationship exists among variables or not will determine the estimation techniques to be adopted in this study. If a co-integrating relationship exists between variables under consideration, the Vector Error Correction Model (VECM) will be used otherwise the Vector Autoregressive (VAR) method will be used. VAR was introduced by Sim (1980) and it is a technique that researcher could use to explain the mutual dynamic behavior of a group of variables without demanding strong restrictions like that needed to recognize underlying structural constant values that describe a population (parameters). It is a general framework applicable to stationary variables to describe dynamic interrelationship, analyzing the interrelation of time series and dynamic impacts of random disturbances.

The Vector Error Correction Model (VECM) is a regulated VAR model. The short run behavior of the explanatory variables to return to their long run equilibrium is restricted in its specification. The possibility that more than one co-integrating relationship exist among variables must be considered when applied to more than two variables. This informed the inclusion of error-correction terms in each equation. VEC takes into account stationary variables in their differences and any co-integrating relationships among variables. Respectively, the VAR and VEC model are given as;

$$Yt = \beta_{y0} + \beta_1 Y_{t-1} + \beta_2 X_{t-1} + \epsilon_{1t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (24)$$

$$Xt = \beta_{x0} + \beta_1 Y_{t-1} + \beta_2 X_{t-1} + \epsilon_{2t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (25)$$

And

$$\Delta Yt = \beta_{y0} + \beta_1 \Delta Y_{t-1} + \beta_2 \Delta X_{t-1} + \delta_1 \gamma_{t-1} + \epsilon_{1t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (26)$$

$$\Delta Xt = \beta_{x0} + \beta_1 \Delta Y_{t-1} + \beta_2 \Delta X_{t-1} + \delta_2 \gamma_{t-1} + \epsilon_{2t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (27)$$

Where:

Y and X = Time series variables

β = Coefficients of co-integrating time series

γ = Error correction term

Δ = Change operator

ϵ = Error terms of co-integrating series.

Table 1: Interpretation of Variable Acronyms

Variables	Definition	Theoretical Justification	Source
IMR	Infant Mortality Rate	Infant mortality rate is the number of neonates dying before reaching 28 days of age, per 1,000 live births in a given year.	World Bank and NBS. Various years
BMS	Broad Money Supply (M_2)	Broad money supply includes narrow money plus short-term time deposits in banks and 24-hour money market funds. It was used to proxy financial liberalization.	CBN Bulletin. Various years
TOPNS	Trade Openness	It measures the ratio of total trade to Gross Domestic Product (GDP). It was measured as Total Import + Total Export / GDP * 100/1	CBN Bulletin. Various years
INTR	Interest Rate	It captures the rate of lending to credit worthy customers by deposit money bank. Annual interest rate was used.	CBN Bulletin. Various years
EXCR	Exchange Rate	It is the price of a nation's currency to a unit of other country currencies. It is very vital in full financial liberalization.	CBN Bulletin. Various years
LTL	Literacy Level	The ability to read and write at a specified age	World Bank. Various years

Source: Author's compilation

4. Data Analyses and Presentation of Result

4.1 Descriptive Statistics

Table 2: Descriptive Statistics

	IMR	BMS	TOPNSS	ECXR	INTR	LTR
Mean	107.5432	23.25135	104.8087	70.76216	12.26973	43.00811
Median	117.5000	21.60000	72.20000	22.05000	12.00000	56.00000
Maximum	127.0000	38.14000	386.9100	192.4400	23.24000	70.00000
Minimum	69.40000	5.90000	18.8100	0.610000	6.130000	0.000000
Std. Dev.	20.28432	6.839585	18.7999	25.81065	3.859897	26.92001
Skewness	-0.669686	0.135660	1.770051	0.220334	0.659464	-0.934868
Kurtosis	1.884270	3.005298	5.012873	1.350530	3.571471	2.030194

Jarque-Bera	4.684772	0.113533	25.56696	4.493863	3.185318	6.839510
Probability	0.096098	0.944815	0.000003	0.105723	0.203384	0.032720
Sum	3979.100	860.3000	3877.924	2618.200	453.9800	1591.300
Sum Sq. Dev.	14812.33	1684.077	365782.5	155917.5	536.3569	26088.73
Observations	37	37	37	37	37	37

Source: Author's extraction from E-view output 2017

Table 2 shows the e-view's output of the descriptive statistics of the study's data, the mean values of infant mortality rate, broad money supply, trade openness, exchange rate, interest rate and literacy rate are respectively put at 107.54, 23.25, 104.80, 70.76, 12.26 and 43.00. The mean infant mortality rate of 107.54 reflects the high rate of child death in the country. In the same vein the mean value of trade openness of 104.8 shows how much volume of external trade generated by the economy. This is quite high as shown from the table but the worry should be about the proportion of export and import, in the merchandise structure. Of equal importance is the diversification of the distribution of the direction of the trade. The median values also confirm this same pattern of average values of the data structure of the variables. The measures of dispersion as reflected by the ranges for infant mortality rate, broad money supply, trade openness, exchange rate, interest rate and literacy rate respectively are; 57.00, 32.24, 368.1 191.8 17.11 and 70.00. This show some measure of consistency among the data. This pattern is also confirmed by the standard deviation values in the table. The rather high values of trade openness and exchange rate, should not be seen as outlying but rather a verification of the volatility of the trade sector as affected by the volatility of the exchange rate. Thus the variability consistency in the data spells a good sign for the standard error of the model as well as the efficiency of parameter estimates of the model. The average skewness index of the data is 0.196. This shows sufficient evidence of normality in distribution. The average kutursis index of 2.80 implies that the data exhibits a mesokurtic distribution. This thus confirms the normality assumption in the distribution of the research data.

4.2 Unit Root Results

Table 3: Stationarity Test

Augmented Dicky-Fuller Test				**Phillip-Perron Test**			
Variable	ADF Stat	Critical Value	Remark	Variable	P-P Stat	Critical Value	Remark
IMR	-3.3893*** 0.9872 -2.2799	-3.5578	(S) (S) (S)	*IMR*	1.5576 -0.0126 -2.2545	-3.5578	(S) (S) (S)
BMS	-3.3604*** -6.7882* 4.1546*	-3.5578	(S) (S) (S)	*BMS*	-3.3700*** -7.9494* -24.559*	-3.5578	(S) (S) (S)
TOPNESS	-2.1053 -3.0449 4.1764*	-3.5578	(S) (S) (S)	*TOPNESS*	-3.0937 -7.2211* -9.5528*	-3.5578	(S) (S) (S)
EXCR	-2.1886 -5.3985*	-3.5578	(S) (S)	*ECXR*	-2.1169 -5.4048*	-3.5578	(S) (S)

	-9.4359*		(S)		27.1124*		(S)
	3.5082**		(S)		-3.0762		(S)
INTR	-3.8799**	-3.5578	(S)	*INTR*	-7.4584*	-3.5578	(S)
	12.2102*		(S)		-19.8596*		(S)
	-1.7845		(S)		-1.8098		(S)
LTL	-6.0930*	-3.5578	(S)	*LTL*	-6.1110*	-3.5578	(S)
	-3.6219**		(S)		-27.7623*		(S)

S = Stationary NS = Not Stationary

*NB: *, ** and *** represents significant at 1%, 5% and 10% respectively.*

Source: Researcher's extraction from E-view output 2017

Dickey and Fuller (1984) asserts that series have to be integrated of the same order for the avoidance of spurious regression results. Following this, the series in this study are not all integrated of order zero *I* (0) but are integrated of order two *I*(2). Hence the critical values and the Augumented Dikey Fuller statistics are shown in table 3 above. This stationarity status is further confirmed by the Philip – Perron test statistics. This is in attempt to earn double assurance of quality in the results. The result also shows the various levels of significance at which the tests were conducted.

4.3 Johansen Co-Integration Test Result

Table 4: Co-integration Test

Trace Statistic

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.812266	127.3059	95.75366	0.0001
At most 1 *	0.556387	72.10579	69.81889	0.0325
At most 2	0.530810	45.28332	47.85613	0.0855
At most 3	0.310209	20.31066	29.79707	0.4020
At most 4	0.182574	8.055553	15.49471	0.4595
At most 5	0.041622	1.402937	3.841466	0.2362

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Maximum Eigen Statistic

Hypothesized No. of CE(s)	Eigenvalue	Max- Eigen Statistic	5% Critical Value	Prob.**
None *	0.812266	55.20013	40.07757	0.0005
At most 1	0.556387	26.82246	33.87687	0.2730
At most 2	0.530810	24.97266	27.58434	0.1042
At most 3	0.310209	12.25511	21.13162	0.5227
At most 4	0.182574	6.652615	14.26460	0.5310
At most 5	0.041622	1.402937	3.841466	0.2362

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Author's extraction from E-view output 2017

From table 4, both Trace statistic and Maximum Eigen statistic confirm co-integrating association between the regress and regressors. The result

indicates two (2) co-integrating relationship at 1% level of significance while the Maximum Eigen statistics showed one (1) co-integrating equation at 1% level. From the foregoing, the study accepts the alternate hypothesis that there is a co-integrating relationship among variables considered during the period under review.

4.4 Akaike Information Criterions

Table 5: Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	Lag	LogL
0	-778.9265	NA	8.14e+13	49.05791	0	-778.9265
1	-580.1719	310.5541	3.25e+09	38.88574	1	-580.1719
2	-525.9926	64.33791	1.35e+09	37.74954	2	-525.9926
3	-461.1285	52.70212*	4.83e+08*	35.94553*	3	-461.1285

* indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion.

Source: Researcher's extraction from E-view output 2017

The importance of lag structures in Causality test cannot be under estimated, because causality test is highly sensitive to lag structures. To reduce this menace, the Akaike Information Criterion (AIC) was employed in deriving the optimum lag length and this was three (3). This is shown in table 5 above.

4.5 Pair-Wise Granger Causality Tests

Table 6: Causality Result

Null Hypothesis	Obs	F-Statistic	Prob	Decision
DIMR → DBMS	32	3.30**	0.03	Reject
DIMR ← DBMS		0.09	0.85	Accept
DEXCR → DIMR	32	1.461	0.24	Accept
DEXCR ← DIMR		4.168*	0.01	Reject
DIMR → DINTR	32	0.699	0.56	Accept
DIMR ← DINTR		1.935*	0.14	Accept
DLTL → DIMR	32	2.034*	0.13	Reject
DLTL ← DIMR		1.651	0.20	Accept
DIMR → DTOPNSS	32	4.183*	0.01	Reject
DIMR ← DTOPNSS		0.711	0.55	Accept

Source: Researcher's extraction from E-view output 2017

To examine the feedbacks between variables and to provide the technique for determining whether one variable is significant in forecasting the outcome of the other, given the interrelationship between both variables, the pair-wise granger causality test is adopted within the restricted vector autoregressive framework with the $F_{(0.05,\ 6\ and\ 31)} = 2.00$ approximately. From the results in table 6 it is observed that infant mortality rate has a unidirectional causality with financial liberalization (broad money supply), exchange rate is granger caused by infant motility rate. It is also noticed that infant mortality rate granger causes trade openness in unidirectional manner (Partial feedback) and not the other way. The result

also shows literacy and interest rates are partial drivers of infant mortality. Thus, the alternative hypotheses for these the variables are accepted.

4.5 Vector Error Correction Model

Table 7: Vector Error Correction Estimates

	D(DIMR)	D(DBMS)	D(DTOPNSS)	D(DEXCR)	D(DINTR)	D(DLTL)
CointEq1	-0.00503	-0.63415	-0.11824	0.09132	-0.00204	-0.03849
S.E	(0.00077)	(0.29314)	(0.37822)	(0.05874)	(0.01568)	(0.04244)
t-statistic	[-6.57829]	[-2.1633]	[-0.31263]	[1.55479]	[-0.13062]	[-0.90703]
Vector Error Correction Results						
	D(DIMR)	**D(DBMS)**	**D(DTOPNSS)**	**D(DEXCR)**	**D(DINTR)**	**D(DLTL)**
D(DIMR(-1))	0.730742	0.828027	-7.415061	3.285728	0.278100	-0.884356
	(0.04684)	(1.17408)	(23.1271)	(3.59167)	(0.95892)	(2.59487)
	[15.6014]	[0.70526]	[-0.32062]	[0.91482]	[0.29001]	[-0.34081]
D(DBMS(-1))	-0.004696	0.233700	-6.220958	1.002524	0.109521	-0.854354
	(0.00834)	(0.20913)	(4.11937)	(0.63974)	(0.17080)	(0.46219)
	[-0.5629]	[1.11751]	[-1.51017]	[1.56707]	[0.64122]	[-1.84848]
D(DTOPNS(-1))	-0.000929	0.039247	-0.689098	0.065714	0.020010	-0.030080
	(0.00071)	(0.01769)	(0.34848)	(0.05412)	(0.01445)	(0.03910)
	[-1.3159]	[2.21843]	[-1.97743]	[1.21424]	[1.38490]	[-0.76931]
D(DEXCR(-1))	0.003440	-0.146989	1.947606	-0.124242	-0.031762	0.070771
	(0.00264)	(0.06617)	(1.30339)	(0.20242)	(0.05404)	(0.14624)
	[1.30313]	[-2.2214]	[1.49426]	[-0.61379]	[-0.58772]	[0.48394]
D(DINTR(-1))	-0.023104	0.739452	-5.173864	1.436019	-0.168259	-0.041241
	(0.0115)	(0.28849)	(5.68271)	(0.88253)	(0.23562)	(0.63760)
	[-2.0075]	[2.56317]	[-0.91046]	[1.62716]	[-0.71411]	[-0.06468]
D(DLTL(-1))	0.005954	0.018617	-0.349032	-0.171966	-0.100589	-0.053144
	(0.00385)	(0.09662)	(1.90315)	(0.29556)	(0.07891)	(0.21353)
	[1.54482]	[0.19269]	[-0.18340]	[-0.58183]	[-1.27473]	[-0.24888]
R^2	0.986	0.401018	0.266560	0.181861	0.228078	0.183814
Adjusted R^2	0.983	0.233303	0.061197	-0.047218	0.011940	-0.044718
F-Statistic	270.94	2.391071	1.297993	0.793878	1.055244	0.804325

Source: Author's extraction from E-view output 2017

Table 7 reveals that, apart from exchange rate D(DEXR), the rest of the co-integrating variables D(DIMR), D(DTOPNESS), D(DINTR), D(DBMS) and D(DLTL) are adjusting due to their negative signs. D(DIMR) and D(DBMS) are statistically significant. This is seen from their corresponding t-values of 6.58 and 2.13 respectively. This means that the error correction has the correct sign and that the speed of adjustment in the five variables converge in the long run but would converge more significantly faster in D(DIMR) and D(DBMS).

From table 7, the infant mortality rate (DIMR) model reveals that one period lag values of infant mortality rate, (IMR-1), exchange rate (EXR-1) and literacy rate (LTR-1) are not correctly signed as they have positive signs. The implication for infant mortality is that current level of infant mortality feeds on their immediate past period effects to positively spur up current mortality rate. This implies a spillover effect, possibly, emanating from ineffective policy attention. The non-conformity of literacy rate to a-priori expectation could be attributable to the dysfunctional education curricula

in Nigeria. This shows that, policy efforts in the Nigerian education system, has not yielded the desired result in mitigating infant mortality rate in the country. Interest rate (INTR), trade openness (TOPNS) and broad money supply (BMS) are correctly signed because they have negative signs as expected by theoretical relationship of the six regressors, one period lag variables of interest rate and infant mortality are statistically significant at 5% level. The result shows that a unit increase in one period past value of broad money supply will enhance 0.0046-unit decrease in current value of infant mortality, a unit increase in the immediate past value of trade openness will yield 0.0009-unit decrease in current value of infant mortality while one-unit increase in one lag value of interest rate will yield 0.023-unit decrease in current value of infant mortality. On the other hand, a unit increase in one period lag value of infant mortality will yield an increase of 0.73 in current value of infant mortality, one-unit increase in one period lag value of exchange rate will create an increase of 0.003 unit in current value of infant mortality while a unit increase in the immediate past value of literacy rate will produce a 0.005 increase in the current value of infant mortality.

The coefficient of determination R^2 is 99% but when adjusted (R^2) to its degree of freedom it deflated to 98%. This means that all the variables considered in the infant mortality model account for approximately 98% of total systematic changes in infant mortality rate in Nigeria. The F-statistic value of 270.94 is significant at 1% level. This also implies that there is a simultaneous significant relationship between all explanatory variables taken together and the dependent variable. Thus, the overall goodness-of-fit of the model is on the affirmative

5. Policy Implication

The results above connote a lot for policy. First, infant mortality rate granger causes financial liberalization. This perhaps suggests stimulations from the health sector owing to pressure of attention to infant health. Yet indices of infant mortality only reflect minimal repression. This calls for more serious policy efforts at optimization of scarce resources channeled to infant health for efficiency. Exchange rate was found to granger cause infant mortality rate. This reflects on the importance of exchange rate as a critical factor of welfare because of its determining influence on cost of living and hence affordability of infant health bills. This could also remind the government to beef up exchange rate policies in giving special preference to health sector especially with respect to the importation of medical facilities as current level of attention shows serious level of inadequacy. Infant mortality rate was also found to granger cause trade openness. This is perhaps in the quest for more effective medication for child health. This reminds that government should accelerate more trade policies in Nigeria especially in the health sector to enable this variable to impact significantly on infant mortality reduction.

One period lag of infant mortality rate (IMR-1) positively and significantly impacted on current infant mortality. Implied here is the fact

that, infant health issue is seen to mutually feed on each other. This is true as most causes of infant death burden are contagious diseases such as measles, chicken pox, to name but two. Interest rate also negatively and significantly impacted on infant mortality. This indicates that monetary policy instrument are vital in influencing child health in that they are critical variables in determining cost of living and child health care affordability. Finally, the result shows that financial liberalization and trade openness had a desirable impact on infant mortality even though they were not significant. This shows that infant mortality rate could be reduced if improved efforts and emphasis are placed on these policy directions.

6. Discussion

In the annals of policy development, be it monetary, fiscal, commercial or industrial, the target is to maximize the health of the populace which will enhance economic development for the affected economy. This can always be achieved by increased productivity in such economy. In the course of achieving this target the Nigerian government has been involved in series of policy adjustments and development of which financial liberalization is one of such efforts. The result of this study shows, on the whole, that, variables of financial liberalization policy satisfy their a-priori expectations. This implies that financial liberalization policy in Nigeria can be used in reducing infant mortality. This finding runs counter to Qadir and Majeed, (2018) and Barlow, (2018). Their findings actually show that trade liberalization did not have reducing effect on child mortality in Pakistan and low and medium income countries respectively. The exchange rate variable which shows a non-reducing effect on maternal mortality, in the study, can be attributed to the inability of the Nigerian economy to fulfill the Marshall-Learner trade condition. It was however, also, found to granger cause infant mortality. This still underscores the importance of financial variables in the annals of infant mortality. The adjusted coefficient of determination is 98% and the F-statistic was statistically significant at 1% level. This shows that the goodness-of-fit of the model is very good. This, therefore, confirms that, in modeling infant mortality in Nigeria, the explanatory variables in the model are very crucial. The import here, therefore, is that health care policy should be effective to avoid the subsisting effect of infant mortality on itself while educational curriculum in Nigerian schools should be modified to enable it contribute its expected reducing effect on infant mortality. This can be achieved by enriching the curricular with health and hygiene studies. Thus on the whole the study confirms the efficacy of financial liberalization on infant mortality in Nigeria.

7. Policy Recommendations

From the findings, the study recommends as follows:

1. Policy attention to financial liberalization, trade openness and interest rate by the Nigeria government is in the right direction but efforts should be more intensified in order to achieve the

desired objectives of mitigating infant mortality in Nigeria economy.

2. Exchange rate stability should be pursued so as to moderate its effect on cost of living and affordability of infant health care cost.
3. Education curriculum and schooling cost should be revised so as to enhance increase in number of female graduates and as well as making them employable.

8. Conclusion

The most crucial macroeconomic objective of any economy is to maximize the health of the populace. With adequate health of the populace of any economy, a veritable component in the composition of human capital is assured. This, by implication means that productivity is guaranteed which will, in turn, guarantee GDP growth and hence improvement in economic development. The study examines the impact of financial liberalization on infant mortality in Nigeria. Its findings confirm the efficacy of financial liberalization in mitigating infant mortality in Nigeria. The model was found to be of good fit. The Nigerian infant mortality model, as specified by the study, was also found to be of very good fit. This therefore creates the motivation that in combating the health challenges, and infant mortality, in particular, in Nigeria, Monetary policy can wield resourceful utility. Prior to this study, monetary studies are mostly viewed and concentrated on commercial and industrial instrument of productivity. This study has however, shown and confirmed that the excess of any economic policy is to enhance productivity and economic development and that health being a critical component of human capital needed to be considered in the ultimate development model of the Nigerian economy.

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