Fiscal Decentralization and Social Service Delivery Policy Response in Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors have read and approved the final manuscript.

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ABSTRACT

This study examines the impact of fiscal decentralization on social delivery policy response in Nigeria, utilizing panel data for fourteen states in Nigeria for the period covering from 2000 to 2019. Specifically, this study evaluates the impact of fiscal autonomy on social indicators such as infant mortality rate, maternal mortality rate and adult literacy rate. The panel vector error correction mechanism (PVECM) the granger causality test was employed as the estimation techniques. The result of the granger causality test to determine the direction of causality relationship among the

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variables in the estimated model showed that there was one way directional causality running from maternal mortality rate (MMR) to fiscal autonomy (FISA); adult literacy rate (ADLIT) to population (LPOP); population (LPOP) to maternal mortality rate (MMR), adult literacy rate (ADLIT) to maternal mortality rate (MMR), and education expenditure (LEDU) to fiscal autonomy (FISA). This means that maternal mortality granger caused fiscal autonomy in Nigeria. The result also implies that adult literacy rate granger caused growth in population, and growth in population granger caused maternal mortality rate in Nigeria. The error correction variable in the infant mortality rate equation has the coefficient of 0.069. This indicates that approximately 6.9 percent of the distortion in the system would be corrected each whenever the system moves away from equilibrium. This depicts a slower speed of adjustment mechanism from the disequilibrium in the short run to equilibrium in the long run. The estimated infant mortality rate equation has a very good fit on the data and very high explanation power, given the adjusted R-squared of 0.736. The adjusted R-squared of 0.736 showed that approximately 74 percent of variation in the dependent variable (infant mortality rate) was accounted for by variations in the independent variables. This result is not in agreement with the theoretical postulate. In real term, the result showed that an increase in education expenditure by one percent would lead to a decrease in adult literacy rate by 0.22 percent, other things being equal. This result showed that spending in education has not improved the literacy rate in Nigeria. This suggests that it is either the fact that spending in education by the government has been so small that it cannot bring about improvement in the literacy or that funds meant for educational projects are siphoned into private pause, thereby resulting to huge decline in terms of literacy rate. Lastly, growth in population has a declining effect on adult literacy rate in Nigeria. This inference is in accordance with a priori expectation showing that as population increase, pressure is being put on the existing educational facilities and overwhelm it, leading to the decline in adult literacy rate. In concrete term, an increase in population by one percent resulted to a decrease in adult literacy rate by 0.73 percent, other variables remaining the same. Based on our result, the study made some policy recommendation for the states to double their efforts in generating their internal revenue to become fiscally autonomous less reliance on the federal government for allocation. Also, there is need for the government to raise her expenditure in education and health sectors so as to increase the literacy rate and health sector outcomes in the country.

1. INTRODUCTION

One puzzle amongst economist in developing nations has been how to create a balance in the degree of decentralization of expenditure and the degree of decentralization of revenue sources amongst sub-national and federal government for funds transfer to meet expenditure needs meant for social sector development.

This is termed fiscal decentralization- and it is a process by which a central government cedes powers from the exclusive legislative list to the sub-national government for economic development [1]. "It can also be seen as a two-dimensional policy that involves either decentralization of a tax instrument when states and local governments bear the responsibility for implementing full expenditure functions [37-44]. Or a situation where states and local governments are allowed more revenue sources.

This is because for any organization the Managerial behaviour emanating from corporate culture and subcultures can either enhance or hinder the successful implementation of its strategy" (Egbe, Ifere and Ejor , 2010).

"It is essentially about the allocation of government resources and spending to the various tiers of government" [15,16]. "To enhance economic growth and development potentials, developing countries have embraced the decentralization of public spending and revenue collection from governments to sub-national government" (Aigbokhan,1999) "Thus, the issue of tax jurisdictions, expenditure assignment and which tier of government can best deliver social services to accelerate economic development continues to be the focus of active and extensive research" [2]. Although, fiscal decentralization has the risks of horizontal fiscal imbalances, but it could increase the

capacity and efficiency for high-quality public goods and services [17].

2. LITERATURE REVIEW

"Many developed economies of the world today like Canada, United States, Australia, Brazil, and Germany have long ago developed elaborate forms of fiscal decentralization between the central and other levels of government to address the issue of expenditure assignment and tax jurisdiction" [18,3], Aigbokhan, 1999 and [19]. This policy has been embraced as a strategy for weakening the dominance of the central government fiscal operations to bring these nations into sustainable economic development. Arends, (2020). Sees "the dangers of decentralization as highly relevant to local public service provision". Studies like (Slavinskarite, 2017), [20,21] have empirically proven that developed economies of Europe have a higher degree of fiscal decentralization and more power for financial solutions than the emerging countries. In terms of economic growth, Chugunoy, Makohon and Krykun [22], as well as Korotun, Keneva, Drepin, Levaleva and Kucherenko, [17] investigated the impact of fiscal decentralization on economic growth and GDP per capita growth of emerging markets respectively. Similarly, Permai, Christina, and Gunawan [23] investigated the effect of fiscal decentralization indicators on regional economic performance and found spatial dependencies and spatial heterogeneity on economic performance between locations that affect economic performance using geographically weighted regression (GWR).

In a bid to foster economic growth and development, the central government owing to her federal structure had a consistent increase in her annual budgetary expenditure on health and education sectors to improve social outcome. Despite increased expenditure in health and education sectors in Nigeria, access to healthcare services has been severely limited leading to little or no improvement in the ratio of infant and maternal mortality rate, via adult literacy rate.

This ebb is largely due to the fact that expenditure powers are concentrated at the federal level averaging 72.05 percent while decentralization at the state level averaged only 21.05 percent and only 6.88 percent allocated to the local government. Also, revenue concentration at the center averaged 95.26percent while revenue decentralization at the state level averaged just 4.24 percent and 0.50 percent for local governments. The degree of decentralization of expenditure is higher than the degree of decentralization of revenue sources. The consequence remains that sub-national governments are usually dependent on federal governments for funds transfer to meet their expenditure needs, which has been insufficient to social sector development.

"Despite the appeal for fiscal decentralization, empirical findings are inconclusive on its impact on economic growth and development in Nigeria. While studies such as [24,18,25], revealed a positive relationship between fiscal decentralization and social service development". While Aigbokhan, 1999, Philip and Isah, [25] found "a negative relationship between fiscal decentralization and economic development in Nigeria. The contradiction in the empirical literature in Nigeria provides the motivation for a re-examination of the relationship between fiscal decentralization and social services delivery in Nigeria. Also, this study will examine the issue of causality between fiscal decentralization and social service development using health and education outcome such as infant mortality rate, maternal mortality rate and adult literacy rate".

One of the key constraints to effective fiscal policy is the structure of Nigeria fiscal federalism. This is especially so with respect to the impact of fiscal policy on social services delivery, consisting of education and health outcomes [45-52]. Over the years however, there have been consistent budgetary allocation to the health sector with relative contribution to economic development. This is as evident in World Bank [4] fact sheet, which revealed that health expenditure as a percentage of GDP in Nigeria was 4.8percent in 1995, thus increased to 5.6percent in 1999 and 7.5percent in 2003. It there after decreased to 6.8 percent in 2009 and again reduced to 5.7 percent in 2010. There was a relative increase between 2012 and 2013, to 6.09 percent and there after decreased to 4.56 percent in 2014.

Similarly, despite the huge annual budgetary expenditure on education, the ratio of literacy rate remains an issue that must be addressed. CBN [26] report revealed that adult literacy rate ranges between 59 percent and 70 percent among the states with Kano state having the highest illiteracy rate within the period.

In a United Nations Report on "Trends in maternal mortality 1990-2010", it was concluded

that 14 percent of the world deaths related to childbearing occur in Nigeria, while maternal death rates around the world have almost halved over the past two decades. According to the report, Nigeria's ranks 10th highest in the world with 630 deaths for every 100,000 live births.

"Data from save the children organization (SCO) revealed that almost 800,000 Nigerian children die every year before their fifth birthday, making Nigeria the country with the highest number of newborn deaths in Africa. According to a recent estimate by the WHO, United Nations Children Emergency Fund (UNICEF), United Nations Population Fund (UNPF) and the World Bank about 358,000 maternal deaths occurred worldwide in 2008 out of which 50,000 occurred in Nigeria. The report, however, notes that the Maternal Mortality Rate (MMR) (whose deaths per 1000,000 live births) for Nigeria declined from 980 in 2000 to 840 in 2008 which is described as "insufficient progress" (WHO, 2010).

WHO (2015) also reported an increase in Nigeria maternal mortality rate to 1100 in 2013? The wide disparity of Maternal Mortality Rate (MMR) of different regions of Nigeria is also noteworthy, according to the Society of Gynecology and Obstetrics of Nigeria (SOGON). Similarly, in 2014 the MMR in Kano State (North West) was 7523 per 100,000 compared to 783 per 100,000 in Enugu State (South-East).

This scenario is largely due to the ineffectiveness of Nigeria fiscal federalism. The practice has seen to a large extent increase in budgetary spending in improving health and education outcomes in this regard. Over the years, however, Nigeria budgetary expenditure in meeting MDG's goal 2,4 and 5 have been resounding in achieving sustainable development, this scenario has left the objective unachievable. There has been a consistent increase in budgetary transfers, conditional and non-conditional cash transfer to sub-national governments to curb the situation posed by infant and maternal mortality rate. In contrast, this spending has shown little or no positive result.

2.1 Fiscal Decentralization and Infant Mortality Rate

"Infant mortality is believed to be a barometer of health status of a society" [27]. "And in case fiscal decentralization is successful in reducing infant mortality rate, it is believed that it can improve the health condition of a society. Infant mortality rate (number of infant deaths per 1000 live births) is an indicator used to compare the health status of a country's population" (WHO, 2011). "Nigeria's figure on the index of world health organization remains high in the world today, even by the standard of developing countries. Currently, one tenth of children born in Nigeria dies under the age of one year (infant mortality rate) of 100 per 1000 live births, and a fifth die before their fifth birthday, under five mortality rates of 201 per1000 live births" (National Population Commission 2009).

According to the Nigeria Health Journal (2014) only 5 percent of the country's budget is allocated to health care over the years. This deficit in fiscal allocation has brought about the health menace under study. The nation's poor healthcare delivery via infant mortality rate has been blamed on the country's practice of fiscal federalism. Fiscal federalism has brought about a shortfall in financial resources of sub-national Governments. Who are quite far from achieving desired economic development?

To this end, the practice of fiscal decentralization as a macroeconomic policy has been considered as an effective policy provision of social services and thereby increases efficiency, good governance and above all foster economic development. It is also believed that fiscal decentralization is consistently associated with lower infant mortality rates. A number of literatures that are in agreement with this submission include; Robalino ,Picazo, and Voetberg [5], who assessed "the impact of infant mortality rates on fiscal decentralization (measured by the share of public expenditure of local governments), using panel data, with samples from both high and low income countries for the period 1970-1995. Findings from the study showed that fiscal decentralization was associated with a significant reduction in infant mortality rates, particularly, in countries that promoted political rights. Based on the obtained results, the authors affirmed the fact that greater fiscal decentralization will only be successful in lowering mortality rates if there is significant local institutional capacity". In addition, the result showed that; in countries where the sub-national Governments are responsible to manage higher share of total health expenditures, tend to have better health indicators including infant mortality rate (IMR). Their analysis demonstrates that sub-national governments with better administrative capacity

are more effective providing better health care services. This implies that for fiscal decentralization to be more useful it needs to be accompanied with administrative decentralization.

Country specific analysis have also been conducted for the assessment of fiscal decentralization on health outcome [53-56]. The result showed that fiscal decentralization has a positive impact in reducing infant mortality rate in Colombia. For instance, Schwartz [6] study on "the Philippine suggests a positive correlation between fiscal decentralization and health outcome. The study compares the level and composition of health expenditure during both pre and post devolution reforms in 1994. Empirical results of the study show a comparative increase in per capita health expenditures following the devolution, and the rise on expenditure is more prominent in provincial level compared to municipal ones which may be because the former are responsible for major health projects and hospitals".

Another interesting finding showed that after the devolution, the sub-national governments tend to have higher allocation for health sector at the expense of other social services. Other studies also showed similar results regarding the positive impact of fiscal decentralization on infant mortality rate [57-62]. For example, Arze del grando, Martinez-Vazquez and McNab [20]. showed "a common trend in Bolivia, Ecuador, Elsalvador and Nicaragua where higher health expenditure is followed by fiscal decentralization".

In related research carried out by Eugene, Maria and Vincent [28], "Colombia has experience a significant decrease in infant mortality rates, and in parallel, an increasing decentralization of health outcomes. The most specific health competencies shifted to the municipalities lie in the demands of promotion, health education and preventive healthcare in this way, municipalities were encouraged to channel local resources to meet their new responsibilities at local level".

In figures, local health resources as a proportion of total health spending, increased from 1.1 percent in 1974 to 6.1 percent in 2003 [7] to this end, fiscal decentralization helped to reduce infant mortality ratio in Colombia.

In Rwanda, for example, infant mortality rate decreased from 107 per 1000 live births in 2000 to 86 in 2005 and 62 in 2007 and 58 in 2011, due to a rapid expansion in health service delivery.

2.2 Fiscal Decentralization and Maternal Mortality Rate

"Maternal mortality has been of great concern in Nigeria. The country is not lagging behind in regional comparisons but will also be important to meet its millennium development goal (MDG) on maternal mortality (MDGs). Despite high utilization of Ante-natal care (ANC) services and high rates of skilled birth attendance; maternal mortality has remained stubbornly above 800 per 100,000 live births in the year 2014" (CBN 2015). "This is about five times as high as the MDG target set at 102 per 100,000 live births and represents one of the highest maternal mortality rates in African" [29].

With maternal mortality being an integral part of the MDGs, developing countries have been experimenting with different types of intervention to increase access and utilization of maternal care services including for example, subsidies, vouchers, or conditional cash transfers programs (CCTs) [63-66]. However, evidence on the effectiveness of these interventions is still scarce and the debate on how best to promote access and utilization is still ongoing. To this end, fiscal decentralization has consistently been advocated for even development in improving maternal mortality ratio as a mechanism for increasing the responsiveness of social services.

Evidence of fiscal decentralization in reducing maternal mortality rate has firmly been supported by many literatures. Sekabaraga et al. [8] carried out a work in Rwanda posit that the impact of fiscal decentralization in improving health outcome cannot be over emphasized. In their study, they found that maternal mortality ratio has declined at an annual rate of 12.1 percent to reach 383 per 100,000 live births in 2008, ranking it among the best – performing countries in the world. The rate decline far exceeds the 55percent rate needed to meet the MDG target of reducing the maternal mortality ratio by three quarters between 1990 and 2015.

These achievements have been the result of innovative strategies (partial decentralization in health expenditure) to address some of the key challenges affecting maternal mortality. The share of women delivering their babies in health facilities has steadily increased, rising from 255 of pregnant women in 2000 to 45 percent in

2008. Many challenges remain but preliminary data from the ministry of health for 2010 suggest that this figure has risen to two-third of all pregnant women; the finding should be validated by the 2010 demographic and health survey.

Similarly, Indonesia embarked on a far-reaching decentralization reform in 2001, granting a substantial degree of political and fiscal autonomy to district governments which are now to a large extent responsible for social service delivery [67-71]. With this relative autonomy, district governments in Indonesia have gradually implemented local healthcare financing schemes, collectively known as Jamkesda (Jamanan Kesehatan Daerah – Regional Health Insurance). The first local Insurance Scheme emerged soon after decentralization was realized but the proliferation of the Jamkesda schemes accelerated after 2005 in the wake of the nationwide subsidized social health insurance for the informal sector and the poor [7].

This measure of decentralization enabled a decrease in the ratio of maternal mortality rate in Indonesia between 2002 till date. Major progress has also been made in extending the coverage of vitamin A supplementation among children and women through a mass campaign and integration into routine health facility services. Improvement in the use of women's health services is also evident with significant increase in the proportion of assisted birth deliveries and the number of emergency obstetrical cases referred, the use of modern contraceptives increases ever observed.

The proportion of women having at least one antenatal consultation rose from 58 percent in 2002-96percent in 2011. The proportion of assisted deliveries increased from 39 percent in 2005 to 52percent in 2007. This progress occurred in a context in which annual total per capita health expenditure doubled, from 817 to 834 dollars between 2003 and 2006.

Nauman [30] posit that maternal mortality rate is a very important indicator reflecting a country's economic, cultural or health system development, also recognized worldwide. Maternal mortality includes the deaths during pregnancies or the ones 42 days after deliveries. Traditionally, thus indicator includes direct maternal deaths from pregnancy, indirect maternal deaths from pregnancy and maternal deaths that occur during pregnancy. As a worrying factor in the world today, many

countries have improved on her public policies in a bid to meet MDGs target. Among these policies is fiscal decentralization. De Allegri, Igor Jean De and Abe [31]. Show that in Burkina Faso due to improved public policy in health, 80percent of subsidy on delivery services increased the number of institutional deliveries from 49 to 84 percent over a five-year period. Bangladesh, Cambodia, and Kenya, have been experimenting with conditional cash transfers for maternity care. While studies have found generally positive effects of conditional cash transfers on institutional deliveries. In contrast, these schemes appear to be less successful in promoting and improving ante-natal care.

Accordingly, Gawi, Kennedy Wurzel and Andre [32]. Showed that in Indonesia, fiscal and political decentralization in 2001, district government have increasingly engaged in local health insurance programs. This development has been mainly driven by coverage gaps in national health insurance programs and local political factors. This measure has brought a major improvement in the health outcome, hence, reducing maternal mortality ratio in Indonesia. This success can also be attributed largely to an increase in the use of essential health interventions, particularly high impact interventions that are critical in reducing maternal mortality rate.

In a related development Zhu, Fu and Li [33], revealed that in 1990 the maternal mortality ratio in Indonesia was 600 per 100, 000 live births. In 2010 after the decentralization policy to achieve MDGs, Indonesia had a reduced maternal mortality rate of 150 per 100, 000 live births in 2015. This means a decrease of 70percent per 100,000 live births must be accomplished within five years. Indonesia's vice minister of health stated that achieving MDG goal 5 is the most challenging compare to other MDG goals. This measure has also been enabled by improvement in the number of skilled health personnel in Indonesia between 1991 and 2007 (32 percent of 79 percent). According to report, 60 percent of births occurred at home. However, these increases are not yet being reflected in reduced maternal mortality. Similarly, as a measure to eradicate maternal mortality, there was an increase of ante-natal care coverage (at least one visit by skilled health provider) by 17percent between 1991 and 2007 (from 76 percent to 93 percent). However, there was only a slight increase between 2002 and 2007 (from 92 percent to 93 percent). Recent reports state that

the coverage of antenatal care in 2007 was 82 percent. In addition, the same year caesarian section rate in Indonesia was 70 percent (11 percent in urban areas and 4 percent in rural areas. This means that for rural areas, it was close to the minimum target of 5 percent for caesarian sections in rural areas. The percentage of births attended by skilled health personnel was higher in mothers from urban areas, from the highest wealth quintile, and with secondary or higher education level.

2.3 Fiscal Decentralization and Adult Literacy Rate

The practice of federalism in Nigeria has hindered to a large extent the development of education in spite of the huge annual expenditure on education for many years. Over the years, however, Adult literacy rate ranges between 59 percent and 88 percent among the thirty six states of Nigeria, with Kano having the highest range between 73 percent and 83 percent in the period studied. UNDP [9]. However, a state by state data has showed a large difference in literacy rate among the six geo political zones of the country. According to MDG 2005 report, literacy level in the country has steadily and gradually decreased especially between 15-24 years group.

By 2009 the overall literacy rate had declined to 64.1 percent from 71.9 percent in 2006. The trend was in the same direction for male and female members of the 15-24 years age bracket. Among the male, the rate of declined from 81.35 percent in 1991 to 69.8 percent in 1999. The decline among the female was from 62.49 percent to 59.3 percent during the same period. In spite of consistent budgetary allocation, conditional cash transfer, grants, out of pocket expenses etc. the rate of decreasing literacy rate in Nigeria have become a worrisome issue.

In recent times, emphasis and policy implementation on improving education outcome in developing economies have shifted towards fiscal decentralization. Existing literature on this context have shown that greater fiscal decentralization is consistently associated with improving adult literacy rate. In an empirical evidence conducted by Robalino (2001). Suggest a statistically significant and positive association between fiscal decentralization and the literacy rate. The result showed that transferring expenditure responsibilities to provincial or sub-national governments can increase the enrollment rate and against the quality of schools, due to which pupils tend to retain in schools which results into more literacy rate in relation to this, one unit increase in the share of provincial government expenditure share leads to a rise in the literacy rate by 0.4 percent in the first model and 0.99 percent in the second model.

The above result is in coherence with the existing empirical works of Gupta et al [10] and Psacharopoulus [34] showed that more expectancy on social services, such as education is highly and likely to enhance economic growth, decrease income inequality and reduce poverty. Psacharopoulus [35] illustrates how expenditure on basic education is associated with high social rate of return whereas in Baluchistan total literacy rate was recorded as 45 percent with 62 percent male and only 23 percent female literacy rate.

The relationship between fiscal decentralization and literacy rate at provincial level is strongly significant and positive which suggests that different degrees of fiscal decentralization across provinces do not affect its impact on education outcome. However, a portrayer of this positive and statistically significant association underlines the fact that poorer provinces like Balochristan and IKPLC with high illiteracy rate since 1990's have made noticeable improvement in their literacy rate thereafter. Despite several constraints, the correlation between decentralization and literacy rate is strongly significant with a positive coefficient across all provinces.

Similarly, (Alfonso and Mello, 2000) who offers some data on changes in terms of human development indicators in Brazil between 1990 and 2000. As the data suggests, education indicators have improved across the country, with the disparity between regions decreasing somewhat over the period. Adult literacy rate has increased from 68.84 percent to 78.23 percent over the period and school attendance from 55.52 percent to 72.95 percent. The ratio of indicators for the south eastern region to the North eastern region gives a sense of the magnitude of the disparity between the country's richest and poorest regions. In terms of rate of school attendance for example, the poorest regions have all but caught up with the richer ones, and the disparity in terms of adult literacy rate has also diminished in Brazil.

Furthermore, Ghuman and Ranjeet [11] found the impact of fiscal decentralization on adult literacy rate in India during the post decentralization period within a span of three years, (1997-2000), 30,000 new schools were opened under education guarantee scheme (EGS) against the opening of 80,000 schools spread over 50 years of the pre-decentralization phase. The beneficiaries included 2 million students, majority of which were tribal and girl children from the poorest 40 percent households. On similar link under the adult literacy model, the literacy rate witnessed an increase of 20 percent points from 44.7 percent in 1991 to 64.1 percent in 2001.

The female literacy rate increased from 29.5 percent in 1991 to 50.3 percent in 2001, thus reducing the gender literacy gap from 29.3 percent in 1991 to 26.5 percent in 2001. The empirical evidence from another study by Antonio (2017) also revealed that most of the education outcomes comprising national average years of schooling, adult literacy rate, female literacy rate and school dropout rate have improved significantly after decentralization.

2.4 Theoretical Framework

In the context of this study two theories have been adopted and Wallace Oates [12]. Luiz de Mello [13] "proposed a straightforward theorem that formalized the basic efficiency argument for the decentralization provision of certain kinds of public goods". The theorem lays out a set of goods to be pareto-superior to a centralized determination of public outputs.

Wallace Oates Theory: Oates [36] and Tiebout (1956) offer a theoretical framework in which fiscal decentralization can guarantee an efficient provision of public goods simply because local preferences are better satisfied than in the case of centralization. Both previous approaches assume a benevolent government, but the leviathan hypothesis is based on the opposite assumption whereby decentralization is a means of reducing governments size to stern its inefficient behavior.

Luiz de Mello Theory : This theory recognizes the fact that sub-national government have an important role to play in the implementation of public policies aimed at fostering social and human development. The key argument for this remain that they are closer to the intended beneficiaries of public programmes. For this reason sub-national government are believed to be better equipped to extract information and local preferences and need more effectively than the central government and to be accountable to local residents. With greater voice in the design and implementation of public policies, local residents can also benefit from greater choice in the goods and services delivery to them by the government.

3. METHODOLOGY

The study adopted the panel estimation method using the fixed and random effect models to test the error correction variables (ECM). A typical panel data regression model takes the form below:

$$y_{it} = \alpha_{it} + \beta x_{it} + \varepsilon_{it}$$

Where: y is the dependent variable, x is the explanatory variable, α and β are the coefficients to be estimated, i and t represents indices of individuals and time, and ε is the error term.

The study used secondary data sourced from panel survey of selected states in Nigeria from 2000 to 2015. The data was collected from the Central Bank of Nigeria (CBN) statistical bulletins (various years), Central Bank of Nigeria (CBN) annual report and statement of accounts (various years), National Bureau of Statistics (NBS) abstract of statistics (various years), publication of states bureau of statistics, actual and estimated annual budgetary appropriation of the states, states ministries of health, states ministries of education, the World Bank Datasheet (Various years), annual budgetary speeches of state governors (various years).

The variables in the empirical models for this study are rooted in the fiscal decentralization theories developed by Luiz De-Mello [13] and Wallace-Oates [12] but abstracted from Robalino et al. [5] and Akpan [14] with slight modifications. The dependent variables for this study include infant mortality rate, maternal mortality rate, and adult literacy rate. The independent variables captured include fiscal autonomy, health sector expenditure, education sector expenditure and growth in population.

On the basis of theoretical and empirical exposition, the model for this study is expressed functionally as:

$$IMR_{it} = f(FISA_{it}, HEXP_{it}, POPG_{it}) \qquad (3.1)$$

$$MMR_{it} = f(FISA_{it}, HEXP_{it}, POPG_{it}) \qquad (3.2)$$

$$ADLT_{it} = f(FISA_{it}, EDEXP_{it}, POPG_{it}) \qquad (3.3)$$

Where:

IMR = infant mortality rate, measured by the number of infant deaths per 1,000 live birth per states of interest in Nigeria.

MMR = maternal mortality rate, measured by the number of maternal deaths per 100,000 live birth per states of interest in Nigeria.

ADLT = adult literacy rate, proportion of adult population aged 15 and above that is literate in Nigeria states of interest.

FISA = fiscal autonomy, measured by the ratio of internally generated revenue by the state government to fiscal allocation from the federal government to the state governments.

HEXP = health expenditure by state governments in Nigeria (in millions of naira)

EDEXP = education expenditure by state governments in Nigeria (in millions of naira)

POPG = growth in population (in percent) of states in Nigeria.

Equations 3.1, 3.2 and 3.3 can be expressed in an econometric form as follows:

$$IMR_{it} = \alpha_0 + \alpha_1 FISA_{it} + \alpha_2 LHEXP_{it} + \alpha_3 POPG_{it} + \varepsilon_{1it} \qquad (3.4)$$

$$MMR_{it} = \beta_0 + \beta_1 FISA_{it} + \beta_2 LHEXP_{it} + \beta_3 POPG_{it} + \varepsilon_{2it} \qquad (3.5)$$

$$ADLT_{it} = \delta_0 + \delta_1 FISA_{it} + \delta_2 LEDEXP_{it} + \delta_3 POPG_{it} + \varepsilon_{3it} \qquad (3.6)$$

4. RESULTS AND DISCUSSION

4.1 Unit Root Texts

In the cause of using a panel estimation technique, the variables were tested to determine the order of integration. A stationary test was carried out using the augmented Dickey –Fuller (ADF) test and Philips Perron (PP) test for Unit Root Result. The result of the panel group unit root test showed that the series was stationary at level using both ADF and PP statistics. This is because of the zero probability values for both test statistics that were less than 0.05 at five percent level of significance. This means

that the series was integrated of order 1(0).

Since the series was integrated of order I(0), that is, the series was stationary at level, requires no conduct of cointegration test to determine the existence of long run relationship among the variables. For this reason, the study concludes that there is occurrence of long run relationship among the variables.

4.2 Granger Causality Test

The result of the granger causality test to determine the direction of causality relationship among the variables in the estimated model showed that there was one way directional causality running from maternal mortality rate (MMR) to fiscal autonomy (FISA); adult literacy rate (ADLIT) to population (LPOP); population (LPOP) to maternal mortality rate (MMR), adult literacy rate (ADLIT) to maternal mortality rate (MMR), and education expenditure (LEDU) to fiscal autonomy (FISA). This means that maternal mortality granger caused fiscal autonomy in Nigeria. The result also implies that adult literacy rate granger caused growth in population, and growth in population granger caused maternal mortality rate in Nigeria. Furthermore, adult literacy rate granger caused maternal mortality rate. Lastly, expenditure in education granger caused fiscal autonomy.

Other results of the granger causality test were that there no causality relationships between fiscal autonomy (FISA) and adult literacy rate (ADLIT); fiscal autonomy (FISA) and infant mortality rate (IMR); education expenditure (LEDU) and adult literacy rate (ADLIT); education expenditure (LEDU) and infant mortality rate (IMR); health expenditure (LHEA) and maternal mortality rate (MMR); health expenditure (LHEA) and infant mortality rate (IMR); and growth in population (LPOP) and infant mortality rate IIMR).

4.3 Over-Parameterized Results

The results of the over-parameterized specifications are depicted in Table 1. As indicated in the table, the error correction variables for all specifications have their expected negative signs and then were all statistically significant as postulated theoretically. The error correction variable in the infant mortality rate equation has the coefficient of 0.069. This indicates that approximately 6.9

percent of the distortion in the system would be corrected each whenever the system moves away from equilibrium. This depicts a slower speed of adjustment mechanism from the disequilibrium in the short run to equilibrium in the long run.

The estimated infant mortality rate equation has a very good fit on the data and very high explanation power, given the adjusted R-squared of 0.736. The adjusted R-squared of 0.736 showed that approximately 74 percent of variation in the dependent variable (infant mortality rate) was accounted for by variations in the independent variables. The remaining 26 percent that is left unexplained could be due largely to variation in other variables that influence infant mortality rate not captured in this study.

In the same vein, the F-statistics of 3.243 showed that the overall model is statistically significant at the five percent level of significance. This is so because the computed F-statistic of 3.243 is greater than the table value of 1.67 at the five percent level of significance. The significance of the overall model showed that the independent variables have joint impact on the dependent variable.

The coefficient of the error correction variable in the maternal mortality rate equation of 0.875 showed that approximately 88 percent of systemic disequilibrium in the estimated equation was corrected each year. This represented a fast speed of adjustment from the disequilibrium in the short run to equilibrium in the long run. This shows the proportion of shocks that will be corrected after the initial disequilibrium condition of the system due to shocks. The adjusted R-squared of 0.582 showed that the estimated model has a moderately high fit on the data. In particular, the adjusted R-squared of 0.582 showed that about 58 percent of the total variation in the dependent variable has been explained by the independent variables. The model therefore has moderately high explanatory power.

The high value of F-statistics of 12.118 showed that the estimated regression equation is statistically significant at the five percent level of significance. This is because the computed F-statistic of 12.118 is greater than the F-statistic of 1.67 from the table. The statistical significance of the overall model showed that the explanatory variables exhibited joint impact on the dependent variable.

The coefficient of the error correction variable in the adult literacy equation of 0.035 showed that approximately 3.5 percent of the disequilibrium in the adult literacy rate equation was corrected each year. This represents a slow speed of adjustment of the system from short run disequilibrium to long run equilibrium.

The adjusted R-squared of 0.541 showed that the estimated equation exhibits a good fit on the data. The result based on the adjusted R-squared showed that approximately 54 percent of the entire variation in the dependent variable is explained by variation in the independent variables.

Meanwhile, the F-statistic of 2.967 showed that the estimated adult literacy rate equation is statistically significant at the five percent level of significance. This is so because the computed F-statistic of 2.967 is greater than the critical F-statistic of 1.67 at the five percent level of significance. This indicates that the explanatory variables have a joint effect on the dependent variable.

4.4 Analysis of Infant Mortality Rate Equation

The result of the parsimonious vector error correction model as depicted in Table 2 showed that the coefficient of the error correction variable has the expected negative coefficient and was statistically significant in line with theoretical expectation. Its coefficient of 0.720 showed that approximately 72 percent of systemic disequilibrium in the estimated equation was corrected each year. This represented a fast speed of adjustment from the disequilibrium in the short run to equilibrium in the long run. This shows the proportion of shocks that will be corrected after the initial disequilibrium condition of the system.

The adjusted R^2 of 0.716 for column 1, Table 2 shows that about 71.60percent of the variation in the dependent variable has been explained by the independent variables. The model therefore has a high explanatory power.

The high value of F-statistics of 6.243 showed that the estimated regression equation is statistically significant at the five percent level of significance. This is because the computed F-statistic of 6.243 is greater than the F-statistic of 1.67 at the five percent level of significance. The statistical significance of the overall model

Table 1. Summarized results of the panel unit root test for the study's variables

Methods/ variable	level of integration	ADLIT	FISA	LEDU	LHEA	LPOP	MMR	IMR
Levin, Lin & Chu t*	at level	-5.40141	-3.12789	-13.7122	-15.5718	-14.5264	-8.97157	-12.1963
		(0.0000)	(0.0009)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Decision	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
Im, Pesaran and Shin W-stat	at level	-2.93007	-2.47263	-4.99183	-11.8605	-10.8573	-3.65214	-6.80425
		(0.0017)	(0.0067)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)
	Decision	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
ADF - Fisher Chi-square	at level	51.5137	71.0489	53.2387	157.838	145.132	73.0891	91.4920
		(0.0044)	(0.0000)	(0.0028)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Decision	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
PP - Fisher Chi-square	at level	47.8677	88.3916	37.8693	204.151	180.959	38.6862	88.8390
		(0.0111)	(0.0000)	(0.1009)	(0.0000)	(0.0000)	(0.0861)	(0.0000)
	Decision	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)

Table 2. Granger causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
FISA does not Granger Cause ADLIT	196	0.25021	0.7789
ADLIT does not Granger Cause FISA		0.03442	0.9662
IMR does not Granger Cause ADLIT	196	1.64060	0.1966
ADLIT does not Granger Cause IMR		1.76622	0.1738
LEDU does not Granger Cause ADLIT	196	0.31822	0.7278
ADLIT does not Granger Cause LEDU		0.54173	0.5826
LHEA does not Granger Cause ADLIT	196	0.10894	0.8968
ADLIT does not Granger Cause LHEA		1.86815	0.1572
MMR does not Granger Cause ADLIT	196	0.21391	0.8076
ADLIT does not Granger Cause MMR		2.77046	0.0652
LPOP does not Granger Cause ADLIT	196	0.47536	0.6224
ADLIT does not Granger Cause LPOP		2.35509	0.0976
IMR does not Granger Cause FISA	196	0.92870	0.3968
FISA does not Granger Cause IMR		3.13481	0.0458
LEDU does not Granger Cause FISA	196	6.78608	0.0014
FISA does not Granger Cause LEDU		1.24612	0.2899
LHEA does not Granger Cause FISA	196	0.06003	0.9418
FISA does not Granger Cause LHEA		1.82890	0.1634
MMR does not Granger Cause FISA	196	3.70386	0.0264
FISA does not Granger Cause MMR		1.91158	0.1507
LPOP does not Granger Cause FISA	196	0.04461	0.9564
FISA does not Granger Cause LPOP		0.04165	0.9592
LEDU does not Granger Cause IMR	196	0.65580	0.5202
IMR does not Granger Cause LEDU		0.01674	0.9834
LHEA does not Granger Cause IMR	196	0.11199	0.8941
IMR does not Granger Cause LHEA		0.44042	0.6444
MMR does not Granger Cause IMR	196	5.35343	0.0055
IMR does not Granger Cause MMR		0.52440	0.5928
LPOP does not Granger Cause IMR	196	0.09256	0.9116
IMR does not Granger Cause LPOP		0.17020	0.8436
LHEA does not Granger Cause LEDU	196	2.04716	0.1319
LEDU does not Granger Cause LHEA		13.8464	2.00E-06
MMR does not Granger Cause LEDU	196	1.97033	0.1422
LEDU does not Granger Cause MMR		0.70083	0.4974
LPOP does not Granger Cause LEDU	196	0.26390	0.7683
LEDU does not Granger Cause LPOP		0.06849	0.9338
MMR does not Granger Cause LHEA	196	1.05800	0.3492
LHEA does not Granger Cause MMR		0.75945	0.4693
LPOP does not Granger Cause LHEA	196	0.16221	0.8504
LHEA does not Granger Cause LPOP		0.07465	0.9281
LPOP does not Granger Cause MMR	196	3.44764	0.0338
MMR does not Granger Cause LPOP		0.04505	0.956

Source: researcher's computation, January 28, 2023.

showed that the explanatory variables exhibited joint impact on the dependent variable.

Examination of the estimated coefficients showed that one, two and three periods lagged of infant mortality rate exerted a negative influence on infant mortality rate in the current period in Nigeria. This outcome means that a one percent increase in infant mortality rate in the previous one, two and three periods resulted to a decrease in infant mortality rate in the current period by 0.22 percent, 0.20 percent, and 0.14 percent, respectively.

Fiscal autonomy turned out with positive coefficient, meaning that there is a positive impact of fiscal autonomy on infant mortality rate in Nigeria. This result though not in consonance with a priori expectation stressed the fact that fiscal operation of the government has increased

rather than decreased infant rate in Nigeria. This means that states in Nigeria are not financially autonomous to undertake meaningful investment in the health sector so as to bring down the rate of infant mortality. The result in absolute term means that a one percent increase in fiscal autonomy resulted to an increase in infant mortality rate by 0.93 percent, ceteris paribus. Fiscal autonomy was also statistically significant in influencing infant mortality rate in Nigeria during the evaluation period. This is because the computed t-statistic of 2.32 is greater than the critical t-statistics of 1.96 at the five percent level of significance.

Similarly, expenditure on health exhibited a positive impact on infant mortality rate in Nigeria. This result however goes contrary to theoretical expectation in that increase in government spending in the health sector supposed to improve the condition of the health sector and result to a decrease in infant mortality rate. The reverse is the case in Nigeria as shown empirically in the result, suggesting that either allocation to the health is so small that it cannot impact negatively on health outcomes or funds allocated to the health sector are diverted or embezzled. The result in real term showed that a one percent increase in health expenditure resulted to an increase in infant mortality rate by 0.72 percent, other things being equal.

Furthermore, expenditure in education has a positive impact on infant mortality rate in Nigeria. This result is contrary to a priori expectation, indicating that a one percent increase in expenditure in education resulted to an increase in infant mortality rate by 0.34 percent.

Lastly, the negative coefficient of population showed that there is a negative relationship between population and infant mortality rate. This result is not consistent with a priori expectation, showing that a one percent increase in population resulted to a decrease in infant mortality rate by 0.48 percent, ceteris paribus.

4.5 Analysis of Maternal Mortality Rate Equation

The result of the parsimonious vector error correction model for the maternal mortality rate equation as depicted in Table 2 showed that the coefficient of the error correction variable has the expected negative coefficient and was statistically significant in line theoretical expectation. Its coefficient of 0.885 showed that approximately 89 percent of systemic

disequilibrium in the estimated equation was corrected each year. This represented a fast speed of adjustment from the disequilibrium in the short run to equilibrium in the long run. This shows the proportion of shocks that will be corrected after the initial disequilibrium condition of the system.

The adjusted R^2 of 0.649 for column 2, Table 2 shows that about 64.90 percent of the variation in the dependent variable has been explained by the independent variables. The model therefore has a high explanatory power.

However, the high value of F-statistics of 12.118 showed that the estimated regression equation is statistically significant at the five percent level of significance. This is because the computed F-statistic of 12.118 is greater than the F-statistic of 1.67 from the table at the five percent level of significance. The statistical significance of the overall model showed that the explanatory variables exhibited joint impact on the dependent variable.

Analysis of the result showed that one period lagged of maternal mortality rate exhibited a negative relationship with maternal mortality rate in the current period. This outcome in real term means that a one percent increase in one period lagged of maternal mortality rate by 0.53 percent, other things remaining the same.
However, two and three period lagged of maternal mortality rate exerted a positive influence on maternal mortality rate in the current period in line with a priori expectation. This means that two and three period lagged of maternal mortality rate resulted to an increase in maternal mortality rate in the current period by 0.08 percent and 0.18 percent, respectively.

Three period lagged of maternal mortality rate has a statistical significant effect on maternal mortality rate during the evaluation period. This is because during the calculated t-value of 2.577 was greater than the table t-value of 1.960 at the five percent level of significance. This means that previous period value of maternal mortality rate has significant influence on maternal mortality rate in the current period in Nigeria.

Fiscal autonomy has a positive coefficient, indicating that there is positive impact of fiscal autonomy on maternal mortality rate in Nigeria. This result goes against theoretical expectation, showing in real term that a one percent increase in fiscal autonomy resulted to an increase in maternal mortality rate by 0.29 percent. Fiscal

autonomy exerted a significant effect on maternal mortality rate in Nigeria, given that the computed t-statistic of 2.474 was greater than the critical t-statistic of 1.960 at the five percent level of significance.

The negative sign of the coefficient of health expenditure indicates that there is a negative influence of health sector spending on maternal mortality rate in Nigeria. This outcome is in consonance with theoretical expectation, showing that an increase in health sector expenditure by one percent resulted to a decrease in maternal mortality rate by 2.02 percent, ceteris paribus.
However, expenditure in education exerted a positive influence on maternal mortality rate in Nigeria. This outcome does not go according to a priori expectation, indicating that an increase in education expenditure by one percent resulted to an increase in maternal mortality rate by 15.26 percent, ceteris paribus.

Lastly, the negative coefficient associated with population showed that there is a positive association between population and maternal mortality rate in Nigeria. The outcome is in accordance with a priori expectation because an increase in population could put pressure and over-stretch the existing health facilities, leading to poor healthcare delivery and high maternal mortality rate. In real term, the result showed that an increase in population by one percent resulted to an increase in maternal mortality rate by 38.36 percent.

4.6 Analysis of Adult Literacy Rate Equation

The result of the parsimonious vector error correction model of the adult literacy rate equation as depicted in Table 2 showed that the coefficient of the error correction variable has the expected negative coefficient and was statistically significant in line with theoretical expectation. Its coefficient of 0.004 showed that only about 4 percent of systemic disequilibrium in the estimated equation was corrected each year. This represented a very slow speed of adjustment from the disequilibrium in the short run to equilibrium in the long run. The ECM's coefficient of 0.004 shows the proportion of shocks that will be corrected after the initial disequilibrium condition of the system. The adjusted R^2 of 0.614 shows that, about 61 percent of the variation in the dependent variable has been explained by the independent variable.

The model therefore has moderately high explanatory power.

However, the high value of F-statistics of 6.968 showed that the estimated regression equation is statistically significant at the five percent level of significance. This is because the computed F-statistic of 6.968 is greater than the F-statistic of 1.67 at the five percent level of significance. The statistical significance of the overall model showed that the explanatory variables exhibited joint impact on the dependent variable.

Analysis of regression coefficients showed that previous one, two and three periods of adults' literacy rate exerted negative influence on adult rate in the current period in Nigeria. In real term, the result showed that an increase in one, two, and three period lagged of adult literacy rate resulted to a decrease in adult literacy rate in the current period by 0.42 percent, 0.30 percent, and 0.21 percent, respectively. The variables were also statistically significant in influencing adult literacy rate in the current period. This is because the calculated t-values of 5.376, 3.901 and 2.756, for one, two, and three period lagged of adult literacy rate, respectively were all greater than the table t-value of 1.960 at the five percent level of significance.

Fiscal autonomy with its positive coefficient showed that there is a positive impact of fiscal autonomy on adult literacy rate in Nigeria. This outcome is consistent with theoretical postulate, showing that an increase in fiscal autonomy by one percent resulted to an increase in adult literacy rate by 0.35 percent, ceteris paribus. The variable was also statistically significant in influencing adult literacy rate at the five percent level of significance. This is because the computed t-value of 3.156 is greater than the critical t-value of 1.960 at the five percent level of significance.

Contrary to a priori expectation health sector expenditure exerted a negative influence on adult literacy rate in Nigeria. This inference in real term means that an increase in health spending by one percent resulted to a decrease in adult literacy rate by 0.47 percent.

In the same vein, expenditure in education exerted a negative influence on adult literacy rate in Nigeria. This result is not in agreement with the theoretical postulate. In real term, the result showed that an increase in education expenditure by one percent would lead to a decrease in adult literacy rate by 0.22 percent,

other things being equal. This result showed that spending in education has not improved the literacy rate in Nigeria. This suggests that it is either the fact that spending in education by the government has been so small that it cannot bring about improvement in the literacy or that funds meant for educational projects are siphoned into private pause, thereby resulting to huge decline in terms of literacy rate [72-75].

Lastly, growth in population has a declining effect on adult literacy rate in Nigeria. This inference is in accordance with a priori expectation showing that as population increase, pressure is being put on the existing educational facilities and overwhelm it, leading to the decline in adult literacy rate. In concrete term, an increase in population by one percent, resulted to a decrease in adult literacy rate by 0.73 percent, other variables remaining the same.

5. CONCLUSION AND RECOMMENDATION

The thrust of this study is to examine the effect of expenditure assignment, tax jurisdictions and balance in the degrees of decentralization of expenditure and revenue sources amongst sub-national and federal government.

Based on the findings from this study, the following recommendations were made.

i)   It is recommended that states should double their efforts to generate internal revenue and become autonomous and less reliant on the federal government.. By so doing, they will become fiscally independent and would be able to undertake fiscal spending in their respective social sectors in Nigeria.
ii) Secondly, the federal government should divulge some revenue raising sources to sub-national government. This will increase earnings and also offset budget deficits especially for social service development.
iii) Thirdly, state governments should raise its expenditure in education sector so as to increase the literacy rate in the country. The government can do this by increasing budgetary allocation to education sector in Nigeria.
iv) In the same vein, states governments should increase their spending in the health sector so as to improve health outcomes in Nigeria. This the government can do by increasing budgetary allocations to the health sector in Nigeria so as to improve the condition of health care services in the country.

v)   Finally, there is need to ensure that growth in population is matched by increased in social sector spending in Nigeria. For this reason, there is need for the government to continually assess growth in population in Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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