Does Public Health Investment Significantly Influence Healthcare Pricing in Nigeria?

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Abstract

To combat the issue of health inequality in Nigeria, health care should be a public good in other to eliminate healthcare pricing. To achieve adequate healthcare provision, there is a need for public health investment. It is on this note that this study examines the relationship between public health investment and health care pricing in Nigeria from 1985 to 2019. Michael Grossman's health production function was used to formulate the model specification. The study employs the Auto-Regressive distributed lag model to estimate the short-run and the long-run relationship after the confirmation of the pre-test criteria (unit root and bound tests). The study shows that there is a negative but not significant relationship between health pricing, public health investment, and per capita income in the short run while a significant long-run relationship exists among health pricing, public health investment, and per capita income at a 1% level of significance. Therefore, the study concludes that health pricing is a device for expenditure switching in the health sector. The study recommends that healthcare should be pronounced as public goods or quasi-public goods such that sustainable development goals of good health and well-being can be achieved.

Keywords: Health Pricing, Public Health Investment, Healthcare, Per Capita Income, Out of Pocket health expenditure

Introduction

Good health for all populations has become an accepted international goal. It is one of the sources of happiness and wellbeing of people irrespective of their status in society [World Health Organization (WHO)(2012). It also plays a major role in the economic growth and development of a nation. Public health is the science and art of preventing disease and promoting the health of people, and as opined by the Centers for Disease Control Foundation (CDCF, 2019), public health is fundamental for prolonging and improving quality of life including those of those at the bottom of the population pyramid. As defined by the WHO (2019), health means the attainment of physical, mental, and social wellbeing and not merely the absence of disease or infirmity, and like the WHO, the core functions of public health include providing leadership on matters critical to health; shaping research agenda and dissemination of valuable knowledge; setting norms and standards, promoting and monitoring their implementation; articulating ethical and evidence-based policy options; monitoring the health situation and assessing health trend of a nation's population.

As opined by Omoniyi (2018), public health means population's health, and this is so because the goal of public health is to see to the overall health wellbeing of a population in any economy. Public health is, in fact, a public good. For example, strong public health capacity prevents or contains outbreaks of communicable diseases. These outbreaks have the potential to amplify into epidemics or pandemics and destroy the fragile economies of developing countries. Economic development can be the result of improvements in public health, and hence, investing in public health will not only improve the quality of health but also boost the economy (Bloom & Canning, 2012). Nigeria is one of the fastest-growing countries in the world with a population growth rate of about 2.6 % as of 2019 and a projected population growth rate of 2.8% in 2030 (UNDP, 2020). According to United Nations (2020) in a recent report, Nigeria is projected to be the third most populous nation in the world by 2050 with 703 million people. Consequently, there is and will be greater demand for public health to cater for not just disease treatment but also their preventions. However, in Nigeria, public health investment is given little attention by the government.

Health inequality in Nigeria is by extension a resultant effect of healthcare pricing. That is, healthcare is sold at different prices to different health demanders in Nigeria. According to Omoniyi (2018), the reason for this is the dense population of the urban areas and the concentration of health facilities which is also inadequate in the urban areas. Hence, healthcare pricing in Nigeria is highly discriminating among regions in Nigeria. While the government in Nigeria seeks to combat the deficit in public health investment in the urban areas, there is a deadweight loss consequence on the rural part of the country, as the rural part bears the cost of this action (Omoniyi, 2018). Although dwellers in this part of the country are 80% poor (CBN, 2020), they pay heavily for their health needs through their income, thereby enlarging the poverty gap in Nigeria. According to World Bank (WDI, 2020), the public health investment annual growth rate in Nigeria was -9.91% in 2016, -3.49% in 2017, and 1.17% in 2018 while income per capita growth rate was -3.68% in 2016, -2.50% in 2017, and -1.17% in 2018. This analysis shows that while public health investment was increasing per capita income was also increasing. However, in another analysis done by World Bank (WDI, 2020), public health investment per capita; which is the total amount spent by the government on each individual's health in Nigeria was $16.08 in 2016, $10.33 in 2017, and $10.64 in 2018. Whereas, out-of-pocket expenditure per capita; which is the minimum health payment made by an individual was $59.67 in 2016, $57.09 in 2017, and $56.34 in 2018.

Summarily, to combat the issue of health inequalities in Nigeria, healthcare should be a public good to eliminate high healthcare pricing. For proper reduction in healthcare pricing to be achieved, there is a need for public health investment. Likewise, to halt the switching of expenditure meant for other purposes by individuals to health which is usually caused by the arbitrage nature of health natural monopoly arrangement in Nigeria, a significant investment in public health was recommended at the summit of the Nigerian National Health Conference in 2009. Therefore, an investigation of how public health investment, (per capita income) affects health pricing in Nigeria is a welcome development in explaining not just the reluctance in combating epidemics and pandemics, but also the expenditure switching nature of health pricing in Nigeria.

A sequel to this section is the review of relevant literature housed by section 2, section 3 explains the variables employed, sources of variables, and estimation techniques used in the study. Section 4 critically discusses the study findings while section 5 gives the study's conclusion and recommendations.

Literature Review

To examine the relationship between public health investment and health pricing in Nigeria, several studies have been done both theoretically and empirically, but there exists a converse conflict between the theory and the justification for the need for investment in health by the government and its effect on the price of health services rendered to the citizen which significantly affect their standard of living and life expectancy. It is on this note that this study intends to review Wagner's law of increasing state activities, Grossman's theory of health products, and the price/quality hypothesis.

In the year 1835, Aldoph Wagner a German economist primarily examined the historical facts of Germany and concludes that the law of increasing government activities exists. That is the government activities increase over time both briefly and comprehensively. There exists a relationship between government activity growth and economic growth but the growth rate of government is more apparent than that of the economic growth. White (1923) empirically examined the law of increasing state by Wagner and concluded that this law applies to another state which diverges from each other. Despite this empirical support, there are lots of questions which is unclear whether Wagner was submitting to an increase in the absolute level of public expenditure or the percentage of government expenditure to GNP, or the proportion of public sector in the total economy. Musgrave answered the question that Wagner is of the debate on the ratio of government expenditure in the public sector to the total economy.

Also, Michael Grossman's (1972) theory of health production function establishes a model to examine the healthy condition of the citizen. According to Grossman economic activeness of an individual is a function of how affordable and accessible the health facility to consume. The health of the individual is determined by the access to education, and awareness of health service availability by an individual. Grossman concludes that being healthy is of two importance to an individual, firstly it reduces the market and nonmarket active activities, besides the demand for public health is a joint demand which is a replica of input in a production function. That is health is a function of healthcare services and other inputs. The amount, willingness to pay, and patronage of health services are determined by the significance of the health status Omoniyi (2018). Despite the relevance of this theory to the majority of economic issues of different countries (McKinlay *et al,* 1989) still, blemish the theory estimate of health production (Millicent, 2013; Komolafe, 2006) defect the relevance of Grossman theory to developed countries. However, Vigneron and Johnson (1999) affirmed that health consumers might make purchase decisions based on conspicuous value, as they tend to purchase public health-consumed luxury products. Paying a premium price for a product can act as a way of gaining acceptance, due to the pressure placed on them by their peers. Whiting *et al.* (2018) indicated that consumers perceive the health quality of a product or service

to be relational to its health price. Consumers often believe a high price of a product indicates a higher level of quality. Philips *et al* (1983) examined the relationship between price and quality, that is consumers place more value on high price than as a sign of quality. Also, Vigneron and Johnson (1999), state that any purchase decisions by health consumers on based on the value placed on health.

Empirically Matthew *et al* (2015); Elyasi and Rahimi (2012) and Omoniyi (2018) ascertain the relationship between public health expenditure and, health outcomes in Nigeria. Time-series data were used and a secondary method of collecting data was adopted. The study made use of the Johansen Co-integration and the Vector Error Correction Model (VECM). They found out that public health investment has a significant relationship with health outcomes in Nigeria. They further posit a positive correlation between public health investment and health outcomes in Nigeria. The work of XuKe and Alberto (2010) examined the determinants of health expenditure in OECD countries from 1995 to 2008 using Standard fixed effects and dynamic models were used to analyze the panel data. They found no difference in health expenditure between tax-based and insurance-based health financing mechanisms and lastly, they saw that government health expenditure and out-of-pocket payments follow different paths and that the pace of health expenditure growth is different for countries at different levels of economic development. Also, Berger and Messer (2002) investigated the effects of public financing of health investment, insurance coverage, and other factors on health outcomes in Ghana using pooled panel method to analyze the secondary data collected, they conclude that increases in the publicly financed share of health investments are associated with increases in mortality rates.

Methodology

This study examines the impact of public health investment on healthcare pricing in Nigeria; thus, the study utilizes three variables. The dependent variable is healthcare pricing which is proxy with out-of-pocket health expenditure while the main independent variable is public health investment which is measure using capital health expenditure and per capita income is adopted as the control variables which measure the proportion of income earned per individual in a country. The annual time series data of these variables are sourced from World Development Indicators (WDI) and Central Bank of Nigeria (CBN) for the period of thirty-five years from 1985 to 2019.

To empirically examine the impact of public health investment on healthcare pricing in Nigeria, the empirical framework of this study follows the theoretical health production function developed by Grossman (1972). The author asserts that health depends on several factors, some of which can be influenced by the individual himself. Hence, health can be produced and one of the obvious inputs into this production is healthcare. With the United Nations' third sustainable development goal (SDGs) on health by 2030, and the mandate was given to governments of developing nations to cater maximally for the health needs of their populace, the government is, therefore, a major provider of health. Likewise, with the excludability nature of healthcare in Nigeria usually caused by an inability to pay, this study adopts and modifies the Grossman's health production function in a double log model as follow;

$$InOOP_t = \alpha + \partial\, InPHI_t + \lambda\, InPCI_t + \varepsilon_t \qquad (1)$$

Specification (1) measures the long-run relationship between healthcare pricing proxy with out-of-pocket health expenditure (OOP), public health investment (PHI), and per capita income (PCI). α, ∂ &λ represent the long-run coefficient of intercept, public health investment, and per capita income, respectively while ε_t is the error term and In denotes the natural logarithm?

However, to estimate the co-integrating relationship between the explained and explanatory variables, the study adopts the autoregressive distributed lag model of Pesaran *et al* (2001) by specifying the equation (1) is a bounds test co-integrating framework as:

$$\Delta InOOP_t = \alpha + \sum_{i=1}^{N1} \beta_i\, \Delta InOOP_{t-i} + \sum_{j=0}^{N2} \gamma_j\, \Delta InPHI_{t-j} + \sum_{j=0}^{N3} \varphi_j\, \Delta InPCI_{t-j} + \rho InOOP_{t-1} + \partial InPHI_{t-1} + \lambda InPCI_{t-1} + \mu_t \qquad (2)$$

Here, the specification (2) follows the normal ARDL template which frames the short-run and long-run estimates such that the estimates of α, ∂ &λ are expressed over ρ and yield $-\alpha/\rho, -\partial/\rho, and -\lambda/\rho$ as the long-run coefficients of intercept, public health investment, and per capita income, respectively, since $\Delta InOOP_t$= $\Delta InPHI_t$ = $\Delta InPCI_t = 0$ in the long run. Meanwhile, the short-run estimates are obtained as β_i, γ_j and φ_j for out-of-pocket health expenditure, public health investment, and per capita income while $N1$ to $N3$ stands for the lag length order for the variables and it is selected following the Schwarz Information Criterion (SIC).

Additionally, the speed of adjustment to long-run equilibrium due to short-run dynamics is missing in the preceding specification. Thus, to include the error correction term in the ARDL specification, the study specifies the error correction mechanism framework as;

$$\Delta InOOP_t = \emptyset v_{t-1} + \sum_{i=1}^{N1} \beta_i\, \Delta InOOP_{t-i} + \sum_{j=0}^{N2} \gamma_j\, \Delta InPHI_{t-j} + \sum_{j=0}^{N3} \varphi_j\, \Delta InPCI_{t-j} + \mu_t \qquad (3)$$

where v_{t-1} is the lagged error correction term calculated as $v_{t-1} = InOOP_{t-1} - \hat{\alpha} - \hat{\partial} InPHI_{t-1} - \hat{\lambda} InPCI_{t-1}$ and $\hat{\alpha} = -\alpha/\rho,\ \hat{\partial} = -\partial/\rho\ and\ \hat{\lambda} = -\lambda/\rho$. To assume cointegration among the variables, $\emptyset$ which represent the speed of adjustment to long-run equilibrium must be negative and statistically significant, thus, the null hypothesis of $\emptyset = 0$ is tested against the alternative hypothesis of $\emptyset < 0$. This is complemented by the Bounds test to co-integration. To infer long-run co-integration, the F-statistic must be greater than the upper bounds critical values, however, if the F-statistic is less than the lower critical values, a short-run relationship exists while the test becomes inconclusive if the statistic value stands in-between the upper and lower bound critical values.

Empirical Analysis and Interpretation

This section reports the analysis of data which comprises the presentation of results, interpretation, and discussion of findings. This is done through the application of the Augmented Dickey-Fuller (ADF), Phillips Perron (PP) unit root tests, and the Autoregressive Distributed Lag (ARDL) model.

Conventionally, the statistics properties are given first attention. This helps to know the kind of data series this study is using at a glance. All series are in their log form.

Table 1: Descriptive Statistics

Variables	Mean	Max	Min	Std Dev.	Skewness	Kurtosis	Obs.
OOP	1.84	1.89	1.78	0.03	-0.35	2.13	35
PHI	1.92	3.11	-0.04	0.996	-0.51	1.93	35
PCI	4.81	5.82	3.35	0.82	-0.44	1.84	35

Table 1 reveals that the most volatile series in this study is public health investment (PHI), as the standard variation has a value of 0.996. The reason for this is not far-fetched as public health investment is exogenously determined by the government. As clearly indicated above, the average value of OOP in Nigeria from 1985 to 2019 was 1.84%. From the same time frame, the maximum OOP in Nigeria was 1.89% while the minimum was 1.78%. The close difference between the maximum value of OOP and its minimum suggested that the variable is less volatile, and this is further validated by the standard deviation which has a value of 0.03. The PCI on the other hand on average was 4.81, with its maximum and minimum at 5.82% and 3.35% respectively. Therefore, PCI is the second most volatile variable in this study.

Furthermore, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are employed to test for time series properties of model variables. The justification for combining the two tests is to check the robustness of the unit root tests. The null hypothesis is that the variable under investigation has a unit root against the alternative that it does not. The decision rule is to reject the null hypothesis if the ADF statistic or PP statistic value exceeds the critical value at a chosen level of significance (in absolute term). These results are presented in Table 2 below.

Table 2: Unit Root Tests Results

Variables	At Level		First Difference		Order of Integration
	ADF	PP	ADF	PP	
OOP	-3.261**	-3.222**	----------	----------	I(0)
PHI	-1.983	-2.094	-6.369***	-6.499***	I(1)
PCI	-3.001**	-2.679*	----------	----------	I(0)

Note: ***, ** and * represent the respective significant level at 1%, 5% and 10%.

As seen in Table 2, OOP and PCI show a mean-reverting property at levels, indicating that the series is stationary at levels even at a 5% level of significance, although the PP test of PCI shows that the series is stationary at a 10% level of significance. We, therefore, reject their null hypothesis for their alternative hypothesis. PHI on the other hand shows that the series at levels has a unit root. As such, we accept the null hypothesis of unit root for PHI at levels. However, when the series was differenced once, PHI became stable even at 1%. Therefore, we reject the null

hypothesis for PHI at first difference. Conclusively, OOP and PCI will generate a non-spurious result at levels, while PHI will produce this at first difference. These mixed results in unit root result further substantiate the use of ARDL as a choice of estimation in this study. More so, the optimal lag level is 1 as chosen by the lag length criteria. The Schwarz information criterion (SC) is the best criterion for this study as it gives the lowest values among other criteria.

To find answers to the study objectives, the hypothesis was drawn to guide the study. However, this study expects OOP to respond to PHI negatively, and respond to PCI positively. Also, with the heterogeneous results for the stationarity test, the ARDL as estimation techniques was to test the aforementioned hypotheses and to see if the result is in line with a-priori expectation.

Table 3: Bounds Test to Co-integration

F-statistic	17.28	
Critical Values	Lower Bound	Upper Bound
1%	3.65	4.66
5%	2.79	3.67
10%	2.37	3.20

Note: The table reports the Pesaran *et al.* (2001) bounds test to cointegration estimates with a null of no levels relationship at 1%, 5%, and 10% significant levels.

Table 3 presents the result for the bounds test to co-integration. Firstly, F-statistics of the Bounds test shows that there is a long-run relationship between OOP, PHI, and PCI in Nigeria. Particularly, it shows that at a 1% level of significance, the F-statistics of the bound test is greater than the I(0) bounds and I(1) bounds. This means that the null hypothesis of no long-run relationship among the variables is rejected for the alternative hypothesis.

Table 4: Regression result of the ARDL model

Short run Estimates: ΔOOP		
Variables	Coefficient	Standard Error
ΔPHI	-0.017	0.020
ΔPCI	-0.080	0.068
ECT(-1)	-0.768**	0.043
Long run Estimates: OOP		
PHI	-0.123***	0.026
PCI	-0.130***	0.030
C	2.694	0.824

Note: ** and *** represent the significant levels at 5% and 1%, respectively.

Table 4 presents the short-run and the long-run estimates of the relationship between out-of-pocket health expenditure, public health investment, and per capita income. The short-run period is denoted with a difference operator (Δ) sign in the result. Both PHI and PCI are not significant enough to affect OOP in the short run in Nigeria. This implies that the null hypotheses which state that PHI and PCI are not significant to affect OOP are not rejected in the short run. Nevertheless,

the speed of adjustment measured by the error correction term (ECT) shows that disequilibrium in the short run is carried over to the long run with a speed of 76%. This implies that the short-run results do not last as it is swiftly corrected in the long-run.

In the long run, the result shows that a 1% increase in PHI will cause a decrease of 0.12% in OOP even at a 1% level of significance. This is in line with the study a-priori expectation, and it implies that the null hypothesis is rejected for the alternative hypothesis in the long run. On the other hand, the result shows that there is a positive effect of PCI on OOP in Nigeria. Specifically, a percent increase in PCI will cause OOP to increase by 0.13% in the long run. This also resonates with the study a-priori expectation, and it further implies that the null hypothesis of no significant impact of PCI on OOP in Nigeria is rejected for the alternative hypothesis.

The empirical evidence corroborates with previous studies that found a negative impact between the variables (Omoniyi, 2018; Matthew *et al* 2015). As such, it could be inferred that the high cost of health excludes health consumers from having access to good healthcare, and the only remedy to this excludability is for government to make health either pure public goods or quasi-public goods by increasing public health investment.

Also, the negative impact of public health investment on health pricing in Nigeria proves that health pricing is a tool for expenditure switching in the health sector. When public health investment increases, health pricing falls, thereby increasing the available real income for other purposes aside from health. The same goes for the opposite. When there is a decrease in public health investment, the excess demand for healthcare pushes the price of health up, and larger income will be spent on healthcare. This is further substantiated by the positive effect of per capita income on health pricing in Nigeria.

Table 5: Diagnostic Tests

Tests	Statistic	Probability
Normality	1.4112	0.4937
Breusch-Godfrey LM	0.0174	0.9828
ARCH	1.1073	0.3008
Ramsey RESET	0.7624	0.3898

Note: The table presents the post estimation tests for the estimated model.

Having reported the error correction term, we proceed to interpret other post estimation tests to ascertain whether the successive error terms are normally distributed, serially uncorrelated, homoscedastic, and linearly specified. The test for normality reveals the normal distribution of the error terms due to the insignificance of the estimate. The Breusch-Godfrey LM test presents evidence of serial independence and the ARCH LM test also revealed the non-rejection of the null hypothesis of homoscedasticity in the error terms. The Ramsey Regression Equation Specification Error Test (RESET) is insignificant which supports the non-rejection of the null hypothesis of linear specification of the estimated model. Lastly, we tested for the stability of the estimated model through the CUSUM and CUSUMSQ residual tests. To ascertain the stability of the estimated model, the blue line plot of the CUSUM and CUSUMSQ estimates must lie in-between

the two red straight lines of a 5% significance level. Based on the report of the stability tests, the estimated model is stable since the blue line lay in-between the straight red lines that denote a 5% level of significance for CUSUM and CUSUMSQ.

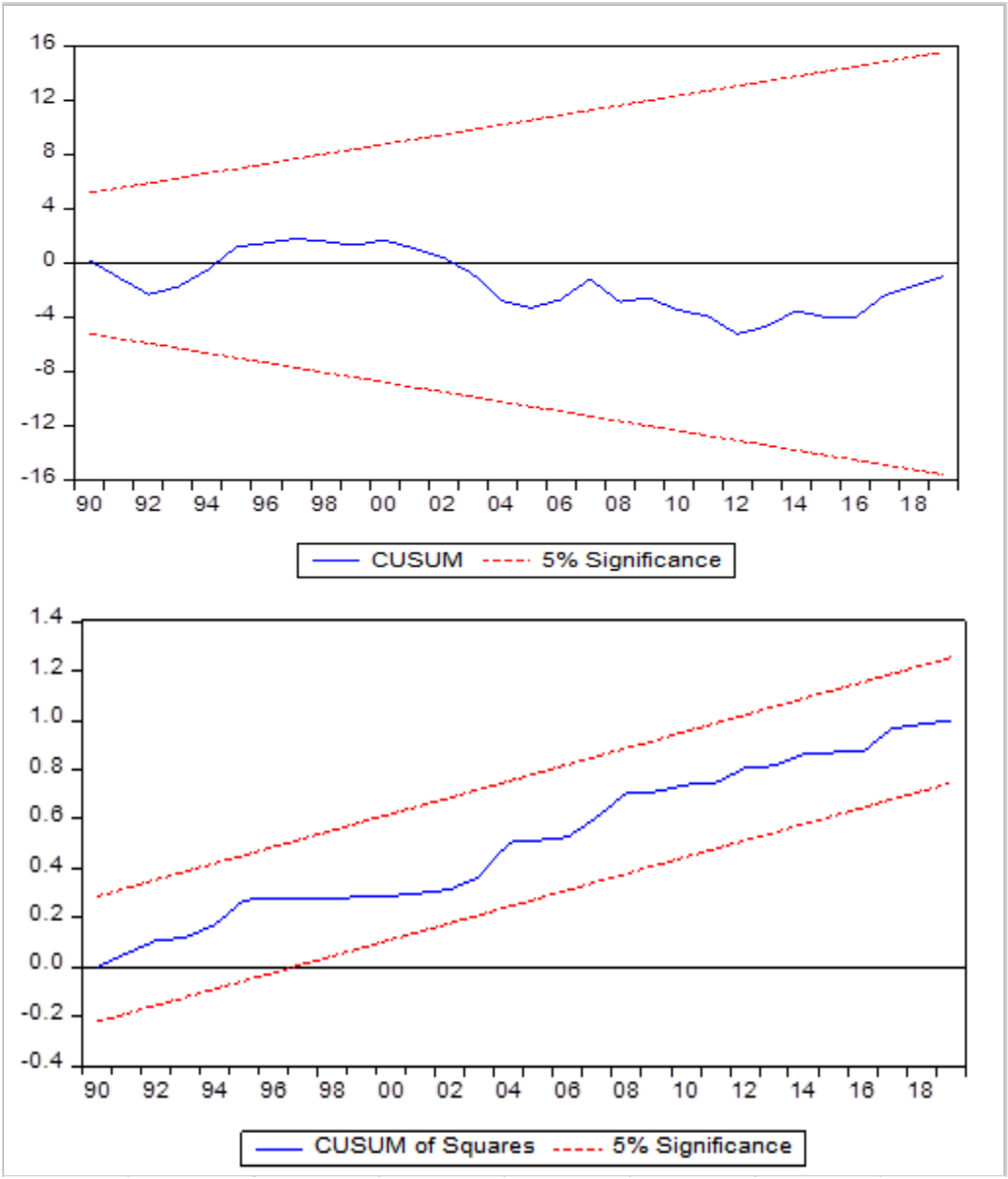

Figure 1: Cumulative Sum and Squared Residual tests for Stability

Conclusion

The findings of the study revealed that in the short run, public health investment is not significant to cause a change in healthcare pricing in Nigeria. That is, healthcare pricing in Nigeria is sticky in the short run. This implies that irrespective of public health investment in the short-run, prices of health still reflect their nominal terms that do not adjust quickly in response to changes in public health investment. However, the speed of adjustment shows that the short-run period does not last

and this may be attributed to mandatory policies prevailing in Nigeria's health sectors. More so, the result, in the long run, shows that the pricing of health is flexible and these various prices of health mirror a natural monopoly arrangement in Nigeria as the high cost of health excludes health consumers from having access to good healthcare. This corroborates with previous studies that found a negative impact between the variables (Omoniyi, 2018; Matthew *et al*, 2015).

Recommendations

Based on the findings, the study recommended the following;

i. To achieve the sustainable development goal of good health and well-being, the government in Nigeria should make a concise effort to make healthcare non-excludable. Likewise, the study result shows that the stickiness of healthcare prices in the short run is just for a very limited period.

ii. Health policies in the sector should be well enacted, and also, the government should see that health stakeholders comply strictly with directives as this will curb unnecessary arbitrage in the health sector.

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