Private and public health capital expenditures in Nigeria: An empirical test of the relationship

David Umoru[a] and Jameelah O. Yaqub[b]

[a]Department of Economics, Banking & Finance,
Faculty of Social & Management Sciences,
Benson Idahosa University, Benin, Edo State, Nigeria
udavidson2000@yahoo.com
[b]Department of Economics, Faculty of Social Science,
Lagos State University, Ojo, Lagos, Nigeria
jyaqub2010@yahoo.com

Abstract. This paper performed an empirical test of the relationship between private and public health expenditures in Nigeria. Our results reveal complementarity of inputs between public and private health expenditures in Nigeria. The result is thus an indication that government health investment plans crowd in private health investment spending. The crowding in effect could be induced by government tax incentives and government regulation (policy intervention). By economic intiution, the efficiency of private health spendings is also a function of the weight of government health expenditure in the country. Implicationally therefore, the more balanced the composition of government health spending, the greater the increase in the level of effective private health care services in Nigeria. We therefore recommend that unless appropriate regulatory measures are implemented by the government, it may lead to inefficiencies that have an unplanned effect on the rest of the economy (private sector inclusive), which could engender misallocation of health care resources. Further, a provision of basic infrastructure projects to the private sector of the economy could help create the appropriate economic and hence regulatory environment that prompts private investment expenditure on health in Nigeria.

Keywords: Private Health Capital Expenditure, Public Health Capital Expenditure, Complementary, Substitution.

1 INTRODUCTION

According to the Commission on Macroeconomics and Health (2001), the level of health spending in the low-income countries is insufficient to address the health challenges they face. The commission estimates the minimum financing needs to be around US$30 to US$40 per person per year to cover essential interventions. In Nigeria, health expenditure is less than US$8 per capita compared to the internationally recommended. While health care needs are increasing, government expenditure on health in developing countries, Nigeria in particular, is declining. The Federal Ministry of Health (FMH) (2005) had earlier observed some erratic growth of health expenditure in Nigeria. Detailed analysis of the FMH data reveals that total expenditure is on the low side. In 1985, health expenditure as a fraction of total expenditure was 1.87%. This nevertheless rose to 3.25% in 1986 and peaked at 3.30% in 1995. The trend was never devoid of fluctuating decreases that dropped to 2.74% in year 2000. Table **1** reveals a low proportion, 4.3% of total expenditures on health as part of gross domestic product 2005. This however rose to 5.3% in 2006 and thereafter embarked on a declining course afterwardsas it fell to 5.0% in 2007, 4.7% in 2008, 4.6% in 2009 and again stabilizes at

4.3% in 2010. Household expenditure on health is increasingly becoming a major source of health care financing in Nigeria. For example, private expenditure accounts for almost 70% of total expenditure on health of which 90% is out-of-pocket (Ogunbekun, 1996; Orubuloye, Cadwell and Bledsoe, 1991). This high level of out-of-pocket expenditure implies that health care can place a significant financial burden on households.

Private health spending constitutes the greatest percentage of aggregate health expenditure in Nigeria. For example, in 2000, out-of-pocket health expenditure of households, health insurance and NGOs together accounted for a total of N116.0 billion which was 73.9% of total health expenditure. This means that just a little over a quarter of total health expenditure was channeled through public spending on health. Such out-of-pocket payment for health care in most developing countries, including Nigeria, is an indication of insufficient government investment in the health sector and is responsible for the medical poverty trap (Adetunji, Mafe, Onajole and Lambo, 2008). World Health Organization (2007) observed that such a reduction in public health spending draws its origin from the neo-liberal ideas brought about by the structural adjustment programmes in the mid 1980s that de-emphasizes meaningful spending on social and health services.

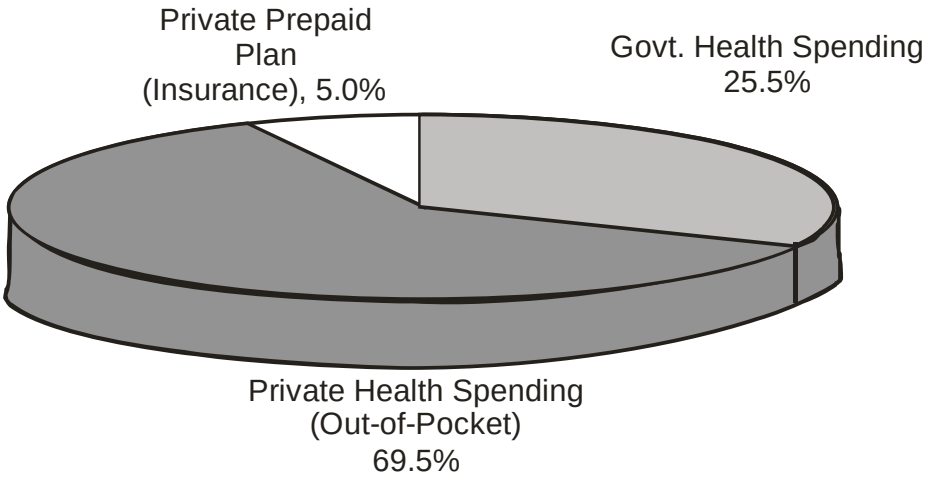
Table 1. National Expenditure on Health, Nigerian (2005 – 2010)

Expenditure Ratios	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Total Expenditure on Health (THE) as % of GDP	4.3	5.3	5.0	4.7	4.6	4.3
Financing Agents Measurement	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
General Government Expenditure on Health (GGHE) as % of THE	33.5	31.4	25.6	27.2	30.4	32.4
Private Sector Expenditure on Health (PHE) as % of THE	66.5	68.6	74.4	72.8	69.6	67.6
Private Households' Out-of-Pocket Payment as % of PHE	92.7	91.4	90.4	90.4	90.4	90.4
Prepaid and Risk-Pooling Plans as % of PHE	5.1	6.5	6.7	6.7	6.7	6.7
General Government Expenditure on Health as % of GGE	4.2	3.2	3.1	3.2	3.5	3.5
Financing Sources Measurement	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
External Resources on Health as % of THE	16.2	5.6	6.1	4.5	5.6	6.4
Selected Per-Capita Indicators for Health Expenditures (US$)	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
General Government Expenditure on Health/ capita at Exchange Rate	6	6	5	6	7	10
General Government Expenditure on Health/at Int'l Dollar Rate	13	16	12	13	16	17
Total Expenditure on Health Per-capita at Exchange Rate	18	19	19	21	23	31
Total Expenditure on Health Per-capita at Int'l Dollar Rate	39	50	49	48	53	53
Health System Expenditure & Financing (N)	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Total Expenditure on Health	215209	256283	278732	338315	392814	537585

(THE)						
General Government Expenditure on Health (GGHE)	72010	80346	71298	91913	119577	173909
Private Expenditure on Health (PHE)	143199	175937	207434	246402	273237	363676
Private Households' Out-of-Pocket Payments	132681	160792	187580	222818	247084	328867
Prepaid and Risk Pooling Plans	7238	11457	13836	16436	18226	24258
Non-Profit Institutions serving Households (NGOs)	3280	3689	6018	7149	7927	10551
Financing Sources Measurement (US$)	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Rest of the World Funds and External Sources	34899	14269	17104	15316	22193	34311

Source: World Health Organization-National Health Accounts Series, 2011

Chart 1: Composition of Nigerian Health Expenditure, 2008



Source: World Health Organization (2009)

Analyzing the Nigeria's health sector by state, Gustafsson-Wright and van der Gaag (2008) observed that there is a clear relationship between the use of private and public health facilities and per-capita income (consumption). The analysis which is as expected indicates that the poorest states in the country namely, Jigawa, Kogi, Yobe, Kebbi and Kwara have among others, the lowest use of private health facilities relative to public health facilities. Indeed, the Nigerian health system is characterized by wide regional disparities in health indicators, service delivery and resource availability. Overall, the private sector finances at least 65% of health services in Nigeria (FMH, 2010; Ogunbekun et al., 1999). Apart from low

public spending on health as a ratio of GDP, external resources to the health sector generally witnessed a decline from 13.1% in 1998 to 4.8% in 2005. The decline that began in the 1990s has been largely attributed to the continual reign of corruption and political unrest in the country which led to loss of confidence of the donors in the country and stringent imposition of economic sanctions (Ataguba, 2006).

As shown in chart 1, government expenditures on health are extremely low while private health spending represents the largest proportion of total health expenditures in Nigeria. Evidently, private health expenditures recorded 74.5% of total health expenditure. While government health spending stood at 25.5%, out-of-pocket health spending averaged 69.5% with the private prepaid plans (insurance) represents about 5% of total health spending. According to the WHO (2005; 2008), private expenditures on health as a percentage of aggregate health expenditures, account for the bulk of health care expenditure in Nigeria. The bulk, over 90%, of private health care spending is out-of-pocket payments. The proportion of Nigerians covered by private health insurance scheme including employer's plan is estimated to be about 0.03% (Onoka, Onwujekwe, Hanson and Uzochukwu, 2010). On the basis of the foregoing, this paper investigates the type of relationship that exists between private and public health capital expenditures in Nigeria. The rest of the paper is thus allocated as follows. Section two reviews related studies. Section three models the private-public health expenditure mix. The empirical results are analyzed in section four. Section five concludes the study.

2 EMPIRICAL REVIEW OF RELATED LITERATURE

A country's level of health investment includes all health expenditure that could be driven by health system, by political preferences, by the cost of inputs, or simply a reflection of national income (Hitris and Posnett, 1992). According to Hitris and Posnett, the level of national income (GDP) plays a role in determining a nation's health expenditures. According to Leu (1986), the amount of money needed to fund an healthcare system adequately is a function of a large number of variables. Leu further hypothesized that health expenditure would increase faster where the share of public expenditure was highest. He explored public expenditure, national income and a range of demographic variables in demonstrating an income elasticity that is exceeds unity. Additionally, Leu showed that the presence of a national health care service model as in the United Kingdom and New Zealand reduces health expenditure; a finding attributed to the central control exerted on the system.

2.1 Review of Macro Studies

Konoreva (2006), Lehan, Rudiy and Nolt.(2005), Atella and Marini (2002), Guisan and Arranz (2001), are amongst the leading macro studies in the empirical literature of private-public health capital investment expenditure. Konoreva (2006) investigates the relationship between health expenditure and GDP growth rate for 24 transition countries and finds a positive result of health expenditure on GDP growth rate and argues for a case of economic growth effects of expenditures on health care services. Lehan et al (2005) on their part found that the low level of government support for the health care industry induces countries to use private health services. Lehan et al focused on the out-of-pocket payments often made by patients in transition countries to deduce a substitutability effect of private health expenditure for public health spending. Explicitly, the authors claim that the share of the private expenditure on health care services is expected to be about 50%. Atella and Marini (2002) utilized OECD health expenditure data for 20 countries over the sample period 1960-1999. Their empirical findings hold that a substitutability relationship exists between private and

public health expenditure, national income, the presence of different health systems and the role of the technical progress are all significant determinant of health care expenditures.

Specifically, Atella and Marini posited that the substitution relationship that exists between public and private health investment expenditure is sensitive to the functional form and the variable used in the model. The substitution effect was found to be asymmetric implying that public expenditure is a good substitute for private health care in Australia, Canada, Denmark, UK and Italy, while the reverse cannot be the case. According to the authors, a dollar income spent on public health expenditure reduces private expenditures on health care services by US$1.43. On the other hand, one dollar income spent on private health expenditure only reduces public expenditures by infinitesimal amount US$0.13. So the empirical evidence from NHS countries shows that, while public health expenditure has a high substitutability power that can offset the contraction in the private health expenditures, the private health expenditures has a much lower substitutability power to increase correspondingly when the public share is reduced. This result underscores the importance of investigating the degree of substitution between private and public health care expenditures. In their analysis of private consumption of health care expenditures for 13 OECD countries for the period 1970-1994, and for 24 OECD countries for the period 1990-1996, Guisan and Arranz (2001) underline the significance of studying the private expenditure on health, due to the fact that in OECD countries private expenditure on health was growing at rates higher than total private expenditure. The authors found some degree of substitution between private and public health expenditure. Since the relationship was far from perfect substitution, Guisan and Arranz further posited that both forms of expenditures should be seen as complementary.

2.2 Review of Micro Studies

Fabbri and Monfardini (2002), Creel and Farell (2001), Mahal and Berman (2001), Wagstaff and Dooler (2001), Pannarunothai and Mills (1997), Baker and Van der Gaag (1993), Cantor (1988), Wolfe and Gottschalke (1987), Gottschalke et al. (1989), Hurst (1985) and Grossman (1972) are amongst the leading micro studies in the empirical literature of private-public health capital investment expenditure. Fabbri and Monfardini (2002) performed an analysis of the demand for physician services in Italy, evaluating the determinants of individual utilization for both private and public health providers. Fabbri and Monfardini accentuate the significant public and private health care providers. The authors explored several models of health care utilization and use the new Italian Survey on Health, Ageing and Wealth (SHAW) conducted in 2001 for the empirical analysis. Their empirical evidence renders support to the fact that both private and the public demands for health care services are explained by different processes, which are driven by the same factors but the degree of substitutability is in different directions. For example, being richer increases propensity to contact private clinics, and hence decreases the number of contacts with public health specialists. Moreover, publicly financed health care is not connotative of the free of cost syndrome to any particular person. The case in point is that in the public health care system the waiting time for being attended to by a physician is much longer than the waiting time in a private hospital (Fabbri and Monfardini, 2002). By economic intuition, time is cost corroborating the popular say, time is money. Indeed, the time patients spend waiting is a cost, and this cost is usually lower for the private hospitals' services. Empirically, the authors found that individual's health insurance policy is not a significant determinant of the health expenditure type. However, such policy exhibits some positive weight of a frequency of private health specialist appointments. Also, the authors found age to be an insignificant factor in choosing between public or private health service deliveries. Relatively the individual's income surfaced to be the most decisive determinant of health care service's type consumed. In fact, while public health care services are pro-poor, private health care delivery is pro-rich.

Cantor (1988) found substantial income redistributions in health care financing system. The study by Wolfe and Gottschalke (1987) reveals regressivity in health care expenditure. Hurst (1985) found a significant effect of the proportion of household income spent on health care services. Basing his deductions on a human capital model, Grossman (1972) treats health capital as both an investment and a consumption commodity. Specifically, health capital is depreciable with age and can grow when investment in it is made. Grossman's model therefore treats an individual as a decision maker that chooses the level of consumption of health care services subject to the fact that a better state of health allows more efficient performance and higher productivity. By pooling over sexes and over time, Cree and Farell (2001) surveyed the determinants of usage of six different types of health care services, using the Medical Expenditure Panel Survey data (1996–2000). Mahal and Berman (2001) evaluate the link between ageing and health care spending and found that the elderly tend to spend more on health care compared to the young individuals. This happens due to poorer health status and invention of new drugs. They found that the cost of health care for elderly depends directly on the type of service consumed such as formal institution financed by government (nursing homes or hospices) or informal home-based care. The choice between the two also depends on whether the expenditure on health care is private or public.

3 MODELING PUBLIC-PRIVATE HEALTH EXPENDITUR RELATIONSHIP

3.1 Theory and Framework

In the spirit of Rosa and Fernando (2004), the theoretical framework considers an individual's utility function. The intuition is that with a given level of consumption, a better health capital status contributes to individuals' utility as:

$$U = c^{\delta} h^{\beta} \quad , \quad \{0 < \delta, \beta < 1\} \tag{1}$$

Where U = utility, c = other items consumed, h = health capital

By theoretical construct, health capital measured by life expectancy h, increases with effective health investment expenditures according to the following health creation path.

$$h = \theta\left(p^{rv} + \varpi p^{hu}\right)^{\sigma} \quad , \quad \{\theta > 0\} \quad , \quad \{0 < \sigma < 1\} \quad , \quad \{\varpi > 1\} \tag{2}$$

According to relation (2), health capital status is determined by both private p^{rv} and public p^{hu} per capita health spending with $\{\theta > 0\}$ being the scale factor capturing the productivity of health technology and ϖ is the efficiency of public health spending. Thus, $\{\varpi > 1\}$ implies a higher efficiency of public health services and vice versa. Also, $\{0 < \sigma < 1\}$ implies that an increase in effective health spending, either public or private, has a high impact on health status, h, when the level of health spending are low but the impact declines as the amount of health spending increases. Aggregate amount of health expenditure is therefore given by:

$$Aggregate\left(T^{he}\right) = \Pr ivate\left(p^{rv}\right) + Public\left(p^{hu}\right) \tag{3}$$

Public health expenditures are financed by tax payments T_Y^{income} on individuals' income Y^{PCI} with π being the relative price of health services. Thus, public health investment spending is given by:

$$\pi^{price} p^{hu}\left(Public\right) = T_y^{income}\left(Y^{PCI}\right) \tag{4}$$

Private health services are purchased as an alternative to consumption goods so that private budget constraint is given by:

$$Y^{PCI}\left(1-T_Y^{income}\right) = c + \pi^{price} p^{rv} \tag{5}$$

Given the health technology, the utility function can be further derived as follows:

$$u = \theta^{\beta} c^{\delta}\left(p^{rv} + \varpi p^{hu}\right)^{\sigma\beta} \tag{6}$$

The optimal allocation of resources between consumption and private health spending requires the value of the utility derived from both of them to be equal at the margin. Thus:

$$\frac{\partial u}{\partial c} = \frac{\partial u}{\partial p^{rv}} \Rightarrow \sigma\beta c^{*} = \delta\pi^{price}\left(p^{rv*} + \varpi p^{hu}\right) \tag{7}$$

Using relation (7), together with the budget constraint, allows us to determine the private health investment demand as follows:

$$p^{rv*}\left(\Pr ivate\right) = \frac{\sigma\beta}{\delta+\sigma\beta}\frac{Y}{\pi} - \frac{\alpha\varpi+\sigma\beta}{\delta+\sigma\beta} p^{hu} \tag{8}$$

From the private health demand, the aggregate health investment plans is derived as:

$$T^{he*}\left(Aggregate\right) = \left(p^{rv} + p^{hu}\right) = \frac{\sigma\beta}{\delta+\sigma\beta}\frac{Y}{\pi} + \frac{\alpha\left(1-\varpi\right)}{\delta+\sigma\beta} p^{hu} \tag{9}$$

The equilibrium health status can be characterized by the following expression:

$$h^{*} = \theta\left(\frac{\sigma\beta}{\delta+\sigma\beta}\right)^{\sigma}\left(\frac{Y^{PCI}}{\pi^{price}} + \left(\varpi-1\right)p^{hu}\right)^{\sigma} \tag{10}$$

According to relation (10), health status rises with income and declines with the price of health services. It is higher, the higher the valuation of health in individuals' preferences (higher β or lower δ), the more efficient the health technology (higher θ) and the lower σ is.

3.2 Empirical Model

The health investment functions postulates that there is a flow of productive health care services from a vector of explanatory variables within the Nigerian health policy framework. Utilizing the Bewley's transformation modeling approach, the double-log linear specifications become.

$$Ln\left(HPU\right) = \varpi_0 + \mu Ln\left(HPR\right) + \sum_{J=2}^{4}\varpi_J Ln\left(F_{J.it}\right) + \varepsilon_{8t} \tag{11}$$

$$Ln\left(HPR\right) = \mu_0 + \theta Ln\left(HPU\right) + \sum_{J=2}^{3}\varpi_J Ln\left(Q_{J.it}\right) + \varepsilon_{9t} \tag{12}$$

The vectors of control covariates denoted by QJ,it = (PHC, GDP, HCTLAB) and FJ,it = (PHC, HCTLAB, EXPT, GXTR) are defined to include, price of health care in Nigeria, national income level proxied by GDP, healthy-labour force, expenditure in other sectors and tax revenues as a percentage growth of GDP. The tax variable controls for government revenue keeping with the view that government health outlays are also financed by an exogenous tax rate on output. By including tax revenue variable and expenditures in other sector to the exclusion of expenditure in health sectors, we are able to integrate both the expenditure and the revenue components of the government budget constraint in our model.

4 METHOD OF ESTIMATION

The Generalized Method of Moments (GMM) estimator is employed in estimating the model. The GMM is a minimum distance estimator defined by $\hat{\beta}_{GMM} \to \beta$, $\hat{\beta}_{GMM} \sim N[\beta, V_{GMM}]$ and is obtained by minimizing a criterion function. The GMM estimator $\hat{\beta}_{GMM}$ chooses β to make the following sample moments to be as close to zero as possible.

$$g(\beta, y_T) = \left[\frac{1}{T}\right]\sum_{t=1}^{T} h(\beta, Z_t) \tag{13}$$

Where Z_T is an $(h \times 1)$ vector of instrumental variables that are observed at date, β is an unknown $(\beta \times 1)$ vector of coefficients which should satisfy the set of theoretical moment conditions, $h(\beta, Z_t)$ is a vector-valued function of the sample moments. Given that Z_T is a vector of random variables, so is $h(\beta, Z_t)$. Thus if β^* denote the time value of β, then it must satisfy the moment conditions defined by the property:

$$E\left\{h(\beta^*, Z_T)\right\} = 0 \tag{14}$$

The r rows of the vector given in (14) describe the orthogonality conditions. Thus, to obtain GMM estimates, the moment condition was transformed into an orthogonality condition which defines the zero correlation of the residuals of e, and the set of instrumental variable, Z_T so that:

$$E\left\{h(Z_T' e)\right\} = 0 \tag{15}$$

Let $y_T = \left[z_T', z_{T-1}', ..., z_1'\right]'$ be a $(Th \times 1)$ vector containing all the observations in a sample of size T, $(r \times 1)$ be the vector-valued function and $g(\beta, y_T)$ denote the sample average of the vector-valued function $h(\beta, Z_t)$, the GMM estimator chooses β so as to make the sample moment $g(\beta, y_T)$ as close as feasible to the population moment of zero (Johnston

and Dinardo, 1997; Green, 2003). Intuitively, the GMM estimator $\hat{\beta}_{GMM}$ is the value of β that minimizes the quadratic criterion function in $g(\beta, y_T)$ given by:

$$Q(\beta, y_T) = \sum_T \left(\left[g(\beta, y_T) \right]' \{V_T\}_{T=1}^{x} \left[g(\beta, y_T) \right] \left[g(\beta, y_T) \right] \right) \quad (16)$$

Where $\{V_T\}_{T=1}^{x}$ is a sequence of $(r \times r)$ symmetric and positive definite weighting matrix which is a function of the data y_T. Thus, V_T is the weighting matrix that weights each moment condition in order to yield a consistent estimate of $\hat{\beta}_{GMM}$. Equation (16) measures the distance between g and zero as shown in relation (17) so that the law of large numbers holds.

$$g(\beta, y_T) \xrightarrow{p} E\{h(\beta, Z_T)\} \quad (17)$$

Accordingly, with continuity of $E\{h(\beta, Z_T)\}$ in β, β^* is the only value of β that satisfies condition (14). Therefore, under moment conditions and general stationarity, that is, z_t is strictly stationary and $h(.)$ is continuous, then the value of $\hat{\beta}_{GMM}$ offers a consistent estimate of β^* under the GMM minimand so that we need the first order condition with respect to $\hat{\beta}_{GMM}$ obtained as,

$$\hat{\beta}_{GMM-CONSISTENT} = \left[X'Z\left(Z'\Omega Z\right)^{-1} Z'X \right]^{-1} X'Z\left(Z'\Omega Z\right)^{-1} Z'Y \quad (18)$$

Consequently, $\hat{\beta}_{GMM-CONSISTENT}$ was obtained by setting the optimal weighting matrix V equal to the inverse of the variance-covariance matrix of heteroskedasticity and autocorrelation (HAC) of the sample moments that is:

$$V_{GMM,OPTIMAL} = \Omega_{(HAC)}^{-1} = \begin{pmatrix} 1 & -\varphi & 0 & \dots & 0 & 0 & 0 \\ -\varphi & 1+\varphi^2 & -\varphi & \dots & 0 & 0 & 0 \\ 0 & -\varphi & 1+\varphi^2 & \dots & 0 & 0 & 0 \\ 0 & 0 & 0 & \dots & -\varphi & 1+\varphi^2 & -\varphi \\ 0 & 0 & 0 & \dots & 0 & -\varphi & 1 \end{pmatrix}$$

With this choice of estimate for the optimal weighting matrix, the GMM estimator was made robust to heteroscedasticity and autocorrelation of unknown forms. The empirical GMM

estimation of the HAC consistent covariance matrix $\hat{\Omega}_{HAC}$ using time series data was then obtained as the Newey-West Covariance Matrix;

$$\hat{\Omega}_{GMM} = \left(Z'Z\right)^{-1} T\left(\sum_{i=1}^{n} e_i^2 z_i z_i' + \frac{1}{T}\sum_{\ell=1}^{P}\left(1-\frac{\ell}{P+1}\right)\sum_{i=\ell+1}^{P} e_i e_{i-\ell}\left(z_i z_{i-\ell}' + z_{i-\ell} z_i'\right)\right)\left(Z'Z\right)^{-1} \quad (19)$$

Equivalently,

$$\hat{\Omega}_{HAC} = \left(\left[\frac{1}{T-k}\right]\sum_{t=1}^{T} Z_t' e_t e_t' Z_t\right) + \left(\sum_{J=1}^{T-1} k(j.q)\left(\left[\frac{1}{T-k}\right]\sum_{t=j+1}^{T} Z_{t-j}' e_t e_{t-j}' Z_t\right) - \left(\left[\frac{1}{T-k}\right]\sum_{t=j+1}^{T} Z_{t-j}' e_t e_{t-j}' Z_t\right)'\right)$$

Where k denotes kernel and q denotes the bandwidth. The kernel is used to weigh the covariances for the matrix $\hat{\Omega}_{HAC}$ which is adjudged to be symmetric and positive definite but otherwise unrestricted. There are basically two kernel options, the Bartlett kernel and the Quadratic Spectral (QS). The study employs the Quadratic Spectral (QS) which is given by:

$$k(j.q) = \frac{25}{12\left(\pi\left(j/q\right)\right)^2}\left(\frac{S\text{in}\left(6\pi\left(\frac{j}{q}\right)\Big/5\right)}{6\pi\left(\frac{j}{q}\right)\Big/5} - Cos\left(6\pi\left(\frac{j}{q}\right)\Big/5\right)\right) \quad (20)$$

The reliability of the Quadratic Spectral (QS) derived from the empirical strength that it has a faster rate of convergence than the Bartlett and is smooth and never to be truncated. However, even when the QS kernel is never truncated, it is a function of the bandwidth q. The bandwidth q determines how the weights given by the kernel change with the appropriate number of lags in the estimation of $\hat{\Omega}_{HAC}$.

5 EMPIRICAL RESULTS

Appendix 1 shows the ADF and PP test results. As shown from these results, we tested for unit root of all the variables in the study in their natural logarithm. A close examination of the unit root test results shows that none of the variables is stationary at level but they however became stationary at their first and second differences. Taking into cognizance the low forecastibility power restraint associated with the ADF and PP tests (see Kwiatkowski, Phillips, Schmidt and Shin, 1992), we went further to ascertain the stationarity position of each of the variables in the study by adopting the KPSS test based on the Quadratic Spectral (QS) estimation technique with automatic selection of the Newey-West bandwidth. The results of the KPSS tests are shown in Appendix 2. A detailed analysis of the KPSS results provides empirical evidence in favour of the null hypothesis of stationary series around a deterministic trend. Thus, failure to reject the null in differences implies that all series are stationary. This in essence validates the results obtained under the ADF and PP tests statistics. The Engle-Granger and Johansen and Juselius co-integration test results as presented in Appendixes 3 and 4 show evidence of long-run correlation amongst the variables in the model. In particular, both the trace and Maximum Eigen value test indicates 1 co-integrating relation at the 5% level. By econometric intuition, while the null hypothesis of no co-integration is rejected, the null of at most one co-integrating vector is nevertheless accepted at the 5% significance level. Following the general to specific approach, the original health

investment functions captured about fourteen exogenous covariates. As usual, the process of estimation entails a gradual elimination of insignificant variables. Thus, in this case of fourteen covariates in the overparametrized health investment expenditure functions, only five (5) covariates sustained significance in the parsimonious representation of the private health investment expenditure equation and six (6) sustained to establish such parsimonious relationship for the public health investment function. The estimated parsimonious error correction models are presented in Table 2. The estimations output reveals an elastic effect of the relative price of health care (measured by consumer price index for health care services). The price effect is significant for private health expenditure but insignificant for public health spending in Nigeria. With a negative coefficient of -0.557 and -0.340 for the private and public health expenditure functions respectively; the results suggest the existence of an acute trade-off between price and health services in Nigeria.

The explanation of the price effect is that health care services depend on the ability to pay principle hence at relatively high prices; Nigerians are disempowered to enjoy health services. This result is however contrary to Newhouse's (1977) results from a cross-country national survey that discarding private sector health care is free of charge and therefore, this means that price may be irrelevant to the health consumer and hence may not be a key determinant in explaining health expenditures. By inference therefore, Newhouse's result was informed by the insignificance of the price variable. On the relationship between private and government health investment spending, the co integration analysis indicates that there is a positive long-run correlation between private and government health investment plans. The normalized parameter estimates as shown in the Appendix 5 also confirm the significant positive effect that government health investment spending has on private health investment. As it were, the striking aspect of both estimations centers on the complementary relationship that is found to exist between public and private health investment spending in Nigeria. The results show a significant response of private health investment spending to public health investment spending. Approximately, the response of private health spending to a 1% increase in government health investment is 0.6%. Effectively, this outcome reveals the existence of a complementary correlation between private and government health investment spending. The evidence therefore, could be pointing to the fact that there is a crowding in effect from government health investment plans to private health investment spending. This particular result contradicts and thus fails to allude to Cooray's (2009) and Laudau's (1986) observations that as the size of the government increases, the relationship between private and public investment spending changes from being complementary to substitutability. The complementary relationship of both health expenditures could further be interpreted to be the case that as the government increases her spending on health, the return to aggregate investment demand rises and hence raises the profitability index of the private health investment. In addition, the result may in effect imply the significance of providing basic infrastructure projects to the private sector of the economy as a way to create the appropriate economic environment that prompts private incentives to invest. The effect of government expenditure in other sectors is negative and highly significant at the 5% level. This is an indication of some possible negative trade-off between government health investment expenditures and other expenditures incurred by the Federal Government.

The estimated result indicates that a ten percentage point increase in the growth rate of output will lead to 0.5% increase in private health expenditures. In fact, the response of private health investment expenditure plans to output growth as measured by GDP, the market size of the Nigerian economy is positive and significant as expected. This could be an indication of the fact that private health investors often deem it fit to always take initiatives when there is an increase in the size of the market demand as a result of its multiplier effect on private health care demand. For example, the larger the markets size of the economy, the more

attractive the economy is to private investors. Government tax revenue as a percentage of GDP is not significant in explaining government health spending; thus, such revenues are yet to be effective. As it were, the government's capability to finance health outlays through taxes is weak in effect. The results also show a significant and positive correlation between health capital investment and healthy labour force. Thus, for a percentage increase in healthy labour force, public and private health expenditures will rise by 0.122% and 0.135% respectively. The estimated coefficients of error correction term are -0.709 and -0.613. These are highly significant with theoretically valid signs. These respectively indicate that 71% and 61% of the disequilibrium in private and public health investment spending is corrected in the next year. In other words, the speed of adjustment to disequilibrium of private health investment spending from short to long-run is about 71% while that of per-capita public medical expenditure is about 61%. Consequently, whenever there is mis-alignment between the short and long-run private and government health care spending; about 61 and 71 percent respectively of the disequilibrium is adjusted within a year. The results suggest high speed of convergence to equilibrium whenever there is a disequilibrating shock. The diagnostic tests statistics (ARCH and White) also substantiate a robust fit of the data to the health investment functions.

6 SUMMARY AND CONCLUSION

This paper is an empirical test of the relationship between private and public health expenditures in Nigeria. Our results reveal complementarity of inputs between public and private health expenditures in Nigeria. The result is an indication that government health investment plans crowd in private health investment spending. The crowding in effect could be induced by government tax incentives and government regulation (policy intervention). For example, the Federal Government sometimes uses policies to stimulate the take-up of private social insurance coverage by individuals or employers. A case in point is the fact that tax subsidies to private health insurance plans do reduce the effective price of private health insurance. As a result, the purchaser faces a price that is not solely based on his or her individual risk-profile. On the other hand, regulation arises in relation to premium setting in private insurance plans especially in Nigeria where private insurers are allowed to calculate premiums based on health risks of consumers. Thus, risk sharing or risk adjustments are required to smooth costs across the insured. These regulations are designed to foster a level playing field between the private and the government health insurance programs.

In light of the preceding, the level of private health spendings is also a function of the weight of government health expenditure in the country. Implicationally therefore, the more balanced the composition of government health spending, the greater the increase in the level of effective private health care services in Nigeria. For example, there is insufficient transnational trade in health-services and hence health providers in most countries are confronted with skimpy foreign competition. This remarkable situation as noted by Suhrcke, McKee, Sauto, Tsolova and Mortensen (2005) may become either a great prospect or jeopardy for the overall economy. Thus, unless appropriate regulatory measures are implemented by the government, it may lead to inefficiencies that have an unplanned effect on the rest of the economy (private sector inclusive), which could engender misallocation of resources. This in turn may impinge on competitiveness at the macro-economy level by diverting resources away from other potentially more productive sectors of the economy. Further emanating from the empirical analysis is the implication that providing basic infrastructure projects to the private sector of the economy could help create the appropriate economic and hence regulatory environment that prompts private investment expenditure on health in Nigeria.

REFERENCES

Ataguba, John (2006), *An Estimation of the Willingness to Pay for Community Health Care Risk-Sharing Prepayment Scheme and the Medical Poverty Trap: Evidence from Rural Nigeria.* PMMA Network Session Paper. Addis Ababa, Ethiopia

Akin, J. D.K. Guilkey, and H. Denton (1995), Quality of Service and Demand for Health Care in Nigeria: A Multinomial Probit Estimation. *Social Science and Medicine*; 40(11): 1527-35.

Asgary, A., K. Willis, A.A. Taghavei and M. Rafeian (2004), Estimating Rural Households Willingness to Pay for Health Insurance. *European Journal of Health Economics,* 5: 209-215

Atella, V. and G. Marini (2002), Can We Do Some Interesting Work with the OECD Data? GHP Meeting, Faculty of Economics, University of Rome

Adetunji Labiran, Margaret Mafe, Bayo Onajole and Eyitayo Lambo (2008), Health Workforce Profile: Nigeria Africa Health Workforce Observator. First Edition, October

Baker, J.L., and J. Van der Gaag (1993), Equity in Health Care and Health care Financing: Evidence from Five Developing Countries, In Dooslaer E. Van, A. Wagstaff and F. Rutten (eds.), Equity in the Financing and Delivery of Health Care: An International Perspective. Oxford University Medical Publications, Oxford.

Bloom David and Salal Humair (2010), *Economic Development in Nigeria: A Demographic Perspective*. Committee on Africa studies, Harvard Africa Seminar, April, 13

Cooray A., (2009), Government Expenditure, Governance and Economic Growth. *Comparative Economic Studies,* 51(3):401-418

Commission on Macroeconomics and Health (2001); *Macroeconomics and Health: Investing in Health for Economic Development,* (Report of the Commission on Macroeconomics and Health); Geneva: World Health Organization. Available at: http:www.cid.harvard.edu.

Creel, M. and M. Farrell (2005), Modelling Usage of Medical Services: Expenditure Panel Survey Data, 1996-2000. Department of Economics and Economic History working Paper, Universitat Autonoma de Barcelona

Crease, A. (1991), User Charges for Health Care: A Review of Recent Experience. *Health Policy and Planning* Vol. 6, No 4, 309-319

Fabbri, D. and C. Monfardini (2002), Public vs. Private Health Care Services: Demand in Italy.
Department of Economics Working Paper, University of Bologna

Federal Ministry of Health (2010), Strategic Plan 2009-2013, *National Malaria Control Program.* Abuja, Nigeria.

Federal Ministry of Health Nigeria (2005), *Revised National Health Policy*: Abuja.

Green, H. Williams (2003), Econometric Analysis. 5th Edition, Prentice Hall, New Jersey

Giannoni, M. and Th. Hitiris (1999), The Regional Impact of Health Care Expenditure: the Case of Italy.Working Paper Series of University of York

Grossman, M. (1972), On the Concept of Health Capital and Demand for Health. *Journal of Political Economy*

Gottschalke P., B. Wolf and R. Haveman (1989), Health Care Financing in the USA, UK and

Netherlands: Distributional Consequences, In Changes in Revenue Structures, Proceedings of the 42nd Congress of the International Institute of Public Finance, Athens, 35-373

Gustafsson-Wright E., and J. Van der Gaag (2008), *An Analysis of Nigeria's Health Sector by State: Recommendations for the Expansion of the Hygeia Community Health Plan.* Amsterdam Institute for Int'l Development (AIID) and the Brookings Institution

Guissan, M.C. and M. Arranz (2001), Consumption Expenditure on Health and Education: Econometric Models and Evolution of OECD Countries in 1970-1996. *Journal of Economic Development.*

Hitiris (1999). The Growth and Containment of Health Care Expenditure in Industrial Countries. Working Paper Series of University of York

Hurst J. (1985). Financing Health care in the USA, Canada and Britain. London, Kings Fund Institute

Johnston, J. and J. Dinardo (1997). *Econometrics Methods.* 4th Edition. McGraw-Hill Companies, Inc.

Konoreva T.(2006), Investigating the Role of Health: Is it Really an Intangible Resource for Economic Growth? MA Thesis, AERC

Kwiatkowski, D., Phillips, P.C.B., Schmidt, P. and Y. Shin (1992). Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root. *Journal of Econometrics*. 54: 159-178.

Laudau D., (1986). Government and Economic Growth in LDCs: An Empirical Study. *Economic Development and Cultural Change,* 35:35-75

Lehan, V., V. Rudiy and E. Nolt (2005). Overview for Ukraine Health Care Systems: Time for Changes. European Observatory of Systems and Health Care Policies

Mahal, A. and P. Berman (2001). Health Expenditures and the Elderly: A Survey of Issues in Forecasting, Methods Used, and Relevance for Developing Countries. The Global Burden of Disease 2000 in Ageing Populations

Newhouse, J. P. (1977). Medical Care Expenditure: A Cross-National Survey. *Journal of Human Resources*, 12: 115-25.

Ogunbekun, I. (1996). Health Insurance: *A Viable Approach to Financing Health Care in Nigeria.* John Snow Inc., Arlington, V A.

Ogunbekun, I., and N. Orobaton (1999). Private Health Care in Nigeria: Walking the Tightrope. *Health Policy and Planning,* 14(2): 174 – 181

Orubuloye, I. O., J. C. Caldwell, and C.H. Bledsoe (1991). The Impact of Family and Budget Structure on Health Treatment in Nigeria. *Health Transition Review,* 1(2):189 – 209

Onoka C. A., O. E. Onwujekwe, K. Hanson, and B. Uzochukwu (2010). Measuring Catastrophic Health Care Expenditures in Nigeria: Implications for financial risk protection. The Research Conducted at Health Policy Research Group, based at the College of Medicine, University of Nigeria, Enugu-campus (UNEC)

Pannarunothai, S. and A. Mills (1997). The Poor Pay More: Health-Related Inequality in Thailand. *Social Science and Medicine* Vol. 44, 1781-1790

Sambo, M. N., C. L. Ejembi, Y. M. Adamu and A. A. Aliyu (2010). Out-of-Pocket Health Expenditure for Under-Five Illnesses in a Semi-Urban Community in Northern Nigeria. *Journal of Community Medicine & Primary Health Care*. 16 (1) 29-32

Suhrcke M., McKee M., Sauto Arce R., Tsolova S., and Mortensen J., (2005). *The Contribution of Health to the Economy in the European Union. Health and Consumer Protection*

Vitaliy Provotorov (2007). Substitution of Private for Public Expenditure on Health Care Services for Countries in Transition. Thesis Report.

Wagstaff A. and E. Van Dooler (2001). Paying for Health Care. Washington D.C., World Bank, Mimeo

Wolfe B. and P. Gottschalke (1989). The Distribution of health Care Financing in the Overall Population among the Elderly. *Social Justice Research* Vol. 1, 3 (315 – 328)

Whitehead, M., G. Dahigren and T. Evans (2001). Equity and Health Sector Reforms: Can Low-income Countries Escape the Medical Poverty Trap? *Lancet*, 358: 833 – 836

Biographies

Jameelah O. Yaqub is a Senior Lecturer in the Department of Economics in Lagos State University. She received her B.Sc. and M.Sc. degrees in Economics from the University of Ilorin and University of Lagos respectively. She has her Ph.D in Economics from University of Ibadan in 2010. She has authored more than 20 journal articles. Her current research interest includes financial innovations and consumers' satisfaction as well as health economics issues. She is a member of Nigerian Economic Society and African Econometric Society.

David Umoru is a lecturer in the Department of Economics, Banking and Finance in Benson Idahosa University, Benin, Edo State in Nigeria. He has a B. Sc and M.Sc. Degrees in Economics. He crowned his training with a Ph D in Economics from the University of Benin, Nigeria. He has authored many articles.

Appendix 1: Unit Root Tests Results Based on ADF and PP Statistical Test Techniques

Unit Root Tests Results with Intercept but no Trend			
Variables	**ADF (PP) Test Statistics**	**95% Critical Values, ADF (PP)**	**Remark**
$\Delta Ln(PHC)$	-4.3459(-6.8888)	-2.8872(-3.4522)	Stationary
$\Delta Ln(HPU)$	-3.5329(-5.8129)	-2.8872(-3.4522)	Stationary
$\Delta Ln(GDP)$	-4.5833(-4.6933)	-2.8872(-3.4522)	Stationary
$\Delta Ln(HPR_{t-1})$	-4.3655(-4.0233)	-2.8872(-3.4522)	Stationary
$\Delta Ln(HCTLAB)$	-8.4566(-5.8555)	-2.8872(-3.4522)	Stationary
$\Delta Ln(HPR)$	-5.2022(-10.322)	-2.8872(-3.4522)	Stationary
$\Delta Ln(GXTR)$	-5.4444(-6.3922)	-2.8872(-3.4522)	Stationary
$\Delta Ln(EXPT)$	-6.6266(-5.2388)	-2.8872(-3.4522)	Stationary
$\Delta Ln(HPU_{t-1})$	-5.9228(-10.8222)	-2.8872(-3.4522)	Stationary
Unit Root Tests Results with Intercept and Trend			

Variables	ADF (PP) Test Statistics	95% Critical Values, ADF (PP)	Remark
$\Delta Ln(PHC)$	-6.5246(-15.999)	-3.2296(-3.4853)	Stationary
$\Delta Ln(HPU)$	-12.8352(-10.443)	-3.2296(-3.4853)	Stationary
$\Delta Ln(GDP)$	-8.3935(-12.8899)	-3.2296(-3.4853)	Stationary
$\Delta Ln(HPR_{t-1})$	-5.6699(-6.8222)	-3.2296(-3.4853)	Stationary
$\Delta Ln(HCTLAB)$	-10.655(-16.4532)	-3.2296(-3.4853)	Stationary
$\Delta Ln(HPR)$	-9.6225(-18.6893)	-3.2296(-3.4853)	Stationary
$\Delta Ln(GXTR)$	-13.5555(-22.266)	-3.2296(-3.4853)	Stationary
$\Delta Ln(EXPT)$	-12.8333(-9.2688)	-3.2296(-3.4853)	Stationary
$\Delta Ln(HPU_{t-1})$	-8.2225(-14.2266)	-3.2296(-3.4853)	Stationary
Notes: The ADF and PP tests the null hypotheses of a unit root such that a rejection of the null under the ADF and PP tests implies a stationary series			

Appendix 2: Unit Root Tests Results Based on KPSS Statistical Test Technique

Series	Auxiliary Regression with Constant	Critical Value	Auxiliary Regression with Constant and Trend	Critical Value	Decision Rule
$\Delta Ln(PHC)$	0.456	0.739	0.022	0.216	Stationary
$\Delta Ln(HPU)$	0.264	0.739	0.015	0.216	Stationary
$\Delta Ln(GDP)$	0.333	0.739	0.028	0.216	Stationary
$\Delta Ln(HPR_{t-1})$	0.028	0.739	0.019	0.216	Stationary
$\Delta Ln(HCTLAB)$	0.662	0.739	0.056	0.216	Stationary
$\Delta Ln(HPR)$	0.222	0.739	0.186	0.216	Stationary
$\Delta Ln(GXTR)$	0.569	0.739	0.205	0.216	Stationary
$\Delta Ln(EXPT)$	0.392	0.739	0.042	0.216	Stationary
$\Delta Ln(HPU_{t-1})$	0.655	0.739	0.084	0.216	Stationary
Note: The KPSS tests the null hypothesis of stationary series. Consequently, a rejection of the null under the KPSS (1992) is interpreted as evidence of non-stationarity with the implication					

that there exits a unit root in the series

Appendix 3: Co-integration Test Results Based on Engle-Granger Two-Step Approach

Residuals from Static Regression	**Augmented Dickey Fuller (ADF) Test Statistic**		**Phillips-Perron (PP) Test Statistic**	**Statistical Inference**
	One-Lag ADF Model	**Two- Lag ADF Model**		
$RESID\left[Ln(HPR)\right]$	-3.704*	-4.745*	-5.164*	Co-integrated
$RESID\left[Ln(HPU)\right]$	-4.002*	-4.675*	-5.952*	Co-integrated
	Critical Values			
	1%	**5%**		
One-lag *ADF* model	**-2.644**	**-1.952**		
Two-lag *ADF* model	**-2.647**	**-1.953**		
***(**)** connotes the stationarity of residuals and hence co-integration at the 99% (95%) levels respectively.				

Appendix 4: Co-integration Test Results Based on Johansen's Maximum Likelihood

Static Models	**Optimal VAR Lag-Length Selected***	**Trace Statistic**		**Maximum Eigen value Statistic**		**Statistical Inference**
		Co integration Rank	**Level of Significance**	**Co integration Rank**	**Level of Significance**	
$Ln(HPR)$	1	1	5%	1	1,5 %	Co-integrated
$Ln(HPU)$	1	1	5%	1	5%	Co-integrated
* The optimal lag length was 3 but the number of observations could not allow for the *VAR* estimation that precedes the Johansen's co-integration test. Hence, a lag-order of 1was utilized.						

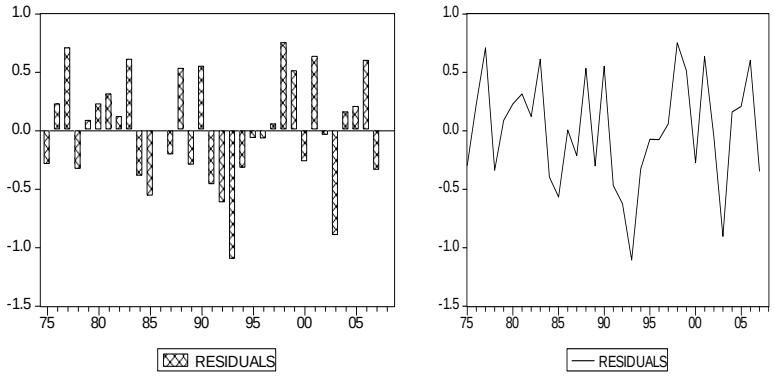
Appendix 5: Regression Estimates of Private and Public Health Capital Investment Expenditure Functions

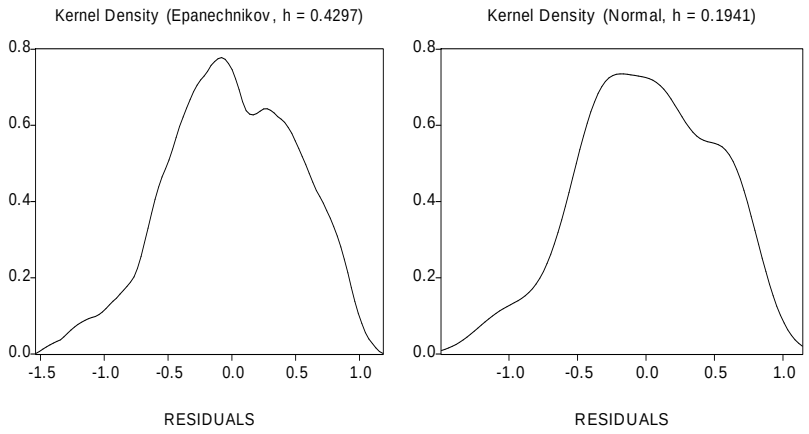
Regressor(s)	Methodology: System Generalized Method of Moments		
	Private Health Expenditure Model	Public Health Expenditure Model	p-value(s)
	Coefficients (t-values)		
Constant	4.293 (1.389)	-0.281** (-2.502)	(0.0013)(0.000)
$\Delta^2 Ln(PHC)$	-0.557** (-2.445)	-0.340* (-2.374)	(0.1011)(0.0001)
$\Delta Ln(HPU)$	0.575** (2.287)		(0.0061)(3.0223)
$\Delta Ln(GDP)$	0.051* (3.116)		(0.0003)
$\Delta^2 Ln(HPR_{t-1})$	0.084** (2.013)		(0.0002)(0.0001)
$Ln(HCTLAB)$	0.122* (5.223)	0.135* (10.006)	(0.0002)(0.0000)
$Ln(HPR)$		1.191 (1.511)	(0.0008)
$\Delta^2 Ln(GXTR)$		0.232 (1.357)	(0.0050)
$\Delta Ln(EXPT)$		-0.108 (-2.041)	(0.0000)
$\Delta^2 Ln(HPU_{t-1})$		0.176* (2.853)	(0.0000)
Error Correction Term			
$ecm_{(t-1)}$	-0.709* (-3.477)	-0.613** (-2.320)	(0.0000)(0.0001)
Diagnostic Test Statistic(s)			
R^2 (Adjusted R^2)	60.9% (56%)	63.5% (60%)	
F-statistic	13.02	21.77	
Newey-West ξ Statistic	1.666(0.304)	1.099(1.533)	Valid Moments Conditions
Sargan Test Statistic	1.882(0.000)	1.551(0.000)	Valid Instruments
White Test Statistic	0.601(0.178)	0.221(0.201)	Homoskedastic Residuals
ARCH Test Statistic	0.225(0.029)	0.077(0.214)	Homoskedastic Residuals
Jarque-Bera Test Statistic	0.391(0.0001	0.745(0.409)	Gaussian Disribtuion
Durbin-h Statistic	1.64	1.57	Non-autocorrelated Resid.
Breusch-Godfrey LM Statistic	0.181(0.000)	0.922(1.005)	Non-autocorrelated Resid
*(**) indicates variable significance at 1%(5%) levels respectively; t-ratios are reported below each parameter estimate			

Appendix 6: Diagnostic Tests on the Residuals of Private and Public Health Investment Equations

Correlogram of Private Equation Residuals
Sample: 1975 2008, Included Observations: 33

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |* . |	. |* . |	1	0.086	0.086	0.2686	0.604
. | . |	. | . |	2	0.002	-0.005	0.2688	0.874
. *| . |	. *| . |	3	-0.073	-0.073	0.4740	0.925
. *| . |	. *| . |	4	-0.083	-0.071	0.7463	0.946
.**| . |	.**| . |	5	-0.261	-0.252	3.5499	0.616
. *| . |	. *| . |	6	-0.123	-0.098	4.1930	0.651
. |* . |	. |* . |	7	0.156	0.170	5.2744	0.627
. | . |	. *| . |	8	-0.008	-0.075	5.2777	0.728
. | . |	. | . |	9	0.046	0.001	5.3784	0.800
. | . |	. *| . |	10	-0.016	-0.081	5.3911	0.864
. |* . |	. |* . |	11	0.109	0.082	6.0140	0.872
.**| . |	. *| . |	12	-0.194	-0.158	8.0777	0.779
.**| . |	.**| . |	13	-0.202	-0.196	10.423	0.659
. *| . |	. *| . |	14	-0.078	-0.084	10.796	0.702
. *| . |	. *| . |	15	-0.064	-0.089	11.062	0.748
. | . |	. | . |	16	0.025	0.011	11.104	0.803

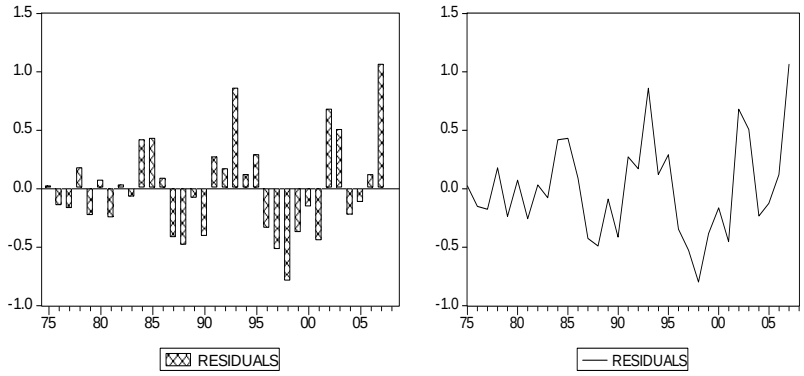


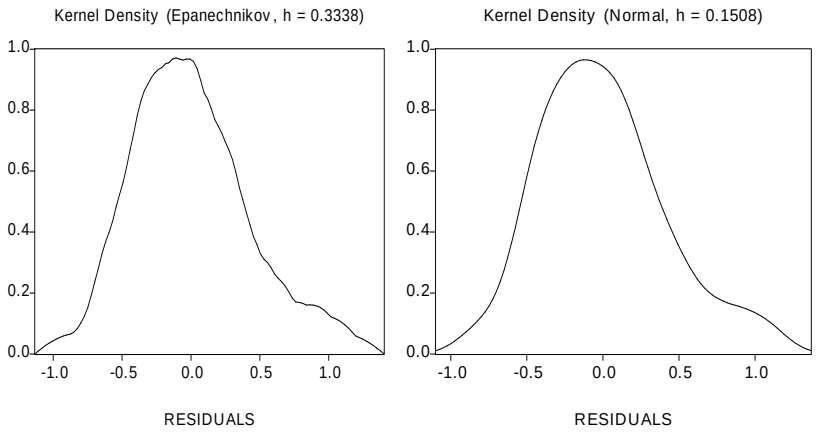


Correlogram of Public Equation Residuals

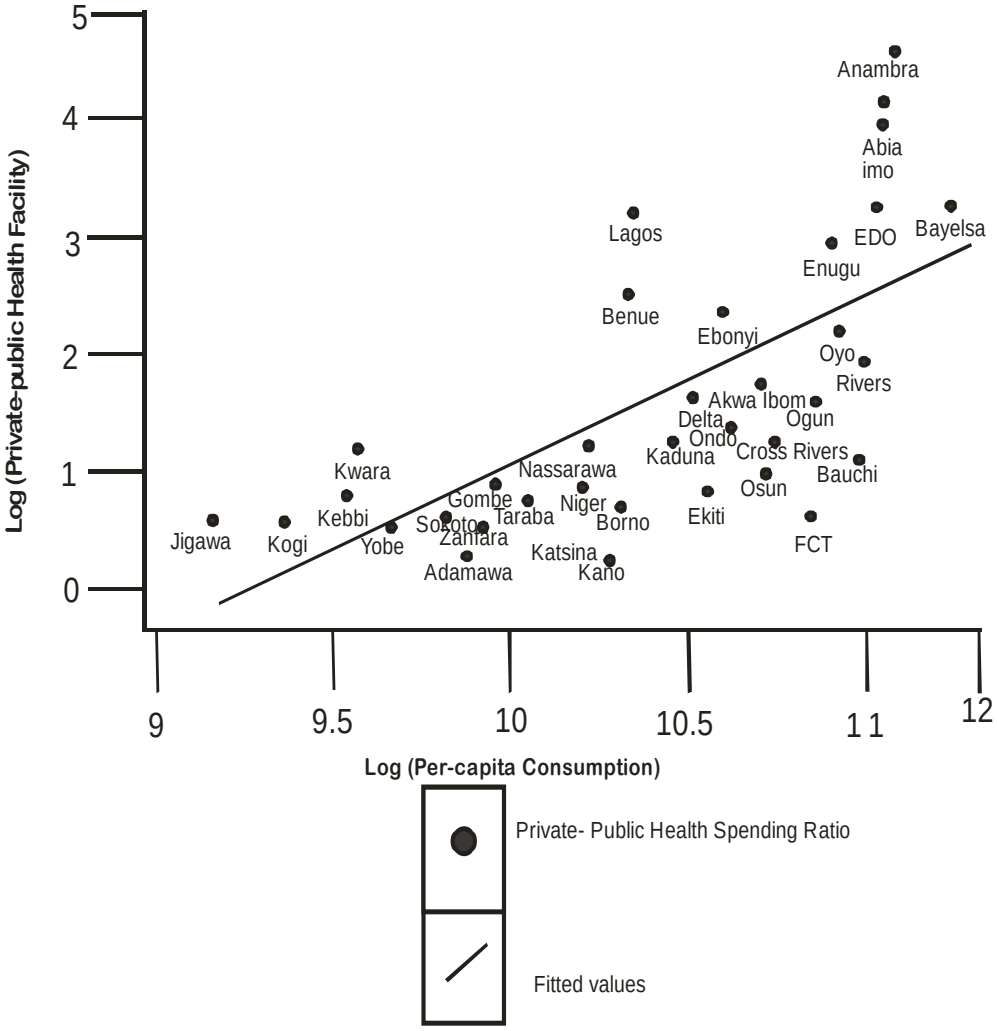
Sample: 1975 2008, Included Observations: 33

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |* . |	. |* . |	1	0.135	0.135	0.6592	0.417
. *| . |	. *| . |	2	-0.062	-0.081	0.8009	0.670
.**| . |	. *| . |	3	-0.193	-0.177	2.2280	0.526
. | . |	. |* . |	4	0.033	0.084	2.2721	0.686
. *| . |	. *| . |	5	-0.108	-0.155	2.7503	0.738
. *| . |	. *| . |	6	-0.174	-0.179	4.0416	0.671
. |* . |	. |**. |	7	0.160	0.246	5.1768	0.638
. | . |	. *| . |	8	0.007	-0.151	5.1794	0.738
. | . |	. | . |	9	0.045	0.031	5.2752	0.810
. *| . |	. *| . |	10	-0.172	-0.098	6.7619	0.748
. *| . |	.**| . |	11	-0.132	-0.232	7.6699	0.743
.**| . |	.**| . |	12	-0.269	-0.234	11.654	0.474
. *| . |	. *| . |	13	-0.156	-0.143	13.054	0.444
. |* . |	. | . |	14	0.077	-0.041	13.414	0.494
. | . |	. *| . |	15	0.055	-0.094	13.611	0.555
. |**. |	. |* . |	16	0.217	0.130	16.810	0.398




Kernel Density (Epanechnikov, h = 0.3338)
1.0
0.8
0.6
0.4
0.2
0.0
-1.0
-0.5
0.0
0.5
1.0
RESIDUALS
Kernel Density (Normal, h = 0.1508)
1.0
0.8
0.6
0.4
0.2
0.0
-1.0
-0.5
0.0
0.5
1.0
RESIDUALS

Appendix 7: Private/Public Care Facility Use By State in Nigeria



Source: Gustafsson-Wright and Van der Gaag (2008)

Appendix 8: Country Health System Fact Sheet, Nigerian Health Expenditure, 2008

Health Expenditures	**(%)**	**Year**
Total Expenditure on Health (%) of Gross Domestic Product (GDP)	05.0	2008
Government Expenditure on Health (%) of Total Expenditure on Health	25.5	2008
Private Expenditure on Health (%) of Total Expenditure on Health	74.5	2008
Out-of-Pocket Expenditure (%) Private Expenditure on Health	91.2	2008
Private Prepaid Plan (%) Private Expenditure on Health	06.7	2008
Per-capita Total Expenditure on Health (US$) Exchange Rate	022	2008
Per-capita Total Expenditure on Health (International Dollar Rate)	051	2008
Per-capita Government Expenditure on Health (US$) Exchange Rate	006	2008
Per-capita Government Expenditure on Health (International Dollar Rate)	013	2008
Social Security Expenditure on Health (%) of GHE	0.00	2008
External Resources for Health (%) Total Expenditure on Health	05.3	2008

Source: World Health Statistics (2009), http://www.who.int/whosis/