THE MEASURE OF MARKET STRUCTURE AND THE QUALITY OF HEALTHCARE IN HOSPITAL MARKETS, IBADAN, NIGERIA

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Abstract

In Nigeria, hospitals are confronted with challenges of inadequate funding, lack of proper supervision and uncompetitive nature that threatens their existence. The situations amount to inadequate provision of healthcare by the government, increased household health expenditures and lower quality of healthcare. Many studies have examined quality of healthcare among hospitals, but study that examine the hospital market structure, which has implication on quality of healthcare has not received much attention in Nigeria. Therefore, this study, examined the effect of measure of hospital market structure on the quality of the healthcare produce within the hospital markets in Ibadan metropolis. The predicted Herfindal Hirschman Index (HHI) obtained from the hospital choice model was employed as a measure of market structure. The values of HHI were disaggregated into four categories, which correspond to the most, more, less and least competitive markets. Quality of healthcare was measured by different hospital's inputs, including the number of registered nurses and hospital beds. Given the continuous nature of dependent variables, Ordinary Least Square (OLS) was used to examine the effect of hospital market structure's measure on the quality of the healthcare. Analysis was conducted at the aggregate, mixed and non-mixed market levels based on the hospital ownership structure. Data were drawn from the census of secondary hospitals in Ibadan and a survey of patients that attended these hospitals. Questionnaires were administered to patients drawn from 127 out of 185 available hospitals. Purposive sampling was adopted to select 6 patients aged 18-60 years in each hospital making 761 patients in all. The findings show that the quality of healthcare is higher in most and more competitive markets than in less and least competitive market as hospitals increase the number of full time resident doctors, house officers and hospital beds to provide high quality healthcare in the most and more competitive markets. Therefore a policy that will encourage investment in the healthcare sector and allow entrance of new hospitals so as to promote competitive behavior among hospitals was recommended.

Keywords: Herfindal Hirschman Index (HHI), Quality of healthcare, Ibadan, competitive market and hospital

1. Introduction

In Nigeria, there are few numbers of hospitals relative to the population and the few existing hospitals are confronted with challenges of inadequate funding and bureaucratic impediments that threatens their existence (Adenuga and Ibiyemi, 2010). The situations imply inadequate provision of healthcare by the government and it makes the private hospitals unavoidable choice of many people. Following the introduction of the National Health Insurance Scheme (NHIS) in 1999, the number of private hospitals has been augmented (NBS, 2012). Consequently, there have been increased private involvement in healthcare delivery that support a competitive health system in Nigeria. Private hospitals now provide at least 70 percent of the healthcare in the country, with the rest coming from federal, state, and local government health institutions (Okechukwu *et al*, 2014). However, some of these private hospitals do not comply with the ministry of health standard, even though, there are regulations that guide the conduct of hospitals ensured by various regulatory bodies such as, Oyo State Ministries of Health (OYSMOH) and Medical and Dental Council of Nigeria (MDCN), these regulations are not being strictly enforced to ensure that minimum quality standards are met (Enabulele, 2014). Importantly, the increasing number of competing private hospitals without adequate regulations, may influence the market structure.

The policy aim to strengthen the national health system to provide effective, quality, and affordable healthcare services that will improve the health status of Nigerians was first formulated in 1988. The policy was later reviewed in 2004 and 2014 to re-outline the framework for the regulation, development and management of the health system and set standards for rendering healthcare services (National Health Act, 2014). In addition, the Nigeria's comprehensive National Strategic Health Development Plan (NSHDP, 2010-2015) targeted increased healthcare quality. However, objectives and targets laid out in the NSHDP were overly ambitious because they were based on the assumption that Nigeria would meet the MDGs when in fact, in 2011 it was not on track to do so and eventually in 2015 only few goals were achieved. Similar plans were developed at the state level, for instance, Oyo State Strategic Health Development Plan SSHDP (2010-2015) covered the eight (8) priority areas that are geared towards ensuring quality and adequate healthcare service, but as of 2014, this policy was yet to fully be implemented. These policies were put in place to bring remarkable progress in the provision of quality healthcare. But little success has been recorded in their implementation and lower quality of healthcare still typified the health sector.

To address the problem of increasing healthcare expenditure and lower quality of healthcare, many developed countries have come to allow a competitive hospital market structure as a strategy for reducing healthcare costs while still producing higher quality healthcare. In theory, competitive market structure is expected to increase the quality of healthcare and reduce costs. However, in the literature, there have been controversies about the effect of the measures of market structure on the quality of healthcare. For instance, some studies established positive relationship between measures of market structure and quality (Kessler and Geppert, (2005), while other authors found negative and neutral effects (Lien *et al*, (2010); and Propper, *et al,* (2003)). However, empirical scholarly attentions directed at examining the effect of market structure on the quality of health care has received little or no attention over the years in Nigeria. Thus, examining the effect of measures of hospital market structure on the quality of healthcare is a reasonable empirical contribution that this study aim to achieve.

2. The Nigerian Healthcare System

The 1999 Constitution puts health on the concurrent list, meaning that all tiers of government; the federal, state and local government have a definite role to play in providing for the people's health needs. At the federal level, the federal Ministry of Health is responsible for technical support to the overall health system and the provision of health services through the tertiary healthcare facilities. The State ministries of health are responsible for the regulations of secondary hospitals and the provision of technical support for primary healthcare, while the local government is directly responsible for the provision of primary healthcare. There are health parastatal, agencies and departments within the federal and state ministries of health (NHS, 2012). These hierarchical organizations of the healthcare system should allow the effective functioning of the system, but the performance of the Nigerian health sector is still described as poor. Okechukwu *et al*, (2014), explains that absence of clarity of roles and responsibilities among the different levels of government is responsible for the shamble state of the health sector in Nigeria. The resulting effects are portrayed in the lower quality delivery and poorer health status.

A. Hospital's Classification in Nigeria

Hospital contributes greatly to the implementation of adequate healthcare delivery in Nigeria. They are geographically dispersed and classified according to the various healthcare services they provide. Hospitals are part of healthcare facilities (WHO, 2014). In Nigeria, there are tertiary and secondary hospitals. Tertiary hospitals are the highest level of healthcare facilities, secondary hospitals are general hospitals where patients stay for a short-term acute-care services. A secondary hospital provides surgical services, supported by beds and bedding for a minimum of 10 patients (MDCN, 2004). These hospitals are controlled by the state governments and private individuals or group of individuals (Ademiluyi and Aluko-Arowolo 2009). There are public and private hospitals, the public hospitals are owned and run by the federal and state governments and they are established with the sole aim of providing adequate and quality healthcare services. Private hospitals are owned by the private sector. Private hospital is further grouped as for-profit and Not- for- profit private hospitals. The for-profit private are run on a commercial basis and they are owned by an individual or a group of individuals, while the not-for profit private are owned by churches, mosques and various charity organizations. The distribution of hospitals and its ownership structure in Nigeria is presented in Table 1.

Table 1. The Ownership Structure of Secondary Hospitals in Nigeria

Geopolitical Zone	Private Sec. Hospital	Public Sec. Hospital	Total No of Hospital
SW	565(75)	193(25)	758(100)
SS	533(76)	166(24)	699(100)
SE	1092(93)	88(7)	1180(100)
NC	194(48)	207(52)	401(100)
NE	20(18)	91(82)	111(100)
NW	54(35)	100(65)	154(100)
Total	2458(74)	845(26)	3303(100)

Source: Compiled from Nigeria Bureau of Statistics (NBS, 2012)

In the South-West geopolitical zone, private accounted for 75% of total hospitals, while public has 25%. In Nigeria, private hospitals accounted for 74% of the total number of hospitals, which indicates that there are more private than public secondary hospitals. This difference may be attributed to inadequate funding and provision of healthcare by the government. By implication, there is a high predisposition for more competitive market for private than public hospitals as it is theoretically assumed that large numbers of hospitals imply a competitive market (Baker, 2001).

B. Hospital Markets in Ibadan, Nigeria

In the hospital markets, there are demand and supply sides, patients are the key players in the demand side and factors such as perceived hospital services and the extent of information accessible by patients determine the patients' choice of hospitals. On the supply side, hospitals are the major actor with emphasis on factors such as hospital ownership structure, regulations and cost structure. Table 2 shows the distribution of hospital in Ibadan and Oyo state.

Table 2. Distribution of Secondary Hospitals in Oyo and Ibadan (2015)

Hospital	Ibadan	Oyo State
Secondary Hospital		
Public hospitals	23(8.3%)	46(13.3%)
For-profit private hospitals	241(87.3%)	282(81.7%)
Not-for profit private hospital	12(4.3%)	17(4.9%)
Total	276(100%)	345(100%)

Source: Compiled from Oyo State Ministry of Health (OYSMOH, 2015) and NHIS (2016)

For-profit private hospitals accounted for 87.3% of the total hospitals, while public hospitals only accounted for 8.3% of the total hospitals in Ibadan in 2015. Not-for-profit private secondary hospitals have the least proportion of the total hospitals with 4.3%. A similar trend was also recorded in the distribution of hospitals in Oyo state. This situation points to increase participation of private sector in the provision of healthcare services in Ibadan and Oyo state and decline in the public provision of healthcare. Due to few number few numbers of public hospitals, they are sparsely geographically dispersed, thus there are some areas that coexist both public and private hospitals, while in some areas, and only private hospitals exist.

The Oyo State Ministry of Health (OYSMOH) is the highest regulating body on health related matters in the state. It controls and monitors private healthcare facilities, it operates administratively through its 8 directorates, which include the Health and Hospital Monitoring (HHM); secondary healthcare and training unit (OYSMOH, 2015). The MDCN, (2004), endorses degrees and training institutions, and supervises the conduct of health professionals. These regulations are meant to ensure healthcare quality is consumed by patients. Hospitals employ human and non-human inputs in the production of healthcare services, these inputs enhance the quality of healthcare. In Ibadan, there are 282 medical consultants, 663 medical doctors, 3443 nurses/midwives and 166 pharmacists employed in the local, state, federal and recognized private healthcare facilities (OSHDP, 2010). Also, the efficiency of regulation of the human resources enhances the supply of qualified medical staff. Public hospitals are equipped with sophisticated equipment and facilities and a large number of beds due to their large sizes, although most of these inputs are in wretched states due to lack of maintenance (Adenuga and Ibiyemi, 2010). Also, the influx of patients to public hospitals is heavy and it is not proportionate to the available inputs and staff, thus, the expected higher quality is not often produced, these situations frequently pushes patient to private hospitals. For-profit private hospitals are privately funded without subsidy from the government, thus, their cost structure is very high and it directly impacts on their scale of operation and pricing policy. Whereas, the state governments generate funds

from the state internally generated revenue and federal allocation and other sources including, WHO, World Bank donor funds among others.

3. Literature Review

Quality of Healthcare in the Hospital Market

Quality represents the key non-price consideration that determines whether consumers will purchase a product. It is a multidimensional concept that encompasses a wide variety of factor inter alia, reliability, location and performance of a product (OECD, 2013). The issue of how to measure quality is a long-standing in the hospital market studies. This is because, quality poses a challenge in linking theoretical predictions and empirical findings, as different studies employ different indicators. In the literature, quality indicators are grouped under four measures. First, outcome indicators, these are health outcome, such as mortality rates, readmission rates determine etc. (in part) by higher quality (Gaynor and Town, 2012). Second, input indicators, it describes the efforts exert by hospitals to demonstrate their commitment to quality, the indicators include, staff patient ratio etc (Lien *et al,* 2010). Third is patient quality's experiences, it examines the perception of patient about quality and provide feedback on patients' experiences of quality. (Morris and Bailey, 2014). Fourth, process indicators, it determines if the services provided to patients are consistent with routine medical care. (Lien et al, 2010). These indicators provided different results about the effect of market structure on healthcare quality.

Theoretical Issues

Hospital Market Structure

The market structure is an external theory that explains how firms compete in the marketplace and the nature of competition that exist in the market is explained through the basic underlying structure of the market (Genakos, 2014). In microeconomic theory, there are perfect and imperfect markets. The starting point is the perfect market with the basic assumption of free entry and homogenous product that do not hold in the hospital market as the market product is differentiated, information available to patients is imperfect and government regulation is extensive to maintain high quality of healthcare (Propper and Dixon, 2011). The imperfect market is divided into monopolistic competition, oligopoly, duopoly and monopoly market structures. The imperfect market emphasis product differentiation, this is because differentiation in the quality of healthcare stimulates the degree of competition that exist in the hospital market and make the market to be highly competitive. The health economics literature on product differentiation is grouped into vertical and horizontal differentiation in a market where price is fixed and set by hospitals.

Hospitals are assumed to compete on both price and quality as patients are sensitive to both in a vertical product differentiation with variable price, (Propper and Dixon, 2011). Hospitals offer different qualities and prices. Economic theory predictions about the relationship between measures of market structure and quality is ambiguous under this model. The vertical model under fixed price assumes that hospitals compete on healthcare quality and patient rank quality while being insensitive to price. It is known that firms will pursue minimal product variety as consumers are insensitive to price (Tirole, (1988). Economic theory prediction is clear under this model. The major contributions to the model are; Shaked and Sutton (1983) and in health economics, Gaynor and Town, (2012) and (Kessler and Geppert, (2005) are classic references. The horizontal product model shows that consumers do not agree on a particular product as a better or most preferred product even at equal prices. Hotelling (1929) was the first to employ

horizontal differentiation and his result was named the Principle of Minimum Differentiation to show that when firms' locations are given, a small cut in a firm's price does not attract the entire market share of the rivals, but only a fraction of it. In Nigeria, there are differences in availability of healthcare quality in respect to ownership structure, which varies between public and private hospitals makes patients to perceive hospitals differently

Empirical Review

Empirically, several studies have examined the effect of measures of market structure on quality of healthcare. Thus, empirical studies exist in this regard, however, most of these studies are peculiar to developed countries, while only a few of these studies have been done in Africa, especially in Nigeria. Kessler and McClellan (2000) investigated the effects of measures of market structure on hospital quality using mortality rates from acute myocardial infarction and HHI. The result showed that the quality of healthcare increases in a most competitive market as patients in the least competitive markets had mortality probabilities of 1.46 points higher than those in the most competitive markets. However, studies Propper, et al., (2003), and Lien et al., (2010) among others, employed HHI and show negative and neutral impacts of competition on quality. Propper, et al., (2003) employed the measure of market structure to examine the impact of the introduction of competition into UK National Health Service and found that the relationship between competition and quality healthcare is negative during the periods of policy reforms in 1990s. Similarly, Lien *et al*., (2010) examined whether market competition affects treatment expenditure and health outcomes of stroke and cardiac treatment in Taiwan and find that competitive market has insignificant impacts on patient's mortality.

In developing countries, Halse, *et al*., (2013) examined the role of competition policy on healthcare markets in South Africa and found that inefficiencies exist in the South African healthcare market due to uncompetitive conducts based on regulatory problems. In Nigeria, studies on the determinants of healthcare quality have been conducted, while studies that examined the effect of market structure on healthcare quality have received little attention. Polsa, *et al*., (2011) compares the perceived quality of healthcare between private and public hospitals in Lagos and found that private hospitals offers a higher quality of healthcare than public hospitals. Adesanya *et al.,* (2012) also portray that private hospitals provide effective service delivery than public hospitals in Nigeria. In summary, several studies have employed HHI, a measure of market structure to examine the effect of market structure on healthcare quality and obtaining mixed findings, which is largely due to different measures of quality.

4. Methodology

Hospital Markets and Market Structure

Empirically, hospital market is viewed from two perspectives; based on related product of interest and geographic area (Baker, 2001). Geopolitical boundaries, fixed and variable radius and patient flow methods have been used to define a hospital market area (Garnick et al. 1987). To examine market structure, the geographical hospital market area (HMA) was first defined. Patient flow method was used to cater for endogeneity bias in other approaches. The approach defines a HMA as the collection of zip code areas (ZCAs) that send a nontrivial amount of patients to hospital, which collectively accounted for 90% of a hospital's attendance. The 90% was adopted to allow a maximum number of hospital market area to be selected, while hospital attendance was considered to cover the inpatient and outpatient that hospitals have record of.

Measures of Market Structure

The market structure was determined using predicted Herfindal Hirschman Index (HHI). The predicted HHI, this is the expected patient shares based on exogenous determinants of patient

flows, rather than potentially endogenous measures such as number of beds or actual patient flows (Kessler-McClellan, 2000). The predicted HHI was derived from the predicted probabilities of the hospital patient choice model specified as;

[1] $U_{ij} = \tau O_j + \varphi Y_i + \partial D_{ij} + \varepsilon_{ij}$

The predicted probabilities of attendance of patients in every hospital in the relevant geographic market is summed to yield the predicted number of patients that attend hospitals in each HMA. The predicted market share for each hospital is then obtained by the ratio of the predicted number of patients that attend hospitals within a HMA and the total number of patients from that HMA The algebraic equations that describe these processes are presented as;

$$\hat{HHI}_j = \left(\frac{\hat{n}_{k_1 j}}{\hat{n}_j}\right) * \hat{HHI}_{k_1} + \left(\frac{\hat{n}_{k_2 j}}{\hat{n}_j}\right) * \hat{HHI}_{k_2} + \left(\frac{\hat{n}_{k_3 j}}{\hat{n}_j}\right) * \hat{HHI}_{k_3} + \ldots\ldots + \left(\frac{\hat{n}_{k_K j}}{\hat{n}_j}\right) * \hat{HHI}_{k_K}$$

$$\hat{HHI}_{k_1} = \left(\frac{\hat{n}_{j_1 k_1}}{\hat{n}_{k_1}}\right)^2 + \left(\frac{\hat{n}_{j_2 k_1}}{\hat{n}_{k_1}}\right)^2 + \left(\frac{\hat{n}_{j_3 k_1}}{\hat{n}_{k_1}}\right)^2 + \ldots\ldots + \left(\frac{\hat{n}_{j_J k_1}}{\hat{n}_{k_1}}\right)^2$$

Where[2];

Using the hospital-level HHI (HHI*j*) may lead to biased estimates of the impact of measure of market structure on patient welfare, to address this problem, hospital-level HHI is assigned to the patient according to each patient's hospital of attendance. Thus, predicted patient-level HHI is employed for analysis[3]. The predicted patient-level HHI assigns hospital HHI to patients based on the vector of average expected probabilities of hospital choice in the patient's HMA. It is constructed as;

$$\hat{HHI}_k^{pat*} = \left(\frac{\hat{n}_{j_1 k_1}}{\hat{n}k_1}\right) * \hat{HHI}_{j_1} + \left(\frac{\hat{n}_{j_2 k_1}}{\hat{n}k_1}\right) * \hat{HHI}_{j_2} + \ldots\ldots\ldots\ldots\ldots + \left(\frac{\hat{n}_{j_J k_1}}{\hat{n}k_1}\right) * \hat{HHI}_{j_J}$$

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[1] Where U_{ij} is the utility function and it denoted that patient i make a hospital choice j among the J hospitals.. τO_j is the vector of hospital j's characteristics such as ownership structure, the patient volume. The natural log of the number of full time resident doctors and hospital beds. φY_i is the vector of patient$i$'s characteristics, including age, sex, average monthly income of the patient in Naira and patient geographical location of residence. D_{ij} is the distance (measured in minutes) to the hospital j from the patient's residence i , the squared value of distance is introduced to allow that distance may influence hospital choice non-linearly. Also, distance is interacted with age and gender to capture the combine effect of these variables on hospital choice. ε_{ij} is an idiosyncratic error term of patient i's unobserved, idiosyncratic preference attendance of hospital *j*.

[2] k =HMA; $k = 1,2,3,\ldots\ldots,K$, $j = 1,2,3\ldots J$, $\hat{n}_j$ = the predicted number of patients who attend hospital j from all HMA , $\hat{n}_{jk}$ =the predicted number of patients from market area k that attend hospital j, $\hat{\pi}_{ij}$ =the predicted probability that patient i attends hospital j , $\hat{n}_k$ =the predicted number of patients from market area k

[3] *The estimates of HHI were categorized into four levels; very high, high, low and very low HHI, which correspond to least, less, more and most competitive markets. The equations were estimated for each hospital in all the HMAs.*

Measure of Healthcare quality

This paper employed five (5) hospital's inputs, namely; the number of full time resident doctors and house officers, the number of registered nurses and hospital beds and staff-nurse patient ratio[4]. The models for the 5 quality indicators are presented as one model since the independent variables are the same for the models except dependent variable that change to capture each quality indicator.

Model Specification

Different methods such as reduced form, structural and semi-structural approaches, have been employed in empirical modelling of the relationship between market structure and the quality of healthcare using the SCP. The empirical model is expressed in a reduced form as:

$$Z_j = f(HHI_{ij}, P_i, D_i, AVC_j, DISTM_{ij}, DUM_{ij}, \varepsilon_{ij})$$

Equation (9) can be re-specified in an econometric model as:

$$\ln(Z_j) = \alpha + \delta(HHI_{ij}) + \beta \ln(P_i) + \gamma \ln(D_i) + \phi \ln(AVC_j) + \psi \ln(DISTM_{ij}) + \varsigma \ln(DUM_{ij}) + \varepsilon_{ij}$$

Where[5]

Hospitals in line with Johnson *et al.,* (2014) are medical centres that provide a variety of inpatient and outpatient services in 24 hours per day and 7 days per week and that typically have at least one doctor. While Patients refer to those that were on admission and those that attended the general outpatient wards for various healthcare services. Simple arithmetic in Excel workbook was employed to estimate HHI for each hospital and hospital market. Ordinary Least Square

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[4] $\ln(Z_j)$ *is the natural logarithm of hospital j input quality indicators, the explanatory variables include HHI, price, demand shifters.* $\ln(P_{ij})$ *is the natural logarithm of average price paid by individual patient, measured in Naira (~~N~~).* $\ln(D_{ij})$ *are demand shifters, which are determinants of hospital market demand such as patient average monthly income from occupation, dummy variable that capture educational status of patients, number of hospital's patients, which capture hospitals' sizes.* $\ln(AVC_j)$ *is natural logarithm of average variable costs of each hospital, which include the salaries of staff, cost of equipment replacement and maintenance, cost of drugs and supplies.* $\ln(DISTM_i)$ *is the travel distance in minute of the patient to a particular hospital.* DUM_{ij} *is dummy variable that capture the status of patients' health insurance coverage in accessing healthcare services. A dummy variable that capture hospital ownership structure (public and for-profit private hospitals).* ε_i *is error term.*

[5] *The full time resident doctors are graduate medical practitioners who are undergoing postgraduate residency program for the award of the postgraduate diplomas (fellowship) of the postgraduate Medical Colleges (Nigerian or West African) that work in hospitals on full time. Full time house officers are doctors in the first year after graduation from medical school. They are interns, qualified doctor practicing under supervision. They are the most junior member of the medical staff of a hospital. A registered nurse (RN) is a nurse who has graduated from a nursing program and met the requirements outlined by the Nursing and Midwifery Council of Nigeria (NMCN). The ratio of staff nurses to the available number of beds in a hospital. This emphasizes adequacy of monitoring and treatment intensity given to patients.*

(OLS) estimation technique was used to estimate the regression models specified and hospital choice model was estimated using the maximum likelihood method.

Data and Sources of Data

Data from both primary and secondary sources were used. The secondary data include information about the name and the locations of all secondary hospitals in Ibadan sourced from the Oyo state ministry of health, National Health Insurance Scheme (NHIS) and health departments in LGAs in Ibadan. Also, information about the list of zip code areas in Ibadan, which aid in the delineation of hospital markets were obtained from the Nigeria Postal Service (NIPOST), Ibadan. Primary data, which include hospital administrative and sociodemoghraphic data of hospital patients were obtained through the use of hospital and patient structured questionnaires.

Sampling and Research Instrument

Questionnaires were administered to patients drawn from 127 hospitals (14 public and 113 private) out of the 185 available hospitals based on willingness to participate. Purposive sampling was adopted to select 6 patients aged 18-60 years in a hospital making 762 patients in all. The research instrument is hospital and patient structured questionnaires that contain information about hospital number of house officers and resident doctors on full time, registered nurses and beds were administered on the administrators/owners of hospitals. The patient structure socio-demographic characteristics that include monthly income, level of education, healthcare price paid to the hospital, health insurance coverage status, and transportation costs were administered to the sampled patients. The data were collected by both the researcher and the trained research assistants to ensure adequate accuracy.

The Study Area and Population

The study area covered Ibadan metropolis, Nigeria. Ibadan is the capital of Oyo state. Ibadan is a metropolis that covers an area of 3,080 square kilometers with a population of 1,343,147 (National Population Commission, 2007). It has 11 Local Government Areas with. Within the LGAs are 35 ZCAs. The study population is the secondary hospitals and patients that attend these hospitals. This study focuses only on secondary hospitals due to the nature of services provide by these hospitals and their geographical availability in Ibadan. The tertiary hospitals are very few in the study area, therefore, they are excluded from the study.

7. Presentation of Results and Discussion

Out of the 127 hospitals, 115 hospitals was used based on the 90% hospital patients. The 115 hospitals fell into 15 distinctive market groupings using the patient flow method. These 15 were then classified into 2 types of markets based on the ownership structure of hospitals; mixed and non-mixed markets. The mixed markets are markets that coexist both public and private hospitals, while non-mixed markets are markets that contain only the private hospitals. Eight mixed markets and 7 non-mixed markets were identified. Analysis was conducted at the mixed and non-mixed market levels. The mean and standard deviation are presented.

Descriptive Statistics Results

Table 4. Hospital and Patient Characteristics

Variable	Mixed Market		Non-mixed Market	
	Mean	**Std. Dev**	**Mean**	**Std. Dev**
Number of full time Resident Doctor	1.95	3.22	1.2	1.49
Number of full time House Officer	1.58	3.37	0.8	1.16
Number of Registered Nurse	4.78	5.63	3.5	3.68
Total number of Hospital Bed	23.94	23.62	17.6	7.5
Staff-Nurse Patient Ratio (SPR)	1.52	1.11	1.4	0.85
Total No. of Hospital Patient	106.58	203.6	77.68	54.44
Average Variable Costs	860823.1	651903	693115	410222
Public Hospital	0.154	0.364	0	0
Private Hospital	0.846	0.364	1	0
Number of Observation	65		50	
Patient Characteristics				
Income	43681.41	32189.81	42806.12	26184.69
Healthcare Price	85537.66	40941.79	99652.33	34355.54
Distance in minutes	23.92	21.61	23.18	18.16
No Education	0.0437	0.205	0.056	0.232
Pry Education	0.111	0.314	0.11	0.313
Sec Education	0.293	0.456	0.25	0.433
Post-sec Education	0.553	0.498	0.583	0.494
Pat wit Health Insurance	0.321	0.468	0.433	0.496
Pat without Health Insurance	0.679	0.468	0.567	0.496
Number of Observation	389		300	
Measure of Market Structure				
Variable	**Mean**	**Std.Dev**	**Mean**	**Std.Dev**
Very High HHI	0.288	0.453	0.397	0.49
High HHI	0.257	0.438	0.097	0.296
Low HHI	0.216	0.412	0.313	0.465
Very Low HHI	0.239	0.427	0.193	0.396
Number of Observation	389		300	

Source: **Computed from STATA 12, (2016)**

On the average, the resident doctors, house officers and registered nurses at the mixed markets are more than non-mixed. The average number of hospital bed is 24 in mixed markets while hospitals in non-mixed markets have less. SPR is on average 1.5 and 1.4 for mixed and non-mixed markets. Besides, patient volume in the mixed is higher than the non-mixed market. Average variable costs, N860, 823 and N693, 115 for mixed and non-mixed markets respectively, indicating that mixed market spends more on variable inputs than non-mixed. However, the proportion of non-mixed hospitals in a mixed market is higher than public hospitals. The patient's average monthly income in mixed and non-mixed markets are N43, 681.41 and N42, 806.12 respectively. Average healthcare price is N85, 537.66 and N99, 652.33 for mixed and non-mixed markets, meaning that patients pay higher healthcare price in non-mixed than in mixed markets. Also, patients with post-secondary education on the average have the highest proportion in non-mixed and mixed markets. Patients without health insurance have the highest proportion across the market levels. It is noted from the results that the summation of very high and high HHI is lower in the non-mixed market than mixed market, which means that more and most competitive

markets are found in non-mixed markets, while less competitive and least competitive markets described the mixed markets.

The findings of the effect of measure of market structure on the quality of healthcare are presented in (tables 5-7). Each table presents the results mixed and non-mixed markets. The very high HHI was used as the reference category. The reference categories for the categorical variables were variables with highest observation, that fall to the extreme sides of the distribution, which are convenient and sensible to use (Grace-Martin, 2016). The control variables were patients and hospital characteristics. In addition, heteroscedastisity and potential autocorrelation were corrected in the statistical results by using Heteroscedastisity-consistent standard errors. The test of significance employed were F statistics and their probability values, which show that the independent variables have explanatory and significance power. Statistical significance was at $p \leq 0.05$, the results for the aggregate market is presented in table 5.

Table 6. OLS Results for Mixed hospital markets

Variable	Log Number of Fulltime Resident Doctors	Log of Numbers of Fulltime House Officers	Log Number of Registered Nurses	Log Number of Hospital Bed	SPR
High HHI^P	-0.0454(-0.56)	0.0485(0.54)	-0.2179***(-2.59)	-0.0691*(-1.69)	-0.1124 (-1.33)
Low HHI^P	0.1793(1.56)	0.2991***(3.07)	-0.2013***(-2.64)	0.1909***(3.87)	0.2213* (1.91)
Very Low HHI^P	0.1277*(1.92)	0.4792***(6.02)	0.0247(0.28)	0.2857***(8.05)	0.3054*** (3.58)
Log of Income	0.1517**(2.58)	0.1564***(2.81)	0.0652(1.16)	-0.0174(-0.67)	-0.1818*** (-3.46)
No Education	0.0562(0.51)	0.1431(1.14)	-0.2264*(-1.68)	-0.1516**(-2.35)	-0.2930** (-2.02)
Pry Education	0.0561(0.55)	0.0126(0.1)	0.1044(1.1)	-0.0565(-1.09)	-0.1805* (-1.66)
Sec Education	0.0941(1.27)	0.1417*(1.71)	0.0892(1.3)	-0.0347(-0.94)	-0.0568 (-0.70)
Log No of Hos Pat	0.1960***(2.83)	0.1262*(1.73)	-0.1075(-1.55)	0.1416***(3.8)	-0.6748*** (-8.30)
Log of Healthcare Price	0.2705***(3.94)	0.4647***(6.6)	0.6595***(11.68)	0.1016**(2)	0.4609*** (5.64)
Patient with Health Insur.	-0.1241*(-1.75)	-0.1784**(-2.59)	-0.0969(-1.38)	-0.0680*(-1.88)	0.0119 (0.16)
Public Hospital	0.3551**(2.27)	0.6674***(3.77)	2.0677***(14.97)	0.2548**(2.27)	1.4550*** (7.39)
Log of Distance	-0.0537(-1.32)	-0.0702(-1.48)	-0.1066***(-2.70)	0.0154(0.71)	-0.0193 (-0.44)
Log of Ave. VC	0.1815***(3.42)	0.1651***(4.23)	0.0582(1.06)	-0.0037(-0.13)	-0.4424*** (-6.55)
Constant	-7.9068***(-7.40)	-9.8972***(-9.97)	-7.0781***(-6.90)	0.6947(1.23)	6.2906*** (6.19)
No of Observation.	296	227	367	378	366
R-sq	0.5742	0.7076	0.5471	0.6801	0.3953
adj. R-sq	0.55	0.69	0.53	0.67	0.37
F Statistics	38.52(0.000)	64.19(0.000)	42.99(0.000)	76.0(0.000)	15.60 (0.000)

t statistics in parentheses* p<.10, ** p<.05, *** p<.01 represent level of significance at 10%, 5% and 1%

From table 6, at the mixed markets, the number of full time house officers, hospital bed and staff bed ratio is 47.9%, 28.6% and 30.5%% higher, respectively in a most competitive market than a least competitive market, while the number of registered nurses is 21.8% lower in a less competitive market. Looking at patient characteristics, income increases the number of full time resident doctor and house officers by 15.2% and 15.6%, respectively. A Patient with no formal education significantly reduces the number of hospital bed and SPR more than patients with post-secondary education. An increase in the average healthcare price positively increases the number of full time resident, house officers, registered nurses, hospital beds and SPR. However, distance is negatively associated with the number of registered nurses. Also, patient with health insurance status negatively influence the number of full time house officers. Hospital variables show that an increase in the volume of hospital patients, increases the number of full time resident doctors and hospital beds by 19.6% and 14.2%, while it reduces SPR by 67.5%. In a mixed market, a public hospital employs more number of full time resident doctors, house officers, hospital beds and SPR than a private hospital. The total average variable cost has a positive influence on the number of full time resident doctors and house officers, while it reduces SPR.

Table 7. OLS Results for Non-Mixed Hospital Markets

Variable	Log Number of Fulltime Resident Doctors	Log of Numbers of Fulltime House Officers	Log Number of Registered Nurses	Log of Number of Hospital Bed	SPR
High HHI^P	-0.2803*(-1.85)	0.2540**(2.2)	-0.0732(-0.76)	-0.3600***(-2.77)	0.0816 (0.37)
Low HHI^P	0.3004***(3.43)	0.3004***(3.43)	0.0834(1.17)	0.2251***(3.57)	-0.0138 (-0.08)
Very Low HHI^P	-0.0762(-0.91)	0.1876***(3.5)	0.3705***(3.7)	0.1307**(2.47)	0.8984*** (4.28)
Log of Income	0.0531(0.59)	-0.0229(-0.43)	0.074(1.22)	-0.0413(-0.95)	-0.0365 (-0.23)
No Education	-0.0214(-0.14)	0.2845***(2.62)	0.1839(0.91)	0.1016(1.01)	0.612 (1.51)
Pry Education	0.0521(0.34)	0.1352*(1.66)	0.0057(0.06)	0.0257(0.33)	-0.0239 (-0.11)
Sec Education	-0.0457(-0.44)	-0.0023(-0.03)	0.0867(1.13)	0.0521(0.9)	0.299 4(1.65)
Log No of Hos Pat	0.3988***(4.53)	0.3409***(5.25)	0.2293***(3.08)	0.3859***(9.08)	-0.084 (-0.60)
Log of Healthcare Price	-0.3156***(-6.26)	-0.2177***(-4.71)	-0.1916***(-3.56)	-0.0006(-0.02)	-0.6209*** (-5.72)
Patient with Health Insur.	-0.1399(-1.52)	0.1342**(2.43)	-0.007(-0.10)	-0.0747(-1.36)	0.0833 (0.5)
Log of Distance	0.1120**(2.55)	0.0751**(2.3)	-0.0022(-0.06)	0.0373(1.43)	-0.084 (-1.03)
Log of Ave. VC	0.2947***(3.4)	0.1827***(2.8)	0.5757***(8.55)	0.0036(0.07)	-0.329 (-1.28)
Constant	-2.5132(-1.63)	-1.573(-1.43)	-6.5967***(-4.73)	1.1565(1.55)	0.4262*** (4.01)
No of Observation.	215	174	292	298	3.1879

					(1.2)
R-sq	0.3084	0.5007	0.4197	0.4775	292
adj. R-sq	0.26	0.46	0.39	0.45	0.2486
F Statistics	6.56(0.000)	9.75(0.000)	16.51(0.000)	18.37(0.000)	0.21

t statistics in parentheses* p<.10, ** p<.05, *** p<.01 represent level of significance at 10%, 5% and 1%

From table 7, the number of full time resident doctors is 30.0% higher in a more competitive market than in a least competitive market. Similarly, the number of full time house officers, registered nurses, hospital bed and SPR is 18.8%, 37.5%, 13.1% and 89.8% higher respectively in a most competitive market. An increase in the average healthcare price significantly decreases the number of full time resident doctors, house officers, registered nurses and SPR. Equally, patients with health insurance, increase the number of full time house officers more than those without health insurance. However, distance is positively related to the number of full time resident doctor and house officers. Patient volume motivates hospitals to employ more full time resident doctors, house officers, registered nurses and hospital bed. In a non-mixed market, an increase in average variable cost, increase quality across the table except the number of hospital beds.

8. Discussion of Results

In both mixed and non-mixed markets, the results revealed that hospitals increase quality by increasing the number of full time house officer's hospital beds, SPR in a more and most competitive market than in the less and least competitive market. By implication, quality of healthcare increases in more and most competitive market and reduces in uncompetitive market. Moreover, in a mixed hospital market, increase in patients' average monthly income motivates hospitals to increase quality by employing more full time resident doctors and house officers so as to meet up with the higher quality expectation of the patients. Whereas, income is insignificant in the non-mixed hospital market. In a mixed market, higher healthcare prices paid by patients, motivates hospitals to hire full time resident doctors, house officers and registered nurses and hospital beds, while it only make hospitals in a non-mixed market to reduce the quality of healthcare, probably to make patients revisit the hospital. This finding is consistent with the findings of Kessler and Geppert (2005), which indicated that hospitals may charge higher healthcare price to high-valuation patients and offer lower quality. In the non-mixed hospital markets, the number of patients with health insurance coverage is higher, thus they motivate hospitals to increase the number of full time house officers more than those without health insurance, while in the mixed markets, the reverse is the case.

Furthermore, in the non-mixed markets, as the distance between hospital and patient origin grows, hospitals tend to offer higher healthcare quality by increasing the number of full time resident doctor and house officers, while hospitals in the mixed markets, reduce the number of registered nurses. Also, in mixed and non-mixed markets, an increase in the hospital patient's volume motivates hospitals to increase quality of healthcare as they increase the number of medical staff and hospital bed input. Furthermore, in a mixed market, private hospitals have lesser number of full time resident doctors, house officers and registered nurses than public hospitals. Also, the treatment intensity is higher in a public than in a private hospital. This conclusion is contrary to the findings of Polsa, *et al.,* (2011); Adesanya *et al.,* (2012) that private hospitals provide effective service delivery than public hospitals in Nigeria.

9. Conclusion and Recommendations

In view of the findings of this study, it was concluded that the quality of healthcare is higher in a competitive market than in an uncompetitive market regardless of the hospital ownership structure. Furthermore, in the non-mixed market, factors such as hospital patient volume, distance between hospital and patient residence, patient status of health insurance coverage, hospitals average variable cost were discovered to positively influence quality, while healthcare price negatively influence quality. However, in the mixed market, healthcare price, income, patient volume and hospital costs are the significant factors that positively influence quality except for distance and patient health insurance coverage's status. On this note, a policy that will allow entrance of new hospitals and promote hospital market with competitive structure is recommended. This can be achieved through increasing investment in the health sector by the government and private sector Also, reduction of registration fees and yearly renewal fees paid by hospitals will help hospitals meet up with their variable costs. In addition, tax holiday to newly established hospitals will enable timely coverage of entry costs and prompt hospitals to operate efficiently and reduce healthcare price. Moreover, reforms that will ensure strict compliance with the hospital establishment procedures and minimize negligence among hospitals, especially private hospitals are also recommended. Also, increasing the demand elasticity for quality, through information, incentives about quality indicators will enable the patients to observe healthcare quality and attend hospitals that provide the level of quality that they desire.

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