Diagnosing The Dynamic Drivers of Healthcare Expenditure in Organisation of Islamic Cooperation (OIC) Countries

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Abstract: The foremost impact of healthcare system is for the individuals to have the right and privileges to access enhanced healthcare services. The demand for health, innovation and sustainable healthcare systems has also been gaining better prominence and consideration in numerous countries, and it is perceived as one of the major contributors to the economic growth and development. This paper looks at the dynamic drivers of healthcare expenditure in Organisation of Islamic Cooperation (OIC) countries from 1990 to 2015. The dynamic panel system Generalized Method of Moments (GMM) technique was used for the study analysis. The findings show that the income, life expectancy, share of population between the age group of 65 years and above, share of population age under 15 years, out-of-pocket payment, research and development (technology) in healthcare and consumer price index were the drivers of healthcare expenditure in OIC countries. In view of this, the study differs from recent and previous studies, because the study offers novel empirical findings as the income per capita is above one, which is about 1.90 and inelastic. This proves that healthcare in OIC countries is a luxury goods.

Keywords: Healthcare expenditure, OIC countries and Generalized Method of Moments.

INTRODUCTION

The importance of healthy individuals cannot be over emphasized for the growth and development of any country. Therefore, healthcare is a relatively imperative tool for high economic achievement that can result in attainment of fruitful undertakings on the part of both individuals and governments and tax rate return improvements. But, the recent growth in healthcare expenditure has been a source of economic challenges to many countries (Wahab and Kefeli, 2016). Government healthcare expenditure is the main root of health finance worldwide. Globally, the healthcare expenditure by various countries amounted to about 59.7% in 2015 (Micah et al., 2019). Also, one of the main obstacles for the U.S and several other developed and developing countries is the rapid upsurge in yearly amounts of healthcare expenditures compared to the yearly GDP growth rates (Murthy and Okunade, 2016; Martin *et al*., 2016).

On the other hand, there are several factors that contributed to the increase in healthcare expenditure in various countries according to the past literature, and several approaches have been employed in determining the factors that drive the healthcare expenditure. Some researchers used household data while some used aggregated macroeconomic data with different methods such as cross-sectional, panel data,

cointegration, unit root, static and dynamic models, and ARDL and arrived at diverse regression outcomes (Xu *et al*., 2011). Thus, the growing cost of expenditure on healthcare in OIC countries and the surge in chronic and non-chronic illnesses is worrisome especially for OIC governments, and this requires urgent attention. In view of this, the incorporation of this research is necessary as it will enhance the understanding of the major drivers of the healthcare expenditure. Hence, this scholarly work balances the literature as it unties the emphasis on the Organisation for Economic Co-operation and Development (OECD) countries to OIC countries. Furthermore, the previous researches on this theme stereotypically focused on a selection of countries but then this study considered the 57 OIC countries. The rest of the paper is further divided into literature review, method, findings and discussion, then, the concluding remarks.

LITERATURE REVIEW

The drivers of healthcare expenditures according to past findings conducted mostly in the OECD regions and other countries comprising of GDP per capita as a proxy of income, life expectancy, infant mortality, medical progress, technological improvement, public financing, population aging, incidence of tuberculosis per 100,000 people, alcohol consumption and tobacco consumption (Gerdtham *et al*., 1998; Gerdtham & Jönsson, 2000; Martin *et al*., 2011; Xu *et al*., 2011; Baltagi & Moscone, 2010; and Murthy & Okunade, 2016). In recent times, various studies estimated the drivers of healthcare expenditure, for instance, Hauck

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& Zhang (2016) used dynamic analysis for 34 OECD countries between 1980 and 2012 and based on the analysis, country-specific regressors are presumed to be static and exogenous. Besides, few other studies that used dynamic analysis to determine the drivers of healthcare expenditure were included (Xu *et al*., 2011; Khan *et al*., 2016; Feng *et al*., 2017). On the other hand, some scholarships on healthcare expenditure by government have observed elements like national income, fiscal policy, population age, healthcare problem, disease incidence, and healthcare scheme features. But, the outcome of these literatures show that national income and fiscal policy are significant contributing factor to healthcare expenditure (Behera and Dash, 2018).

Besides, the multifaceted set of elements powering healthcare expenditure growth comprise ageing populace, consumer demand prospects for expensive high-quality care, increasing incomes, increasing prices of the medical personnel and hospital services, medical innovation diffusion and the inefficient disjointed healthcare system such as the structure of financing (Murthy & Okunade, 2016). On the other hand, the determinants of healthcare expenditure can then be divided into demographic and non-demographic elements (de la Maisonneuve *et al*., 2016). Demographic aspect of healthcare expenditure is associated with the age and health status of the population, whereas non-demographic determinants comprise of income and other variables such as price of healthcare, technology and characteristics of a healthcare system (Feng *et al*., 2017).

Demographic Structures

Demography (especially population age structure) is frequently incorporated as a driver of healthcare expenditure and it is customarily measured by the share of the population of young (such as under 15 years) and the share of the population of an elderly age group, (such as over 65 years old), or by the average age of the population (Xu *et al*., 2011; de la Maisonneuve *et al*., 2016 and Feng *et al*., 2017). Thus, these variables are usually insignificant when incorporated in the regression models to interpret per-capita healthcare expenditure (Leu, 1986; Hitiris & Posnett, 1992; Di Matteo & Di Matteo, 1998).

However, few studies have presumed that nearness to death is the crucial demographic determinant of healthcare expenditure, not population age. This assumption is on par with some studies which show

that individual healthcare expenditure has a tendency to rapidly upsurge as patients are near to death (Breyer & Felder, 2006; Seshamani & Gray, 2004; Felder *et al*., 2000). Also, the mortality rates increase with age but due to improvements in medicine, life expectancy is increasing as well (Feng *et al*., 2017). A basic representation such as ordinary age, share of the population under 15, or share of the population over 65, might not completely serve as a measurement of healthcare expenditure. As a result, demographic structures are seldom established to be statistically significant in regression models of per capita healthcare expenditure (Hitiris & Posnett, 1992; Di Matteo & Di Matteo, 1998; Leu, 1986).

In contrast, recent findings by Murthy and Okunade (2016) indicates that population age structure above 65 years are cointegrated and shows positive effects on U.S. healthcare expenditure per capita. More so, aging population has been identified as a causative factor of accumulating healthcare expenses and it has a significant contributing element to elucidate differences in healthcare expenditure (Ogura & Jakovljevic, 2014 and Khan *et al*., 2016). Likewise, population structure was found to be key determinants for the healthcare demand and an aggregate source of healthcare expenditure (Reinhardt, 2003). Besides, Hosoya (2014) discovered that the ageing population was positive and significant, and it is a vital element that cannot be overlooked and may offer a fresh signal for determining health expenditures.In addition, the epidemiological prerequisite is occasionally included as a covariate from different representations. Lu *et al*. (2010) employed HIV seroprevalence as a substitution for demography and established no significant relationship with government healthcare expenditure as a share of GDP. Likewise, a study conducted in African countries shows that maternal mortality rate has no relationship with healthcare expenditure (Murthy & Okunade, 2009).

Non-Demographic Structures

Income (with GDP per capita as proxy) has been considered to be the primary determinant of healthcare expenditure according to the past studies and the elasticity of income in healthcare expenditure has been extensively deliberated with a diverse outcome (Martin *et al*., 2011; Lago-Penas *et al*., 2013; Khan *et al*., 2016; Murphy & Okunade, 2016 and Feng *et al*., 2017). Some literature recommended that the income elasticity assessment is subject to the countries studied, the period of time and the method of estimation (Feng *et al*., 2017). Martin *et al.* (2011)

surveyed twenty (20) articles and found that only two out of 11 articles from the 20 articles estimated that income elasticity of demand was able to obtain a value greater than one, hence, labelling healthcare expenditure as a "luxury good" while others obtained a value lesser than one, which shows that healthcare expenditure is a "necessity good".

Moreover, cross-section regressions of aggregate healthcare expenditure on GDP per capita consistently showed an income elasticity significantly greater than one from OECD countries ranges from 1.20 to 1.50 (Kleiman, 1974; Newhouse, 1977; Leu, 1986; Getzen, 2006). In addition, aggregate time-series regressions for different countries usually displayed same outcomes but with a substantial difference between countries. Equally, past studies like Musgrove *et al*. (2002) established that income elasticity of healthcare expenditure was between 1.133 and 1.275 through cross-section data from 191 countries. The studies found that income elasticity for out-of-pocket expenditure was between 0.884 and 1.033, and for government health expenditure it was ranged from 1.069 to 1.194 (Musgrove *et al*. 2002). A related study indicated that income elasticity for health expenditure was 1.09 through cross-section data from 175 countries. They also displayed the outcomes by geographical area and established that income elasticity was between 0.830 in the Middle East to 1.197 in OECD countries (van der Gaag & Stimac, 2008).

In the same manner, Okunade and Murthy (2002) surveyed cross-sectional data from 44 African countries and revealed an income elasticity between 1.089 and 1.121, subject to the specification applied. On the contrary, income has been shown to determine the variation in healthcare expenditure as concluded by Xu *et al*. (2011) in a survey of 143 countries for 14 years through panel data. Also, healthcare expenditure, in particular, does not grow quicker than GDP when other factors are considered, and income elasticity of healthcare expenditure is in the range of 0.75 and 0.95 which shows that healthcare is a necessity. Similarly, Khan *et al*. (2016) surveyed the determinant of healthcare expenditure for Malaysia from 1981 to 2014 and discovered that income elasticity for healthcare expenditure was 0.99 which was less than one displaying healthcare was a necessity.

In the same disposition, Lago-Penas *et al*. (2013) emphasized their argument from both sides by showing that healthcare in the past studies has been established to be both a "luxury" good with an income elasticity greater than one (Liu, *et al*., 2011; Mehrara, *et al*., 2010; Getzen, 2006; Parkin, *et al*., 1987; Leu, 1986; Newhouse, 1977; Moscone, & Tosetti, 2010), this cluster of literature stressed on determining the magnitude of income elasticity of healthcare expenditure, and the policy implications for the financing and conveyance of healthcare resources. On the other hand, some literature established that healthcare is a "necessity" with an income elasticity less than one (Baltagi & Moscone, 2010; Chakroun, 2009; Sen, 2005; Gerdtham *et al*., 1998; Gerdtham, 1992; Khan *et al*., 2016; Baltagi *et al*., 2017). Likewise, the authors acknowledged some studies (such as Gerdtham, 1992; Hitiris & Posnett, 1992) which suggested that the income elasticity for government healthcare expenditure could be near to one.

Conversely, the factions that considered healthcare expenditure as a luxury good claimed that it is a commodity that is similar to other goods and ought to be positioned for market forces. But, the promoters of healthcare expenditure as a necessity supported the role of government regulation and involvement in the conveyance of healthcare (Culyer, 1989; Di Matteo, 2003; Haque, Farzana & Anwar, 2018). Though, previous literature could have the problem of variables omission and transformation issue techniques or specific methodological difficulties (Khan *et al*., 2016). However, despite the fact that some studies found the income elasticity to be positive, there is no compromise on the healthcare as a necessity or luxury good.

Other Non-Demographic Structures

Besides income, there are other important non-demographic structures that drive healthcare expenditure according to past reviews, such as research & development expenditure in healthcare, technological progress, medical progress and health system characteristics. According to OECD report, the relative price of health services, technological progress and underlying health policies and institutions are conceivable to be the key factors other than non-demographic drivers of healthcare expenditure (de la Maisonneuve & Oliveira Martins, 2013). But, due to insufficient of applicable data to characterize various non-demographic drivers, these variables are seldom used.

Firstly, in healthcare division, prices, similar to other areas of the economy are obviously a determinant of healthcare. In case inflation in whichever division goes

higher than the rest of the economy, at that point, the real expenditure in that division rises, *ceteris paribus*. Specifically, prices for healthcare services will increase, similar to other prices for the reason that earnings in low productivity divisions must be on par with wages in high productivity divisions. Given a price-inelastic demand, the percentage of healthcare expenditure in GDP would incline to rise over time. This rise is mainly driven by popularly known "Baumol effect" or "cost-disease" (i.e. there is a penchant for relative prices of certain services to escalate as a result of other goods and services in the economy) (Xu *et al*., 2011). Thus, the Baumol effect or price index may be a significant element for the development of healthcare expenditures.Nevertheless, the Baumol effect is an incident that upsets mostly developed economies. The need for the inclusion in this study might not be necessary.

Secondly, few literature have deliberated on technological progress as a variable since the study of Newhouse which considered technological progress as a significant driver of healthcare expenditure (Newhouse, 1992). This is as a result of inadequate data on medical technological progresses and the problem of finding a suitable proxy for variations in technology. In few studies that highlighted technological progress, numerous proxies have been used, such as the number of specific medical equipment and surgical procedures (Baker & Wheeler, 1998; Weil, 2007; Mohan & Mirmirani, 2008). R&D expenditure in healthcare division was used as a proxy for technological change (Okunade & Murthy, 2002). In this work, they demonstrate that real aggregate healthcare expenditure per capita does react to R&D expenditure. As R&D expenditure increases at historical rates and real income increases, health insurance would probably be more expensive and then increase healthcare expenditure. Additionally, life expectancy at birth and infant mortality are often used as variables for both technological change and medical progress (Dreger, 2005).

In addition, time index has been used as a proxy for the impact of technology change (Gerdtham and Löthgren, 2000); time-specific intercepts (Di Matteo, 2004). Modernizations in technology together with frail cost restraint policy were acknowledged as an essential instrumental factor for rising healthcare cost. Particularly, main progresses in the health-connected technologies upsurge healthcare (Bodenheimer, 2005). The inclusion of low cost per patient per year technology to the healthcare scheme surges expenditure on health and healthcare, as new folks are being treated (Lubitz, 2005). Progresses and flows in medical care technology into the healthcare systems were the key accountable elements for rising expenditure in healthcare (Newhouse, 1992).

Yet, there was a contradictory and multifaceted association between medical technology and healthcare (Sorenson *et al*., 2013). There has been an increase in survival rates as a result of healthcare technology on one hand, but then, it has swiftly upsurged the cost relating to healthcare as a proportion to GDP (Chandra and Skinner, 2012). Numerous risk factors such as obesity and disparities in the occurrence of the chronic disease revolved to be significant in the long term estimation (Thorpe *et al*., 2004). Likewise, different innovative technologies added more to progress in the medium term as was the case with focused biologicals (Jakovljevic, 2015), diagnostic radiology (Rankoví́c *et al*., 2013) and radiation therapy of cancer (Jakovljevic *et al*., 2014).

Thirdly, healthcare system characteristics are considered as one of the drivers of healthcare expenditure. Some health policies and institutional indicators were used in de la Maisonneuve *et al*. (2016) study on OECD, from both supply-side aspects (e.g. provider payment, provider competition) and the demand-side aspect (e.g. gatekeeping, cost-sharing) (de la Maisonneuve *et al*., 2016). Structural characteristics of the healthcare system like health financing, the number of physicians, and the number of hospital beds per capita have been included in prior research. Also, the involvement of government in healthcare financing has aroused various disagreement in the earlier few decades. Leu (1986) contended that the percentage of public healthcare financing had a positive effect on total health expenditures and further indicated that healthcare expenditure should rise with the proportion of public finance, under the conjecture that this proportion will minimize the price to users. Also, Gerdtham *et al*. (1992) stated that the impact of public financing in healthcare cannot be dogged as countries with a bigger proportion of public financing do not appear to be described by larger healthcare expenditure.

On the other hand, another institutional feature of healthcare systems that may affect healthcare expenditures is the fee-for-service or out-of-pocket payment scheme which levies a higher cost on healthcare spending than other levy arrangements (Gerdtham *et al*., 1992). Therefore, a transformation

from financing hospitals with budgets to fee-for-services or out-of-pocket payment methods is connected with surges in both public and private mechanisms of healthcare expenditure.

Moreover, the use of physicians or general practitioners as gatekeepers of the healthcare system tends to lead to higher healthcare expenditure. If the stock of physicians upsurges and the workload reduces, physicians appear to persuade the patients to consume more services at higher prices (Gerdtham *et al*., 1992). Furthermore, a rise in remunerated physicians can lead to higher per capita healthcare expenditures. Still, the study also indicated that an upsurge in the number of physicians might not have much effect on health costs under a fee-for-service system when there is traffic of patients from current to new medical practitioners (Sen, 2005). Conversely, per capita healthcare expenditures will absolutely increase when there is a surge in the number of appointments for current physicians.

Fourthly, another proxy for health resources is the number of hospital beds per 1000 of population. This exogenous variable captures developments in patient care admittance in healthcare. Although fewer studies in the past have used this variable as a structural characteristic of the healthcare supply, there exists evidence on restrictions on hospital bed supply as a factor of reducing healthcare expenditures (Vandersteegen *et al*., 2015). In conclusion, the exploration for new considerations of the association between increasing healthcare expenditure and its tenacious determinants motivates the well-timed requirement to examine the importance of these subjects by means of a dissimilar method for this study.

METHOD

The study used panel data of 57 OIC countries as the population, and the sample size of the study are the time series and cross section of OIC member countries healthcare parameters for the time period of 1990 to 2015. The data are collected and sourced from the World Bank (2015) World Development Indicators (WDI) and the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC). The study variables are selected based on the literature review and data availability for the main variables as shown in Table **1** below.

In this paper, wediagnose the dynamic drivers of healthcare expenditure in Organisation of Islamic Cooperation (OIC) countries and the researcher employed panel data of 57 OIC countries using dynamic panel system Generalized Method of Moments (GMM) technique, which was defined by Arellano and Bover (1995) and completely advanced by Blundell and Bond (1998).The method produced an added supposition which resulted in the first differences of instrument variables to be uncorrelated with the fixed effects. With this, it permits the inclusion of other instruments and can vividly increase efficiency of the output. This method pooled the first differencing technique with a levels regression via lagged first differences as instruments. As a result of this, the system GMM estimator is better in efficiency as it offers a more effective set of instruments to adjust the weak instruments issue. Likewise, Arellano & Bond (1991) and Blundell & Bond (1998) system GMM estimators have one-step and two-step alternatives. But, the two-step is asymptotically more efficient (Roodman, 2009).

As a result, the researcher specified a dynamic log-linear equation for healthcare expenditure to be able to

Table 1: Variable Description, Measurement and Sources

Variables	Description	Measurement	Sources
HCE	Healthcare expenditure per capita	In Millions (current price US dollar $)	WDI/WHO
INCOME/ GDP	Real gross domestic product per capita	In Millions (current price US dollar $)	WDI/ SESRIC
LE	Life expectancy at birth	In Years	WDI/ SESRIC
AGE65+	Percentage of the population age 65 years and above	In percentage	WDI/ SESRIC
AGEU15	Percentage of the population age under 15	In Percentage	WDI/ SESRIC
OOP	Out-of-pocket healthcare expenditure	Percentage of GDP	WDI/SESRIC
R&Dhce	Research and development in healthcare	In Millions (current price US dollar $)	WDI/ SESRIC
PINDEX	Consumer price index	Annual percentage changes	WDI/ SESRIC

Sources: Authors Computation, 2018.

interpret the estimated results in elasticities. The study empirical approach undertook maximum usage of both time and cross-country dimensions of obtainable data sets which comprisedof a dependent variable and independent variables. Therefore, the study datacovered the period of 1990 to 2015 and the empirical model of the study wastransformed to natural logarithm, and specified as follows:

$$lhce_{it} = \alpha_1 + \beta_1 lincome_{it} + \beta_2 lle_{it} + \beta_3 lage65^+_{it} + \beta_4 lageu15_{it} + \beta_5 loop_{it} + \beta_6 lrdhce_{it} + \beta_7 lpindex_{it} + \varepsilon_{it} \quad (1.1)$$

Where in Eqn. (1.1), *lhce* is a control variable and serve as a function of income (*lincome*),life expectancy (*lle*), population age 65 (*lage65*$^+$) and above, population age under 15 years (*lageu15*), out-of-pocket expenditure (*loop*), research and development in healthcare (*lrdhce*) and consumer price index (*lpindex*). According to the standard economic theory, $\beta_1 > 0$; $\beta_2 > 0$; $\beta_3 > 0$; $\beta_4 > 0$; $\beta_5 > 0$; $\beta_6 > 0$ and $\beta_7 > 0$ they are adjustment parameters that could be gathered for the equilibrium level when there is slightly shock to the system, and its value equals to 0. As stated by the economic theory, as the real per capita income rises, the expenditure on healthcare is anticipated to increase. Hence β_2 & $\beta_6 > 0$ which means, growing life expectancy and improved research and development in healthcare specifies amplified broad health conditions of the overall public of an economy which could be as a result of the research and development and establishment of innovative technologies in the healthcare area, which have an encouraging effect on healthcare expenditure.

The β_3 and β_4 signify the group of the population between the age group of 65 years and above and population age under 15 years; and as the percentages of these two groups rise the expenditure on health and healthcare is expected to rise due to additional demand for healthcare services. The $\beta_5 > 0$ suggests that the increasing in out-of-pocket payment percentage would permit enhanced access to better service which in turn might have effect on healthcare expenditureand also provide more opportunity to control expenditures as one of healthcare system characteristics.

Consequently, $\beta_7 > 0$ implies that rise in consumer price index would cause "Baumol effect" or "cost-disease" (Baumol 1967; Baumol 1993), such that, the prices of healthcare services could increase relatively to other prices since wages in low productivity sectors must rise up with wages in high productivity sectors. So, the share of healthcare expenditure might have a

tendency to increase over time with a price-inelastic demand (Xu *et al*, 2011). However, α_1 is a vector of constants, the error term ε_{it}, is assumed to be independent and normally distributed and the subscripts *i*&*t* are the individual effects and time periods. The coefficients β_1, β_2, β_3, β_4, β_5, β_6, and β_7 respectively, are the elasticities of healthcare expenditure per capita with reference to the explanatory variables. Nevertheless, Eqn. (1.1) is further specified to followthe procedure proposed by Arellano and Bond (1991); Arellano & Bover, (1995); Blundell & Bond, (1998) as follows:

$$lhce_{it} = \alpha_1 lhce_{it-1} + \beta_1 lincome_{it} + \beta_2 lle_{it} + \beta_3 lage65^+_{it} + \beta_4 lageu15_{it} + \beta_5 loop_{it} + \beta_6 lrdhce_{it} + \beta_7 lpindex_{it} + X\beta_{8it} + \varepsilon_{it} \quad (1.2)$$

$$\varepsilon_{it} = \mu_i + v_{it}$$

$$E(\mu_i) = E(v_{it}) = E(\mu_i v_{it}) = 0$$

whereby, the error term has two orthogonal components: the fixed effects, μ_i, and the idiosyncratic shocks, v_{it}. Eqn.(1.2) above can be re-written as

$$\Delta lhce_{it} = (\alpha_1 - 1)lhce_{it-1} + \beta_1 lincome_{it} + \beta_2 lle_{it} + \beta_3 lage65^+_{it} + \beta_4 lageu15_{it} + \beta_5 loop_{it} + \beta_6 lrdhce_{it} + \beta_7 lpindex_{it} + X\beta_{8it} + \varepsilon_{it} \quad (1.3)$$

where μ_i are unobserved individual level effects that capture the individual heterogeneity, and v_{it} are unobserved specific error, where by μ_i and v_{it}, are independent of each other and among themselves. $\Delta lhce_{it}$ is exogenous variable, $lhce_{it-1}$ is vector of strictly exogenous covariates and $X_{i,t-1}$ is the explanatory variable (which may include the lag of y) and endogenous covariates. α and β *are* vectors of parameters to be estimated. Thus, Eqn. (1.3) contains a lagged dependent variable and dynamic panel data approaches.

RESULTS AND DISCUSSION

The data was sourced from the World Bank (2015) World Development Indicators (WDI) and the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC). The data set for the observation as shown in Table **2** below is 1482, But there is missing values reported in consumer price index (lpindex) (N=1367). The individual descriptive statistics shows that the data and all the variables follow a normal distributions. The highest mean value is income (*lincome*) with the corresponding mean and standard deviation of 7.33 million USD and 1.41 million

Table 2: Descriptive Statistics of Variables

Variable	Mean	St. Dev.	Min	Max	Skewness	Kurtosis	Obs.
lhce	4.31	1.23	1.10	7.94	0.53	2.58	1482
lincome	7.33	1.41	4.53	11.49	0.64	2.69	1482
lle	4.14	0.16	3.58	4.38	-0.76	2.95	1482
lage65	1.24	0.40	-0.36	2.52	-0.29	4.47	1482
lageu15	3.61	0.25	2.59	3.95	-1.14	4.33	1482
loop	3.91	0.48	1.81	5.43	-0.77	3.95	1482
lrdhce	2.56	0.38	0.77	3.28	-0.75	2.97	1482
lpindex	1.68	1.23	-3.22	6.42	0.06	4.29	1367

Note: lhce: denotes logarithm of healthcare expenditure per capita in Millions (current price USD $); lincome: denotes logarithm of Real gross domestic product per capita in Millions (current price USD $); lle: denotes logarithm of Life expectancy at birth in Years; lage65: denotes logarithm of the population age 65 yrs. & above in percentage; lageu15: denotes logarithm of the population age under 15 in percentage; loop: denotes logarithm of Out-of-pocket healthcare expenditure (Percentage of GDP); lrdhce: denotes logarithm of Research and development in healthcare in Millions (current price US dollar $); lpindex: denotes logarithm of Consumer price index in Percentage

USD, while the lowest mean value and standard deviation belongs to population age 65 years & above (*lage65*) with 1.24 % and life expectancy (*lle*)with a corresponding value of 0.16 years. Also, income (*lincome*) is the highest maximum value with 1.41million USD and the minimum value is population age 65 years and above (*lage65*) with -0.36 %. Table **2** below shows descriptive statistics of variables of the study.

Table **3** comprises of the results for the one-step and two-steps system GMM estimators of the healthcare expenditure, i.e. model (1) and model (2), estimated using system GMM estimators. The estimation was executed using the xtabond2 command in Stata 13 as suggested by Roodman (2009). From the result as shown in Table **3**, it is clearly indicated that in the one-step analysis the lagged dependent variable is insignificant to the model while it has a significant relationship to the model in two-steps analysis which shows its reliability and consistency over the latter. Meanwhile, the estimated coefficients of the income was positive and significantly determined the healthcare expenditure at 1% level, also the income elasticity was greater than one for both one-step and two-steps i.e. (1.84 and 1.91) suggesting that healthcare in OIC countries is a luxury goods, which indicate that, healthcare in OIC's country is regarded as a commodity like other goods and services and should be determined by the forces of market and supply. This suggests that a unit increase in real income per capita determines the increase in expected healthcare expenditure per capita by approximately 1.8-1.9 million USD. Table **3** below shows the estimated result of the equation with one step and two

steps analysis, and the post estimation diagnostic tests.

This current finding of a higher point estimate of the income elasticity of demand for healthcare as 1.91 is consistent with the study of Okunade and Murthy (2002), with the Johansen and the Fully-Modified ordinary least square (FMOLS) methods. They presented income elasticity of healthcare expenditure to be around 1.55 for the time period of 1960 to 1997; the study concluded that income was a luxury goods in U.S. Alike, the findings also was consistent with the Newhouse (1977) outcome which showed that healthcare was a luxury goods with coefficients income elasticity ranges from 1.13 to 1.31. However, this study outcome is about 0.35 higher than that of Okunade and Murthy (2002), and 0.6 higher than that of Newhouse (1977) studies. Again, while the two studies used FMOLS and panel cross-sections methods, this study used a better method of analysis i.e. GMM, that is considered reliable in controlling for endogeneity issues. Likewise, aggregate healthcare expenditure consistently showed an income elasticity significantly greater than one from OECD countries (Kleiman 1974; Newhouse 1977; Leu 1986; Gerdtham *et al*., 1992; Getzen, 2006).Hence, this research outcome is consistent with the previous studies as well, which shows that income was the primary determinant of healthcare expenditure, but, the study is in contrary with their opinion that healthcare is a necessity (Martin *et al*., 2011; Lago-Penas *et al*., 2013; Getzen, 2014; Khan *et al*, 2016; Murphy & Okunade, 2016 and Feng *et al*., 2017).

Next, the estimated coefficients of the life expectancy was negative and significantly determined

Table 3:   Dynamic Panel System GMM Estimation of Healthcare expenditure

VARIABLES	One-Step System GMM	Two-Step System GMM
	(lhce)	(lhce)
L.lhce	0.220	0.154***
	(0.238)	(0.0335)
lincome	1.844***	1.907***
	(0.271)	(0.0593)
lle	-8.748***	-7.751***
	(3.146)	(0.574)
lage65	-2.694***	-3.235***
	(1.021)	(0.251)
lageu15	3.708**	3.921***
	(1.861)	(0.290)
loop	-1.221***	-1.200***
	(0.133)	(0.0645)
lrdhce	0.931***	0.815***
	(0.313)	(0.0888)
lpindex	-0.0546	-0.0615***
	(0.0570)	(0.00995)
Specification tests		
Sargan Test (Chi-sq)	130.83	130.83
(p-value)	(0.00)	(0.00)
Hansen Test (Chi-sq.)		48.28
(p-value)		(0.46)
Diff.-in-Hansen/ Sargan tests of exogeneity	2.32	0.33
(p-value)	(0.13)	(0.95)
Autocorelation AR(2)	0.19	0.44
(p-value)	(0.85)	(0.66)
Observations	784	784
Number of countries	57	57

Notes: All modes are estimated with Arellano and Bond (1991) dynamicpanel GMM, Arellano and Bover (1995), and Blundell and Bond (1998)system GMM estimations (using Stata xtabond2 command). Figures inthe parentheses are Standard errors, except for Sargan/Hansen and AR(2) tests, which are p-values. ***, **, and * indicates significance at 1%, 5% and 10% respectively.

the healthcare expenditure at 1% level for both one-step and two-steps i.e. (-8.75 and -7.75). This submitted that the healthcare expenditure per capita, on average, will reduce by 8.8 to 7.8 % for a year change in life expectancy. The outcome was not strange because if there is a decrease inlife expectancy it will lessen the cost of expenditure on healthcare. Subsequently, the estimated coefficients of the share of population between the age group of 65 years and above was negative and significantly determined the healthcare expenditure at 1% level for both one-step and two-steps i.e. (-2.69 and -3.24). This

suggested that the healthcare expenditure per capita, on average, will be reduced for a year change in life expectancy. The outcome was not abnormal as a non-demographic drivers of healthcare expenditure, because, if there is a decrease in life expectancy the budget of expenditure on healthcare will be minimized.

Again, decreasing life expectancy shows that there was a deterioration in the general healthcare conditions of the OIC countries and this had a negative impact on the growth of the economy. On the other hand, a growing life expectancy specifies improvement in

general healthcare system and could positively bring positive changes in the economy. This outcome is reliable and persistent with the preceding studies which indicates that, a variation in the intensities of life expectancy has specifically affected human behavior, in terms of fertility, human capital and growth development (Coile *et al*., 2002). Equally, Kefeli and Zaidi (2014) established that life expectancy is well-thought-out to be good representations to evaluate the healthcare standing of a country and acquiesced that noticeable enhancements have ensued in life expectancy in some OIC states specifically in the high-income OIC countries over the previous years. In addition, Day *et al*. (2008) shows that life expectancy is one of the determinants of healthcare expenditure, as they identified 12 clusters of nations with normal life expectancy stretching from 81.5 years to 37.7 years and established that the three highest ranked clusters were controlled by western European nations while the four bottommost placed clusters were dominated by diverse African nations.

Then, the estimated coefficients of the share of population age under 15 years was positive and significantly determined the healthcare expenditure at 1% level for both one-step and two-steps i.e. (3.71 and 3.92). This implies that a percentage increase in population age under 15 will determine the increase in predictable healthcare expenditure per capita by nearly 3.7 to 3.9 %. The outcome was expected because an increase in population age under 15 will lead to a rise in healthcare expenditure per capita due to additional demand for healthcare services.Besides, the impact of the population age on healthcare per capita sometimes perform contrarily and may have negative consequence on the economy (Khan *et al*, 2016). This is because the more the population age group increases, the higher the dependency percentage is and that will have impact on the individuals and national income, along with the total level of the expenditure on healthcare.

Nevertheless, the population age structure will enhance the economy of the OIC countries if the proportions of the population age above 65 are in good physical shape and contributing energetically to the economy. As a result of this, the outcome is consistent with the past reviews which reveals that, age structure of the population was identified as an important determinant to describe the differences in healthcare expenditure of a country to another (Leu, 1986; Culyer, 1988). Additionally, the proportion of population age under 15 years and population age above 65 years

was incorporated to explain the variations in the healthcare expenditure per capita (Grossman, 1972; Leu, 1986; Di Matteo and Di Matteo, 1998).

Moreover, the estimated coefficients of the out-of-pocket payment was negative and significantly determined the healthcare expenditure per capita at 5 % level for one-step (i.e. -1.22) and at 1 % level for two-steps i.e. (-1.20). This implies that a percentage change in the percentage share of out-of-pocket payments will lead to a 1.2 % decrease in foreseeable healthcare expenditure per capita. This suggests that, a higher percentage of out-of-pocket payment would permit improved accessibility to healthcare services, which might successively escalate patronisation and aggregate healthcare expenditure in OIC regions. Yet, the outcome indicates that there will be a lot of improvement in healthcare services. In the same way, a higher percentage of out-of-pocket payment would as well provide additional opportunity for OIC's government to regulate healthcare expenses. Nevertheless, out-of-pocket expenditure is an indispensable determinant of healthcare expenditure as posited by Glied, 2008; Crystal *et al*, 2000; Litwin & Sapir, 2009 and Bremer, 2014.

Furthermore, the estimated coefficients of the research and development in healthcare was positive and significantly determined the healthcare expenditure at 1% level for both one-step and two-steps i.e. (0.93 and 0.82). This infers that an increase in research and development in healthcare relatively determines the increase in anticipated healthcare expenditure per capita by virtually 0.9 to 0.8 million USD. The result shows that research and development in healthcare will result in innovations, discovery of new technology and assist in intensifying wide-ranging health conditions of the overall populace of OIC countries. For that reason, key enhancements in the overall healthcare linked technological novelties and machineries will improve the OIC countries healthcare service delivery. As a matter of fact, the outcome of the study is persistent with the previous studies that indicated improvements and flows of medical care technology in the healthcare schemes as the main accountable elements of increasing expenditure in healthcare (Newhouse, 1992; Chandra and Skinner, 2012; Rankovi´c *et al*., 2013; Jakovljevic, 2015; Okunade and Murthy, 2002; Murthy and Okunade, 2016).

Additionally, the estimated coefficients of the consumer price index was negative and significantly determined the healthcare expenditure at 1% level in

two-steps estimator i.e. (-0.06). This concludes that a percentage change in consumer price index reasonably determines the decrease in predicted healthcare expenditure per capita by nearly 0.06 %. This resolves that a percentage change in consumer price index reasonably determines the decrease in predicted healthcare expenditure per capita. The outcome means that the prices of healthcare services could decrease relatively to other prices of goods and services (for instance, a decrease in inflation rate in OIC region might boost consumers demand for healthcare services and vice-versa). Above all, the result supports that the cost of wages of the healthcare specialists can also instigate the rise or decrease in healthcare service prices in OIC regions, as this is subject to the changing rate of inflation.

In the light of this, the result of the study is steady with the past studies which point out that, prices in the healthcare area comparative to the other areas of the economy are obviously the drivers of healthcare expenditure (Feng *et al*., 2017). In the same way, the consumer price index or comparative price of healthcare services, technological progress and core healthcare policies and establishments were the possible key determinants of healthcare expenditure (de la Maisonneuve *et al*., 2016). Lastly, the post estimation analysis as shown in Table **2** indicate that the estimated regression confirmed both specification tests. Firstly, the regression is not overwhelmed by simultaneity bias as the orthogonality conditions cannot be rejected at the 5% level, as indicated by the Hansen test in two-steps estimation with p-value of 0.46. Secondly, the serial correlation test of no second-order autocorrelation cannot be rejected at 5% level while it rejects the null of no first-order autocorrelation at 5%. This suggests that the equation was appropriately specified and the instruments engaged in the analysis were valid. Therefore, the residuals of the level equation do not suffer from the autocorrelation problems.

CONCLUSION

It is worth mentioning that, the deductions of the results of the study confirmed that, the income, life expectancy, share of population between the age group of 65 years and above, share of population age under 15 years, out-of-pocket payment, research and development in healthcare and consumer price index were the determinants or drivers of healthcare expenditure in OIC countries. Meanwhile, the study differs from recent and previous studies, because the

study offers novel empirical findings as the income per capita is above one and inelastic. This proves that healthcare in OIC countries is a luxury goods, specifying that healthcare in OIC's country is regarded as a commodity that is similar to other goods and services and should be determined by the forces of market and supply. Once more, the decreasing life expectancy shows that there was a reduction in the general healthcare conditions of the OIC countries and this had a negative impact on the growth of the economy. Thus, an improvement in general healthcare system is needed;it could positively impact changes in the economy.

Then, the population age structure will enhance the economy of the OIC countries, if the sizes of the population age are in good physical shape and contributing actively to the economy. Also, the higher proportion of out-of-pocket payment would provide extra opportunity for OIC governments to regulate healthcare expenses. Besides, more effort should be geared to further improve research and development in healthcare sector because it will result in innovations and discovery of new technology for the OIC countries. Also, the prices of healthcare services should be taken into cognizance as it could be decreased relatively to other prices of goods and services; and the study shows that it has significant effects on the spending on healthcare in OIC regions. In view of this, future studies can expand this research by including more and new variables that could pinpoint the possible drivers of healthcare expenditure.

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