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## ABSTRACT

The socio-economic development level of any country has been significantly attached to the state of healthcare and well-being of its people. Moreover, it is unequivocal that healthy people have substantial influences on economic advancement of a country because when they live longer there is tendency that they will be more productive. On the other hand, the standpoint of education on economic growth cannot be underscored as it serves as method of evolution and progression of personalities and an essential indicator of broad production of the national income. Nevertheless, this paper examines the dynamic effect of healthcare expenditure and education expenditure on economic growth using evidence from Organization of Islamic Cooperation (OIC) countries. The study applied Pool Mean Group (PMG) method by using 1990 to 2015 data. The study reveals a robust long-run co-integrating relationship between healthcare expenditure, education expenditure, research and development and the economic growths of OIC countries. Besides, the short-run effects indicates that, healthcare expenditure per capita significantly impact economic growth of OIC countries, while the education expenditure and research and development (technology) were insignificantly impact economic growth of OIC countries in the short-run. Albeit, the findings of the study short-run specific-effects concluded that, there is existence of a co-integrating relationship between the healthcare, education, technology and economic growth in 36 out of the 56 OIC countries, while 20 other countries have no co-integrating relationship with the economic growths. However, the study suggests that healthcare and education are device to further attain economic growth and development in OIC countries if well managed and administered.

Keywords: Economic growth; healthcare expenditure; education expenditure; OIC countries.

JEL classification: O47, H51, H52, O57

## Introduction

The main value of public healthcare system is for the people to have the right and privileges to access better healthcare services. In spite of this, health is one of the human rights recognized by

international laws. According to Organization of Islamic Cooperation (OIC Health Report, 2011) healthcare objectivity, as stated in most public health writings and practice, is when all and sundry in the world has the chance to "attain their full health potential" whereby no individual is "disadvantaged" from accomplishing this possibility as a result of their social condition or any other socially determined position. Regrettably, the disparities between groups health condition were triggered on account of differences in the occurrence and pervasiveness of healthcare circumstances and healthcare status. The occurrence generally is subject to the socio-economic circumstances of a country and an individual. In addition, the question of health and advancement of up-to-date and sustainable healthcare systems has been gaining better prominence and consideration in numerous developing countries which they perceived as a major driver of socio-economic development and as a result more resources are now been invested in this sector. Currently, people are considered to be healthier, wealthier and live longer when compared to 30 years ago (OIC Health Report, 2011).

On the other hand, most of the improvement attained in healthcare sector over the years has continued to be highly concentrated in the developed countries, while several developing and least-developed countries are still far behind. Specifically, healthcare coverage and health services were still remaining in extremely poor condition in South Asia, Sub-Saharan Africa and several other countries including most of OIC member countries. Although, relentless effort to attain universal healthcare coverage persisted to be highly tenuous in OIC member countries because the healthcare system in many of the OIC countries are extremely suffering from numerous difficulties and challenges that is connected to safeguarding suitable financing resources and infrastructure, personnel and international health guidelines and principles. As stated by OIC Health Report (2011), the state of affairs requires more obligation and determinations by the governments to consider the healthcare system as an important sector which should be accorded higher level in their national development plans.

Nevertheless, a considerable percentage of budgetary in developed countries are invested and allocated for the provision of better healthcare service and quality education because they believe that healthcare and education is part of the key drivers of economic growth. Jack and Lewis (2009) observed that healthcare can improve economic growth through its effect on human and physical capital accumulation. Similarly, assuming that healthier people are more productive,

therefore, people who are healthy have a stout inducement to advance their knowledge and skills through quality education due to the fact that they have longer life period (Bloom and Canning, 2000). In contrary, poor health has a hostile effect on productivity, hence, the underdevelopment in several regions throughout the world has been linked to poor health (Cole and Neumayer, 2006). Also, Clayton (2010) examine health as a major player in nation growth and economic development which aid improvement in labor productivity and reduce the financial burden of diseases through saving of healthcare resources.

Moreover, it is a deeply-rooted assertion that better educated individuals are more probable to have better predictions of employability and remunerations and therefore improved standards of living. Typically, educated individuals equally enjoy countless non-monetary compensations such as better health, hygiene practices, family planning and less potential to engross in illegal doings. An educated individuals are less predicted to self-complain about a prior analysis of a severe or protracted disease, less predicted to die from severe communal and protracted diseases, and are less predicted to complain of anxiety or depression. The magnitude of the attachment between education and health varies from one situation to the other. Similarly, additional schooling minimizes the danger of heart disease and the danger of diabetes (Cutler and Lleras-Muney, 2006).

As a result, the most frequent indicator used in the econometric simulations of growth hinged on the public and private expenditures made in healthcare and education, as a proportion of the gross domestic products for overall stages of healthcare and education. The bankrolling of the country education scheme is considered as a fundamental characteristic that reflects the strength of the national establishments, both public and private to be able to develop an excellent accomplishment in the sector as well as improving economic growth. Generally, the association between the level of sponsoring and the outcomes in education is inelastic to enumerate and estimate in a short term to attain productivity rather a long term approach with a concerted effort of all stakeholders ranging from governments, corporations, establishments as well as individuals and families (Ioana et al., 2013).

Therefore, in order to enhance growth, education similar to healthcare can be considered as a fundamental sector that need government caring irrespective of any challenges the country might be facing because of its prominent role in viable economic sustainability and development.

For that reason, one of the key determinants of nation's wealth is the quality of human capital accumulation through formidable healthcare system and educational attainment. Besides, healthcare and education structure in Organization of Islamic Cooperation (OIC) area comprises of high income, middle income (upper and lower) and low income countries and they are principally public and private inclined. Similarly, the municipal healthcare conveniences are administered to the general population through primary healthcare and secondary healthcare facilities, whereas education bundles are circulated through primary, secondary and tertiary establishments (Wahab & Kefeli, 2017).

Hence, this research undertakes the consequence of healthcare expenditure and education expenditure on economic growth in OIC federations. The investigation absolutely concentrated on fifty-six OIC countries as Somalia was dropped because of incomplete data. Time series data of 1990 to 2015 was used for the analysis. This scholarly work complements the literature as it loosened emphasis on the Organisation for Economic Co-operation and Development (OECD) countries style to OIC countries because the earlier scholars copiously focused on OECD exploration. Furthermore, the previous researches on this theme stereotypically focused on a selection of countries but then this study considered the entire OIC countries and the four categorizations (i.e. high income, middle income (upper and lower), and low income). Equally, empirical studies on the significance of healthcare expenditure and education expenditure on economic growth in OIC countries are seemingly absent and the inferences from the study would propose some recommendations to policy makers in OIC region.

**Literature Review**

There are numerous pragmatic studies that have examined the healthcare expenditures and economic growth and they have found out that there is positive relationship between healthcare expenditure and economic growth. Wang (2009) studied the determinants of healthcare expenditure by means of homogeneous panel of data for the US states and found out that the gross state product, the proportion of the population over the age of 65 years, the degree of urbanization and the number of hospital beds were the four key responsible factors discovered by the survey to be the fundamental determinant of healthcare expenditure.

Furthermore, Hartwig (2008) reconsidered a survey that state whether health capital development encourages economic growth in rich countries relating to the panel Granger-causality framework. The results show that health capital formation does not promotes long-term economic growth in the OECD region. But in an instantaneous contrast, Wang (2011) presented the causality between an increase in healthcare expenditure and economic growth for OECD countries during 1986-2007. The observed method used is divided into two. The first method was the panel regression analysis while the second method was the quantile regression analysis. The assessment of the panel regression analysis discloses that, expenditure growth will encourage economic growth; on the other hand, economic growth will decrease expenditure growth. With reference to the assessment of quantile regression analysis, once economic growth is quantile, in the countries with low level of growth, the effect of expenditure growth on economic growth will be different. Hence, in countries with medium and high levels of economic growth, the effect of expenditure growth on economic growth will be positive; once healthcare expenditure growth is quantile, the effect of economic growth on expenditure growth will likely to be more different.

In addition, Tang (2011) surveyed the Granger causality test within a multivariate co-integration and error-correction framework to explore the relationship between healthcare expenditure, income and relative price in Malaysia within the period of 1970 to 2009. The outcome of the findings revealed that in the short-run there is unidirectional Granger causality running from relative price to healthcare expenditure, whereas relative price and income are bidirectional Granger causality in Malaysia. However, in the long-run healthcare expenditure and income are bidirectional Granger causality, but there is unidirectional Granger causality running from relative price to healthcare expenditure and income. This stipulate that a diverse result was established from the survey as a result of the bidirectional causality of the healthcare and income.

Mehrara and Musai (2011) studied causal relationships between health expenditure and GDP for Iran through annual data for the period of 1970-2008. The outcomes from the co-integration method submitted that there is a long-run relationship between Health expenditure and GDP. Likewise, the outcomes of Granger Causality test showed a robust unidirectional influence from GDP to health expenditure, though there is no support to the opinion that health expenditure encourages long-term economic growth. Correspondingly, from the researcher observation the survey indication used for Iran obviously cares for the ‘Income point of view’ above the ‘Health

point of view'. On the other hand, Hassan (2012) examined the existence of long run association and triangular causality among real GDP per capita, per capita education expenditures and per capita health expenditures in Pakistan, by means of Autoregressive Distribution Lag Model (ARDL) bounding and Granger Causality tests for the period of 1972-2009. It was shown from their findings that there is bidirectional granger causality between the real GDP per capita, per capita education expenditures and per capita health expenditures in the long run. In a different view, Karim (2016) analysed the connection between health expenditure and economic growth in Nigeria through ARDL bounds testing method by using 1985 to 2009 data and found out that health expenditure expounds little impression on the economic growth. The outcomes further show that healthcare expenditures does not make a noteworthy involvement in the economic growth of Nigeria despite its involvement in enhancing of human capital and reducing of infant mortality rate.

On the other hand, the contributions of education to economic growth cannot be overemphasized, as it has been pinpointed as the black-box of the economic development of United State and European Union region, whereby a snowballing level of education of labour-force expounds a huge percentage of rapid growth of their developed nature (Woodhall, 1987 and Schultz, 1996). Similarly, there is a relationship between nation's income and proportion of literacy of a country's populace as opined by Lucas (1988), who is one of the endogenous growth theory advocates. The researcher signified that human capital development ensues in the form of education and learning by doing or schooling and the resultant effect leads to endogenous growth. This same conclusion was also supported in other studies such as (Psacharopoulos and Woodhall, 1985; Barro and Lee, 2010).

In the same view, the findings of Asteriou and Agiomirgianakis (2001) in Greece concludes that a positive significant relationship occurs between long-run educations parameters and GDP per capita, while Li and Huang (2009) identified that in 28 China's provinces there is a positive impacts of education to economic growth. Whereas, in the study carried out by Özsoy (2008) in Turkey shows that there is a long-run and constant association between education and growth. Correspondingly, Maksymenko and Rabani (2011) displays in their findings in India and South Korea that education has a significant positive impact on economic growth. Too, Hanushek and Kimbo (2000) carried out their findings by using indexes of educational quality for 38 countries to

identify the academic performance in mathematics and sciences between 1965 and 1999, the result of the findings recommends a robust connection between educational quality and rise in GDP per capita.

Moreover, technological advancement and adaptation to new innovations has been attributed to the level of schooling and exposure. As a matter of fact, Barro (2001) indicated in his findings that there is significance relationship between males' average level of schooling and economic growth, because individuals who pursued higher education or equivalents tends to adapt to new technologies and better-off than individuals who does not possess higher grades. In a similar opinion, Wolff (2001) established that adaptation to new technology requires labour force to have a somewhat degree of schooling, and training (education) is a key vivid architects in economic growth. In a like manner, an upsurge in education expenditure will stimulate economic growth and capacity building as indicated in the findings of Gyimah-Brempong et al. (2006), they accentuate that in Sub-Saharan Africa, a rise in the education expenditures for tertiary schools will fast-track the progression of closing the gap of technological know-how and guarantee economic growth which will results in labour productivity and nation's development.

In another matching interpretation, primary school, secondary school and tertiary level of schooling has been identified to have a significant influence on economic growth and a quality improvement in nation's education unswervingly encourages economic growth (Weber, 2003; Gylfason and Zoega, 2003). Also, government education expenditure has a great influence in the growth and development of the economy of a country as shown in the findings of Musil and Belassi (2004) in Uganda that surge in public education expenditures per worker positively effects economic growth. Comparably, the findings of Keller (2006) on developed and developing countries found out that public education expenditures per capita have a significant positive impact on GDP per capita. In another view, education expenditures in developing countries contributes a positive significant effect on human capital development and that cause a greater surge in economic growth.

However, despite de fact that many literatures outcomes show a positive significant relationship between education and economic growth there are few findings which established a negative or no significance relationship. For instance, Levine and Renelt (1992) detailed that there are no robust connections between educational variables and economic growth. More so, the

outcomes of a study carried out by Türkmen (2002) justified that there is negative significant association between education expenditures, school enrolment proportions and economic growth. Further, Self and Grabowski (2004) acknowledged in their study that they cannot traced any significant effects of vocational education on economic growth. Besides, in Turkey Özsoy (2008) shows that there is no causality relationship amongst higher education and economic growth.

Additionally, Caselli et al. (1996) refute the recommendations of the findings of Mankiw et al. (1992) that expenditure in human capital through education is indispensable to economic growth. Consistently, education and economic growth have been found to be oppositely related in a naturally gifted nation as highlighted in Behbudi et al. (2010), the study considered country with natural resources richness and discover that there is negative association between economic growth and education in nations that are main fuel exporters. The conclusion of the study stated that oil-reserve wealthy nations have deserted their crucial human capital reserve by dedicating laughable responsiveness and spending to education. Alike, few other findings proved that there is fragile relationship between educational accomplishment of a labour force and economic growth (Benhabib and Speigel, 1994; Pritchett, 1996; Kumar, 2006). Emphatically, a good policies implementation by government in the education industry and provision of better and quality education can create enabling environment for economic growth.

**Method**

In this paper, we examine the dynamic effect of healthcare expenditure and education expenditure on economic growth and the researcher employed dynamic panel data of OIC countries using pool mean group (PMG) model by Pesaran et al. (1999). The technique deliberated a minor degree of heterogeneity, whereas it implements homogeneity in the long-run coefficients and still accommodate heterogeneity in the short-run coefficients and error adjustments. The prime assumption of the pool mean group (PMG) estimator is that the error terms are serially uncorrelated and are distributed separately of the regressors, which implies that, the independent variables can be observed as exogenous. Similarly, PMG estimator is satisfactorily elastic to tolerate long-run coefficient homogeneity beyond an individual subset of regressors. In addition, the data used cover the period of 26 years from 1990 to 2015. For the reporting purpose, the researcher specified a dynamic log-linear equation for the model to be able to present the estimated results in a clear style. The research empirical method assumes the best usage of both time and cross-country

dimensions of accessible data sets which includes the dependent variable and explanatory variables. Thus, the study empirical model is as follows.

$$lgdp_{it} = \alpha_1 + \beta_1 lhce_{it} + \beta_2 ltgee_{it} + \beta_3 ltech_{it} + \mathcal{E}_{it} \qquad (1.1)$$

where in Eqn. (1.1), logarithm of gross domestic product (*lgdp*) in billions US dollars is the dependent variable and viewed as a function of logarithm of healthcare expenditure per capita (*lhce*) in billions US dollars, logarithm of total government education expenditure (*ltgee*) in billions US dollars and logarithm of research and development (technology (*ltech*)) in billions US dollars. Referring to the standard economic theory, $\beta_1 > 0$, $\beta_2 > 0$, *and* $\beta_3 > 0$ are adjustment parameters that could be captured for the equilibrium level and its value equals to 0. According to the economic theory, as the healthcare expenditure per capita increases, the gross domestic product is expected to increase. Consequently, $\beta_2 > 0$ which submits, increasing total government education expenditure stipulates an enhanced and optimistic impact on economic growth (i.e. gross domestic product). Moreover, $\beta_3 > 0$ which infers, increasing research and development in technology specifies a greater and expectant effect on the economic growth.

However, $\alpha_1$ is a vector of constants, the error term $\mathcal{E}_{it}$, is presumed to be independent and normally distributed and the subscripts *i* & *t* are the individual effects and time periods. The coefficients $\beta_1$ $\beta_2$ and $\beta_3$ respectively, are the vectors of gross domestic product with relative to the explanatory variables. In the same way, Eqn. (1.1) is also specified to follow the technique suggested by Pesaran et al. (1999) which engaged the ARDL (p, q) model for the empirical analysis as follows:

$$lgdp_{it} = \sum_{j=1}^{p} \lambda_i lgdp_{it-1} + \sum_{j=0}^{q} \delta'_{30i} lhce_{it} + \sum_{j=0}^{q} \delta'_{31i} lhce_{it-1} + \sum_{j=0}^{q} \delta'_{40i} ltgee_{it} + \sum_{j=0}^{q} \delta'_{41i} ltgee_{it-1} + \sum_{j=0}^{q} \delta'_{50i} ltech_{it} + \sum_{j=0}^{q} \delta'_{51i} ltech_{it-1} + \mu_i + \varepsilon_{it} \qquad (1.2)$$

where $lgdp_{it}$ in Eqn. (1.2) is the logarithm of gross national income and represents the dependent variables. $lhce_{it}$ is the logarithm of healthcare expenditure per capita, $ltgee_{it}$ is the logarithm of total government education expenditure, and $ltech_{it}$ is the logarithm of technology, which signifies the vector of independent variables and the coefficient vectors, parameters are denoted by $i = 1, 2,\ldots, N$, time periods by $t = 1, 2,\ldots, T$, where $\mu_i$ indicates the fixed effects. Hence, it is

suitable to estimate the model with the re-written form of equation (1.2) as follows; since, this can put together the long-run and short-run co-integration dynamic panel model:

$$\Delta lgdp_{it} = (\varphi_i lgdp_{i,t-1} + \beta'_{30} lhce_{it} + \beta'_{40} ltgee_{it} + \beta'_{50} ltech_{it}) + \sum_{j=1}^{p-1} \lambda^*_i \Delta lgdp_{i,t-1} + \sum_{j=0}^{q-1} \delta^{*\prime}_{31i} \Delta lhce_{i,t-1} + \sum_{j=0}^{q-1} \delta^{*\prime}_{41i} \Delta ltgee_{i,t-1} + \sum_{j=0}^{q-1} \delta^{*\prime}_{51i} \Delta ltech_{i,t-1} + \mu_i + \varepsilon_{it} \quad (1.3)$$

The symbol Δ in Eqn. 1.3 indicates the first-difference term, $\Delta lgdp_{it} = lgdp_{it} - lgdp_{i,t-1}$ is the gross domestic product, $\varphi_i = -(1 - \sum_{j=1}^{p} \lambda_i)$ is the coefficient of error correction, $\beta'_{30} = \frac{\delta^{*\prime}_{30i} + \delta^{*\prime}_{31i}}{(1-\lambda_i)}$, $\beta'_{40} = \frac{\delta^{*\prime}_{40i} + \delta^{*\prime}_{41i}}{(1-\lambda_i)}$ and $\beta'_{50} = \frac{\delta^{*}_{50i} + \delta^{*\prime}_{51i}}{(1-\lambda_i)}$ are long-run parameters, $\lambda^*_i = -\sum_{m=j+1}^{p} \lambda_{im}$, $j = 1, 2 \ldots\ldots, p-1$, and $\delta^*_i = -\sum_{m=j+1}^{q} \delta_{im}$, $q = 1, 2 \ldots\ldots, q-1$. Where $\beta'_i$ is the long-run equilibrium relation between $lgdp_{it}$, $lhce_{it}$, $ltgee_{it}$ and $ltech_{it}$. Additionally, $\lambda^*_i$ and $\delta^*_i$ are short-run coefficients in association to its lag values and with the vectors of the determinants of independent variables. The error correction coefficient $\beta'_i$ estimates the speed of adjustment of $lgdp_{it}$ towards its long-run equilibrium in occasioning to a change in $lhce_{it}$ and $ltgee_{it}$ and $ltech_{it}$. When $\beta'_i$ is significant and negative, it suggests the existence of co-integration and there is a long-run relationship between the variables.

**Findings and Discussion**

The data used for the study were sourced from the World Bank (World Development Indicators (WDI)) and the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC). From Table 1 below, the highest mean value and standard deviation belongs to the research and development (*ltech*) with the corresponding values of 10.37 billion USD and 2 billion USD respectively. Thus, the lowest mean and standard deviation value is government education expenditure (*ltgee*) with 1.47 billion and 0.52 billion accordingly. The maximum score of the model is research and development (*ltech*) with 16.47 billion and the minimum value belongs to the total government education expenditure (*ltgee*) with a corresponding value of 0.45 billion. On the other hand, the skewness and kurtosis from the results shows a desirable outcome, whereby all the variables were within normal skewness.

Table 1: Summary of Variables Descriptive statistics

| Variable | Mean | St. Dev. | Min | Max | Skewness | Kurtosis | Obs. |
|---|---|---|---|---|---|---|---|
| lgdp | 7.33 | 1.41 | 4.53 | 11.49 | 0.64 | 2.68 | 1456 |
| lhce | 4.31 | 1.23 | 1.10 | 7.94 | 0.53 | 2.58 | 1456 |
| ltgee | 1.47 | 0.52 | -0.45 | 3.37 | 0.23 | 3.54 | 1456 |
| ltech | 10.37 | 2.00 | 5.32 | 16.47 | 0.80 | 2.90 | 1456 |

Sources: Author's Computation, 2018

**Note**:
lgdp: *denotes logarithm of Real gross domestic product per capita in Billions (current price USD $)*
lhce: *denotes logarithm of healthcare expenditure per capita in Billions (current price USD $)*
ltgee: *denotes logarithm of Total government education expenditure in Billions (current price USD $)*
ltech: *denotes logarithm of Research and development in education in Billions (current price USD $)*

The results gotten from the dynamic analysis by using PMG with ARDL (p, q) structure are offered in Table 2 below. The PMG approach elucidates the effect of healthcare, education and technology on economic growth. This approach displays that the effect of independent variables implements a homogenous system in the long run and assumes a heterogeneous system in the short run. The results exhibited in Table 2 disclosed that, the coefficients of healthcare expenditure per capita, total government education expenditure and technology was positive and statistically significant at 1 % and 5 % level. Equally, this infers that an increasing healthcare per capita driven more economic growth in OIC region by nearly 0.8 % in the long run. Also, the result of the total government education expenditure submits that, on average, a unit increase in education expenditure is associated to an increase in expected economic growth in OIC countries by approximately 0.2 % in the long run. On the other hand, a growing research and development in technology motivated further economic growth in OIC regions by almost 0.2 % in the long run. Again, the results conclusion shows that, there is long-run relationship between economic growth and the explanatory variables.

Table 2: The Long run and Short Run Pool Mean Group (PMG) model of Gross Domestic Product (GDP)

| **Variable** | **Long Run** | **Short Run** |
|---|---|---|
| LHCE | 0.814 (0.036)*** | |
| LTGEE | 0.153 (0.055)** | |
| LTECH | 0.115 (0.034)*** | |
| | | |
| ECT(-1) | | -0.069 (0.020)*** |
| D(LGDP(-1)) | | 0.136 (0.037)*** |
| D(LNHCE) | | 0.049 (0.018)** |

| | |
|---|---|
| D(LTGEE) | 0.009 (0.012) |
| D(LTECH) | 0.004 (0.08) |
| C | 0.234 (0.058)*** |

Diagnostic tests
Breusch-Godfrey serial correlation F-test 0.838(0.668)
Breusch-Pagan-Godfrey heteroscedasticity F-test 0.579(0.628)
Wald test on the coefficient of lhce = 18303.75($\chi$2, DF = 2)

Note: The results shows the coefficients, and in parenthesis (.) the standard deviation. The lag structure is ARDL (2, 1, 1, 1). The signs *, ** and *** indicate significance at the 1%, 5% and 10% levels.

Conversely in the short-run, the coefficient of the error-correction term, *ECT(-1)* is necessitated to be negative and significant. Accordingly, the result in Table 2 exhibits that this coefficient is -0.069 and statistically significant at the 1 % level. Also, the error-correction term confirmed the existence of a co-integrating relationship between the healthcare, education, research and development (technology) and economic growth (GDP). This displays that about 7 % adjustment to the disequilibria in economic development occurred in the current period, which might be as a result of previous economic shocks. In spite of this, the speed of adjustment is normal. More so, the speed of adjustment specifies that, both healthcare per capita and total government education expenditure and technology in OIC countries, modifies its preceding period disequilibrium from the short-run at a speed of 7 % yearly, towards long-run equilibrium relationship to accomplish economic growth.

Besides, the short run results indicate that, the intercept (constant) term was positive and significant at 1 % level. Similarly, the coefficients of D(LGDP(-1)) and D(LHCE) were positive and significantly related to the model at the 1 % and 5 % level respectively while the coefficients of D(LTGEE) and D(LTECH) were insignificantly related to model in the short run. The outcomes suggest that economic growth of OIC is expected to improve in the short-run. As well, an increase in healthcare expenditure per capita in the short run will increase economic growth of OIC region while a slight change in education and technology has no effect on economic growth in the short run. To conclude, the end part of Table 2 comprises of the diagnostic test results of the selected ARDL (2, 1, 1, 1) model. The outcomes show that, the Breusch-Godfrey serial correlation F-statistic and the Breusch-Pagan-Godfrey heteroscedasticity F-statistic could not reject the null-hypotheses of no serial correlation and no heteroscedasticity of the residuals.

Thus, the outcome of this current study is persistent and resolute with previous studies which reiterated a long-run relationship between healthcare expenditure, education expenditure and economic growth. As a case in point, Mehrara and Fazaeli (2010) showed that there is long-run relationship between healthcare expenditure, education expenditure and economic growth in Middle East countries and North Africa (MENA) using the sample of 13 countries for the period of 1995-2005. Alike, Rehman and Khan (2012) established that healthcare and education expenditure accelerates a long run economic growth in Pakistan. In a likely manner, Yardimcioğlu et al. (2014) recognized that there is robust long-run relationship between education and economic growth in 25 OECD countries during the period of 1980 to 2008. Also, Simões (2011) and Doğan et al. (2014) shows a long run relationship between education and economic growth for OECD countries. In a different view, a positive significance of research and development in technology in relation to the economic growth of OIC regions in the long run is resolute with previous studies. For illustration, Lucas (1988) and Romer (1990) takes into account of technology, as their research shows that, research and development (R&D) are an optimistic externality on capital efficiency and the impacts on economic growth cannot be ignored. As a result, the findings indisputably resolved that a resilient co-integration connection occurred between healthcare, education, technology (as a proxy of both healthcare expenditure & education expenditure) and economic growth of OIC countries in the long-run.

In spite of long-run outcome, we proceed to estimate the cross sections short-run effect of the healthcare expenditure, government education expenditure and technology in relation to economic growth to reveal the extent to which the effect differs from the general results in Table 2. Thus, the coefficients of the error-correction term, *ECT(-1)* outcomes in Table 3 demonstrates that, the coefficients are negatively significant and there is existence of a co-integrating relationship between the healthcare, education, technology and economic growth in 36 out of the 56 countries such as: Albania, Azerbaijan, Bahrain, Brunei, Djibouti, Egypt, Gabon, Gambia, Guinea, Guinea Bissau, Guyana, Indonesia, Iran, Kazakhstan, Kuwait, Libya, Malaysia, Maldives, Mauritania, Morocco, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Sierra Leone, Sudan, Suriname, Syria Arab Republic, Tajikistan, Tunisia, Turkey, Uganda, UAE, Uzbekistan and Yemen.

Alike, the estimated coefficient of error-correction terms (*ECT(-1)*) of individual effect for the OIC countries as portrayed in Table 3 signifies, the short-run specific-effect and the short-run equilibrium. The error-correction term (*ECT(-1)*) identifies the speed at which the past period disequilibrium of the healthcare and education is being adjusted towards economic growth. This suggests that, healthcare, education and technology of the 36 OIC countries, corrects its preceding period disequilibrium towards economic growth at a speed corresponding to their respective error-correction terms (*ECT(-1)*)'s as shown in Table 3 below:

Table 3: OIC Countries specific-effects co-integration relationship

| | Countries specific-effects with negative and co-integration relationship | | Countries specific-effects with positive significance but no co-integration relationship | | Positive & negative insignificant countries specific-effects and no co-integration relationship with GDP | |
|---|---|---|---|---|---|---|
| No. | Country / Variable | Co-integration ECT(-1) | Country / Variable | Co-integration ECT(+ve) | Country / Variable | Co-integration ECT(none) |
| 1 | Albania | -0.069 (0.003)*** | Afghanistan | 0.071 (0.008)*** | Benin | 0.004 (0.003) |
| 2 | Azerbaijan | -0.233 (0.010)*** | Algeria | 0.323 (0.028)*** | Chad | 0.008 (0.004) |
| 3 | Bahrain | -0.074 (0.024)** | Bangladesh | 0.004 (0.001)** | Cote d'Ivoire | -0.046 (0.031) |
| 4 | Brunei | -0.078 (0.003)*** | Burkina Faso | 0.156 (0.004)*** | Niger | 0.0005 (0.0004) |
| 5 | Djibouti | -0.029 (0.001)*** | Cameroon | 0.222 (0.031)** | | |
| 6 | Egypt | -0.049 (0.005)*** | Comoros | 0.163 (0.006)*** | | |
| 7 | Gabon | -0.225 (0.008)*** | Iraq | 0.040 (0.003)*** | | |
| 8 | Gambia | -0.126 (0.005)*** | Jordan | 0.005 (0.001)** | | |
| 9 | Guinea | -0.017 (0.004)** | Kyrgyzstan | 0.068 (0.002)*** | | |
| 10 | Guinea Bissau | -0.502 (0.013)*** | Lebanon | 0.05 (0.002)*** | | |
| 11 | Guyana | -0.094 (0.001)*** | Mali | 0.021 (0.011)*** | | |
| 12 | Indonesia | -0.129 (0.004)*** | Mozambique | 0.123 (0.005)*** | | |
| 13 | Iran | -0.091 (0.004)*** | Nigeria | 0.116 (0.002)*** | | |
| 14 | Kazakhstan | -0.105 (0.010)*** | Senegal | 0.076 (0.005)*** | | |
| 15 | Kuwait | -0.042 (0.001)** | Togo | 0.090 (0.002)*** | | |
| 16 | Libya | -0.227 (0.019)*** | Turkmenistan | 0.0118 (0.001)*** | | |
| 17 | Malaysia | -0.474 (0.018)*** | | | | |
| 18 | Maldives | -0.071 (0.003)*** | | | | |
| 19 | Mauritania | -0.191 (0.006)*** | | | | |
| 20 | Morocco | -0.183 (0.009)*** | | | | |
| 21 | Oman | -0.145 (0.008)**** | | | | |
| 22 | Pakistan | -0.115 (0.017)** | | | | |
| 23 | Palestine | -0.058 (0.001)*** | | | | |
| 24 | Qatar | -0.175096 (0.007)*** | | | | |
| 25 | Saudi Arabia | -0.227 (0.004)*** | | | | |
| 26 | Sierra Leone | -0.253 (0.008)*** | | | | |
| 27 | Sudan | -0.097 (0.014)** | | | | |
| 28 | Suriname | -0.059 (0.004)*** | | | | |
| 29 | Syria Arab Republic | -0.203 (0.007)*** | | | | |
| 30 | Tajikistan | -0.92 (0.021)** | | | | |
| 31 | Tunisia | -0.171 (0.127)*** | | | | |
| 32 | Turkey | -0.197 (0.015)*** | | | | |
| 33 | Uganda | -0.095 (0.002)*** | | | | |
| 34 | UAE | -0.032 (0.003)*** | | | | |

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|---|---|---|---|---|
| 35 | Uzbekistan | -0.44 (0.025)*** | | |
| 36 | Yemen | -0.075 (0.005)*** | | |

Note: The results shows the coefficients, and in parenthesis (.) the standard deviation. The lag structure is ARDL (2, 1, 1, 1). The signs *, ** and *** indicate significance at the 1%, 5% and 10% levels.

Besides, the coefficients of the error-correction term, *ECT(-1)* results in Table 3 are positively significant and there is no co-integrating relationship between the healthcare, education, technology and economic growth in countries such as: Afghanistan, Algeria, Bangladesh, Burkina Faso, Cameroon, Comoros, Iraq, Jordan, Kyrgyzstan, Lebanon, Mali, Mozambique, Nigeria, Senegal, Togo and Turkmenistan. On the other hand, the coefficients of the error-correction term, *ECT(-1)* results confirmed that there is no significance and no occurrence of co-integration relationship between the healthcare, education, technology and economic growth in the following countries such as: Benin, Chad, Cote d'Ivoire and Niger.

In a different view, Table 4 below highlights the individual countries in which gross domestic product was positive and significant at 1 %, 5 % and 10 % respectively. This shows that the economy of these countries witnessed an increasing growth rate. The following countries are as follows as displayed in Table 4 below: Azerbaijan, Bahrain, Bangladesh, Chad, Djibouti, Egypt, Gambia, Guinea, Guinea Bissau, Guyana, Iran, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Oman, Pakistan, Palestine, Qatar, Senegal, Sudan, Suriname, Tajikistan, Togo, Turkmenistan, Uganda, UAE and Uzbekistan. Accordingly, Table 4 also shows the individual countries in which gross domestic product was negative and significant at 1 %, 5 % and 10 % respectively. This illustrates that the economy of these countries are perceiving a slow-moving growth rate, the countries include, Brunei, Burkina Faso, Cameroon, Cote d'Ivoire, Indonesia, Jordan, Kuwait, Libya, Mali, Nigeria, Saudi Arabia and Turkey. As well, Table 4 displays the individual countries in which gross domestic product was insignificant at 1 %, 5 % and 10 % respectively. This reveals that the economy of these countries does not witness any growth within the time period under review. The countries are as follows: Afghanistan, Albania, Benin, Gabon, Comoros, Iraq, Maldives, Mauritania, Morocco, Mozambique, Niger, Sierra Leone, Syria Arab Republic, Tunisia and Yemen.

Furthermore, the short run results in Table 4 also indicates that, the coefficients of the individual countries healthcare expenditure were positive and significant at 1 %, 5 % and 10 % respectively. The results imply that an increase in healthcare expenditure per capita in the short

run will directly impact economic growth in the following countries: Afghanistan, Albania, Algeria, Bahrain, Bangladesh, Brunei, Cameroon, Cote d'Ivoire, Djibouti, Egypt, Gabon, Gambia, Guinea, Indonesia, Iraq, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon, Libya, Malaysia, Mali, Morocco, Mozambique, Nigeria, Qatar, Saudi Arabia, Sierra Leone, Sudan, Suriname, Tunisia, Turkey, Turkmenistan and UAE. Likewise, the short run results in Table 4 specifies that, the coefficients of the individual countries healthcare expenditure were negative and significant at 1 %, 5 % and 10 % respectively. The outcomes suggest that a unit change in healthcare expenditure per capita in the short run will indirectly impact economic growth in the following countries: Benin, Burkina Faso Chad, Comoros, Guinea Bissau, Guyana, Iran, Maldives, Mauritania, Niger, Oman, Pakistan, Palestine, Senegal, Syria Arab Republic, Togo, Uganda, Uzbekistan and Yemen. Conversely, the short run outcomes stipulate that, the coefficients of the individual countries healthcare expenditure were insignificantly related to the economic growth at 1 %, 5 % and 10 % respectively in two countries namely, Azerbaijan and Tajikistan as shown in Table 4. The outcomes submit that a unit change in healthcare expenditure per capita in the short run will have no impact on the economic growth.

In addition, the short run results in Table 4 designates that, the coefficients of the individual countries education expenditure were positive and significant at 1 %, 5 % and 10 % respectively. The results infer that an increase in education expenditure in the short run will have an optimistic impact on economic growth in the following countries: Bahrain, Benin, Brunei, Burkina Faso, Cameroon, Comoros, Cote d'Ivoire, Egypt, Gabon, Guinea, Guinea Bissau, Indonesia, Iran, Iraq, Kuwait, Libya, Malaysia, Maldives, Morocco, Mozambique, Oman, Qatar, Sierra Leone, Togo, Tunisia, Turkey, Turkmenistan and UAE. Correspondingly, the short run results in Table 4 agrees that, the coefficients of the individual countries education expenditure were negative and significant at 1 %, 5 % and 10 % respectively. The results put forward that a unit change in education expenditure in the short-run will indirectly impact economic growth in the following countries: Afghanistan, Algeria, Bangladesh, Chad, Djibouti, Gambia, Guyana, Jordan, Kazakhstan, Lebanon, Mali, Mauritania, Nigeria, Pakistan, Palestine, Saudi Arabia, Sudan, Suriname, Syria Arab Republic, Uganda and Uzbekistan. On the other hand, the short run outcomes require that, the coefficients of the individual countries education expenditure were insignificantly connected to the economic growth at 1 %, 5 % and 10 % respectively. Then, the outcomes as shown in Table 4 infers that a unit change in education expenditure per capita in the

short run will have no impact on the economic growth of the following countries: Albania, Azerbaijan, Kyrgyzstan, Niger, Senegal, Tajikistan and Yemen.

Additionally, the short run results in Table 4 describes that, the coefficients of the individual countries in technology was positive and significant at 1 %, 5 % and 10 % respectively. The results deduce that an increase in research and development in the short run will have an expectant impact on economic growth in the following countries: Algeria, Benin, Burkina Faso, Cameroon, Comoros, Egypt, Gabon, Iran, Iraq, Lebanon, Libya, Mali, Mauritania, Mozambique, Nigeria, Oman, Palestine, Qatar, Saudi Arabia, Senegal, Sierra Leone, Sudan, Suriname, Togo, Turkmenistan, Uganda and UAE. Similarly, the short run results in Table 4 supports that, the coefficients of the individual countries technology were negative and significant at 1 %, 5 % and 10 % respectively. The results suggest that a unit change in research and development in the short-run will indirectly impact economic growth in the following countries: Afghanistan, Albania, Azerbaijan, Bahrain, Bangladesh, Brunei, Burkina Faso, Chad, Cote d'Ivoire, Djibouti, Gambia, Guinea, Guinea Bissau, Guyana, Indonesia, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Malaysia, Maldives, Morocco, Niger, Pakistan, Tajikistan, Tunisia, Turkey, Uzbekistan and Yemen. In converse, the short run outcomes show that, the coefficients of the individual countries technology were insignificantly connected to the economic growth at 5 % level in Syria Arab Republic. Then, the outcomes as shown in Table 4 concludes that a unit change in research and development in the short run has no effect on the economic growth of Syria Arab Republic, which might be as a result of the economic and political turmoil witnessing by the country.

Table 4: OIC Countries specific-effects of healthcare, education and technology on economic growth (GDP)

| No. | Country / Variable | Positive significant GDP (D(LGDP(-1)) | Negative significant GDP (D(LGDP(-1)) | Insignificant GDP (D(LGDP(-1)) | Positive impact of Healthcare on GDP | Negative impact of Healthcare on GDP | Insignificant impact of Healthcare on GDP | Positive impact of Education on GDP | Negative impact of Education on GDP | Insignificant impact of Education on GDP | Positive impact of Technology on GDP | Negative impact of Technology n on GDP | Insignificant impact of Technology on GDP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Afghanistan | | | 0.058 (0.049) | 0.139 (0.026)** | | | | -0.125 (0.008)*** | | | -0.02 (0.002)*** | |
| 2 | Albania | | | 0.053 (0.029) | 0.136 (0.008)*** | | | | | 0.009 (0.021) | | -0.028 (0.001)*** | |
| 3 | Algeria | | | | 0.407 (0.012)*** | | | | -0.065 (0.002)*** | | 0.209 (0.001)*** | | |
| 4 | Azerbaijan | 0.574 (0.025)*** | | | | | 0.019 (0.009) | | | 0.006 (0.003) | | -0.025 (0.0003)*** | |
| 5 | Bahrain | 0.237 (0.052)** | | | 0.009 (0.0004)*** | | | 0.138 (0.139)*** | | | | -0.030 (0.001)*** | |
| 6 | Bangladesh | 0.541 (0.038)*** | | | 0.021 (0.003)*** | | | | -0.035 (0.0003)*** | | | -0.011 (0.0004)*** | |
| 7 | Benin | | | -0.055 (0.075) | | -0.115 (0.039)** | | 0.078 (0.006)*** | | | 0.004 (0.001)** | | |
| 8 | Brunei | | -0.017 (0.047)** | | 0.089 (0.002)*** | | | 0.026 (0.002)*** | | | | -0.016 (0.002)*** | |
| 9 | Burkina Faso | | -0.093 (0.008)*** | | | -0.093 (0.008)*** | | 0.073 (0.008)*** | | | 0.038 (0.001)*** | -0.358 (0.028)*** | |
| 10 | Cameroon | | -0.292 (0.120)* | | 0.372 (0.047)*** | | | 0.200 (0.005)*** | | | 0.081 (0.002)*** | | |
| 11 | Chad | 0.493 (0.005)*** | | | | -0.099 (0.007)*** | | | -0.056 (0.004)*** | | | -0.023 (0.005)** | |
| 12 | Comoros | | | 0.022 (0.009) | | -0.061 (0.013)** | | 0.028 (0.002)*** | | | 0.049 (0.001)*** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Cote d'Ivoire | | -0.324 (0.076)*** | | 0.279 (0.041)*** | | | 0.395 (0.034)*** | | | | -0.027 (0.002)*** | | |
| 14 | Djibouti | 0.698 (0.018)*** | | | 0.033 (0.001)*** | | | | -0.014 (0.0001)*** | | | -0.005 (0.0001)*** | | |
| 15 | Egypt | 0.496 (0.032)*** | | | 0.026 (0.007)** | | | 0.018 (0.002)*** | | | 0.006 (0.002)** | | | |
| 16 | Gabon | | | -0.015 (0.044) | 0.031 (0.006)** | | | 0.078 (0.013)** | | | 0.007 (0.004) | | | |
| 17 | Gambia | 0.195 (0.028)*** | | | 0.177 (0.014)** | | | | -0.008 (0.001)*** | | | -0.029 (0.002)*** | | |
| 18 | Guinea | 0.263 (0.029)*** | | | 0.164 (0.008)*** | | | 0.122 (0.003)*** | | | | -0.109 (0.002)*** | | |
| 19 | Guinea Bissau | 0.129 (0.022)*** | | | | -0.269 (0.007)*** | | 0.067 (0.001)*** | | | | -0.074 (0.002)*** | | |
| 20 | Guyana | 0.290 (0.013)*** | | | | -0.034 (0.001)*** | | | -0.037 (0.001)*** | | | -0.016 (0.0004)*** | | |
| 21 | Indonesia | | -0.195 (0.021)*** | | 0.157 (0.007)*** | | | 0.239 (0.006)*** | | | | -0.030 (0.005)** | | |
| 22 | Iran | 0.544 (0.033)*** | | | | -0.056 (0.004)*** | | 0.051 (0.011)** | | | 0.020 (0.002)*** | | | |
| 23 | Iraq | | | 0.004 (0.022) | 0.188 (0.001)*** | | | 0.039 (0.007)** | | | 0.255 (0.006)*** | | | |
| 24 | Jordan | | -0.105 (0.040)** | | 0.018 (0.001)*** | | | | -0.007 (0.001)*** | | | -0.001 (0.0003)*** | | |
| 25 | Kazakhstan | 0.371 (0.026)*** | | | 0.058 (0.009)*** | | | | -0.031 (0.006)** | | | -0.081 (0.003)*** | | |
| 26 | Kuwait | | -0.261 (0.023)*** | | 0.232 (0.005)*** | | | 0.065 (0.009)*** | | | | -0.039 (0.005)** | | |
| 27 | Kyrgyzstan | 0.153 (0.053)** | | | 0.080 (0.004)*** | | | | | 0.001 (0.014) | | -0.004 (0.001)** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | Lebanon | 0.600 (0.012)*** | | | 0.063 (0.001)*** | | | | -0.028 (0.0002)*** | | | 0.024 (0.0002)*** | | |
| 29 | Libya | | -0.183 (0.023)** | | 0.463 (0.028)*** | | | 0.035 (0.011)** | | | | 0.041 (0.009)** | | |
| 30 | Malaysia | 0.069 (0.016)** | | | 0.049 (0.018)* | | | 0.053 (0.003)*** | | | | | -0.061 (0.001)*** | |
| 31 | Maldives | | | -0.063 (0.044) | | -0.058 (0.002)*** | | 0.014 (0.001)*** | | | | | -0.010 (0.001)*** | |
| 32 | Mali | | -0.412 (0.042)*** | | 0.169 (0.004)*** | | | | -0.078 (0.001)*** | | | 0.056 (0.002)*** | | |
| 33 | Mauritania | | | 0.057 (0.046) | | -0.167 (0.013)*** | | | -0.122 (0.015)*** | | | 0.016 (0.001)*** | | |
| 34 | Morocco | | | 0.026 (0.040) | 0.114 (0.015)*** | | | 0.025 (0.001)*** | | | | | -0.042 (0.002)*** | |
| 35 | Mozambique | | | -0.104 (0.051) | 0.198 (0.005)*** | | | 0.033 (0.003)*** | | | | 0.085 (0.002)*** | | |
| 36 | Niger | | | 0.0211 (0.052) | | -0.138 (0.014)*** | | | | 0.001 (0.0004) | | | -0.079 (0.008)*** | |
| 37 | Nigeria | | -0.392 (0.05)*** | | 0.153 (0.004)*** | | | | -0.055 (0.002)*** | | | 0.035 (0.003)*** | | |
| 38 | Oman | 0.386 (0.22)*** | | | | -0.034 (0.006)** | | 0.125 (0.006)*** | | | | 0.065 (0.002)*** | | |
| 39 | Pakistan | 0.212 (0.044)** | | | | -0.039 (0.012)** | | | -0.025 (0.001)*** | | | | -0.012 (0.001)*** | |
| 40 | Palestine | 0.289 (0.041)** | | | | -0.043 (0.002)*** | | | -0.045 (0.001)*** | | | 0.001 (0.0002)*** | | |
| 41 | Qatar | 0.626 (0.029)*** | | | 0.045 (0.023)** | | | 0.053 (0.008)** | | | | 0.019 (0.0004)*** | | |
| 42 | Saudi Arabia | | -0.113 (0.039)* | | 0.064 (0.002)*** | | | | -0.205 (0.009)*** | | | 0.017 (0.0002)*** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | Senegal | 0.291 (0.107)** | | | | -0.108 (0.009)*** | | | | 0.021 (0.012) | | 0.017 (0.004)** | | | | | | |
| 44 | Sierra Leone | | | 0.011 (0.029) | | 0.067 (0.009)** | | | 0.180 (0.008)*** | | | 0.027 (0.001)*** | | | | | | |
| 45 | Sudan | 0.199 (0.035)** | | | | 0.062 (0.014)** | | | | -0.050 (0.002)*** | | 0.156 (0.005)*** | | | | | | |
| 46 | Suriname | 0.259 (0.039)** | | | | 0.025 (0.003)*** | | | | -0.031 (0.001)*** | | 0.085 (0.002)*** | | | | | | |
| 47 | Syria Arab Republic | | | 0.017 (0.021) | | -0.158 (0.014)*** | | | | -0.054 (0.002)*** | | | | | | | | -0.024 (0.002) |
| 48 | Tajikistan | 0.363 (0.038)*** | | | | | | 0.006 (0.001) | | | -0.019 (0.016) | | | -0.097 (0.006)*** | | | | |
| 49 | Togo | 0.390 (0.049)*** | | | | -0.120 (0.003)*** | | | 0.068 (0.004)*** | | | 0.012 (0.003)** | | | | | | |
| 50 | Tunisia | | | 0.053 (0.032) | | 0.111 (0.007)*** | | | 0.097 (0.006)*** | | | | | -0.015 (0.0002)*** | | | | |
| 51 | Turkey | | -0.167 (0.038)** | | | 0.423 (0.023)*** | | | 0.029 (0.006)** | | | | | -0.025 (0.001)*** | | | | |
| 52 | Turkmenistan | 0.363 (0.054)** | | | | 0.122 (0.008)*** | | | 0.018 (0.002)*** | | | 0.023 (0.0004)*** | | | | | | |
| 53 | Uganda | 0.276 (0.033)*** | | | | -0.047 (0.002)*** | | | | -0.012 (0.001)*** | | 0.020 (0.0002)*** | | | | | | |
| 54 | UAE | 0.286 (0.053)** | | | | 0.002 (0.006)** | | | 0.031 (0.001)*** | | | 0.0002 (0.041)** | | | | | | |
| 55 | Uzbekistan | 0.529 (0.031)*** | | | | -0.068 (0.020)** | | | | -0.015 (0.001)*** | | | | -0.007 (0.0004)*** | | | | |
| 56 | Yemen | | | -0.109 (0.001) | | -0.015 (0.004)** | | | | | 0.012 (0.013) | | | -0.014 (0.0002)*** | | | | |

Note: The results show the coefficients, and in parenthesis (.) the standard deviation. The lag structure is ARDL (2, 1, 1, 1). The signs *, ** and *** indicate significance at the 1%, 5% and 10% levels

## Conclusion and Policy Implication

The current study demonstrated that, in the long run, the healthcare expenditure per capita, total government education expenditure and technology is positive and statistically significant. This infers that an increasing healthcare per capita will determine more economic growth in OIC regions. Besides, the finding of the study discloses that, the total government education expenditure submits that a rise in education expenditure is associated to an increase in expected economic growth in OIC countries in the long run. On the other hand, a growing research and development in technology motivated further economic growth in OIC regions in the long run. Once more, the findings displayed that, a robust and sturdy long-run co-integrating relationship occurred between healthcare expenditure, education expenditure, research and development (technology), and the economic growths of OIC countries. Further, the short-run results indicates that, healthcare expenditure per capita was positive and significantly related to the economic growth of OIC countries. Although, the education expenditure and research and development (technology) were insignificantly related to the economic growth of OIC countries in the short-run.

Generally, the conclusions of the study suggest that, on average, the economic growth of OIC countries is expected to observe growth in the short-run. In addition, an increase in healthcare expenditure per capita in the short-run will increase economic growth of OIC regions, whereas a slight change in education and technology has no influence on the economic growth of OIC countries in the short-run and this prompt for further improvement of the sectors. In view of this, the submission of the findings implies that a well-coordinated healthcare and education plays a stakeholder role in attaining robust economic growth in OIC regions. The current study shows that an easily accessible and affordable healthcare and education is a platform to improve the quality of life and status of the population of OIC member states. Also, OIC governments should take it upon themselves to heavily support research findings and innovations in both healthcare and educational institutions for effective contributions to the economic growth of the region. Similarly, policy structures should be readdressed by boosting the allocation entitled to the healthcare and education subdivisions in yearly financial plans. At the same time, the stakeholders in both divisions should be brought together to proffer the best way of appropriating funds to healthcare and education sectors to improve the economic growth and development of the region. Lastly,

future study could further magnify this research by observing the performance of healthcare and education in OIC region with other economic regions.

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