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Article

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Healthcare Expenditures Channel of Natural Resource Curse: The Case of Gulf Cooperation Council Countries

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ABSTRACT

The fact that the increase in natural resource revenues is not adequately transferred to human capital investments is one of the main reasons for explaining the weak economic growth performance. The findings of numerous studies investigating the relationship between healthcare expenditures and natural resource abundance in natural resource-rich countries confirm this assertion. These findings can be considered as a source of information in the process of determining the policies regarding human capital investments to be implemented in natural resource-rich countries. The aim of this study is to investigate the relationship between the abundance of natural resources and health expenditures by using data from 2000 to 2016 for Gulf Cooperation Council (GCC) member countries consisting of United Arab Emirates, Bahrain, Qatar, Kuwait, Saudi Arabia and Oman. The empirical results indicated that there is no causal relationship between the variables of GCC countries except Bahrain and UAE. This result shows that the resource curse hypothesis is partially valid. Therefore, GCC countries aiming to increase their economic growth performances by implementing a diversification strategy in production should allocate more sources to health expenditures in order to increase their labor efficiency.

Keywords: Healthcare Expenditures, Natural Resource, Gulf Cooperation Council Member Countries
JEL Classifications: H51, N55, J24

1. INTRODUCTION

One of the most important determinations of the researchers studying in the field of growth economics regarding the natural resource-rich countries is that the income obtained from natural resources and the large-scale oil and natural gas resources do not always have positive results in economic growth performance. On the contrary, in many countries having rich oil reserves, autocratic governments are in charge; government institutions do not work effectively; and problems like civil conflicts trigger political and social chaos. As a result, in natural resource-rich countries driven by global capital, the natural resource curse hypothesis is valid. According to this hypothesis, natural resource abundance affects economic growth in negatively (Wigley, 2017. p. 143). There is an extensive literature on natural resource curse hypothesis. Studies of Auty (1994) and Sachs and Warner (1995 and 1997[1]) are the pioneer studies that inspired similar researches.

Political and social problems in natural resource-rich countries, as well as the lack of sufficient sources for health expenditures to strengthen human capital, are the most important reasons for inadequate economic growth performance.

Despite the abundance of natural resources, qualitative and quantitative insufficiency of health, which is one of the sub-components of human capital, negatively affects economic growth

1 In this study, while analyzing the slowness of economic growth in the countries included in the study, the authors also highlighted the decisive role of low life expectancy which is one of the main indicators of health, as a fundamental structural problem.

performance, and can be explained by the concept of healthcare channel of natural resource curse.

Despite having natural resource abundance and great amount of public revenue, in resource-rich countries there is not enough sensitivity on improvement of health investments or not enough allocation on health expenditures. Moore (2014) stated that, this contradiction stems from the political pathologies.

Some of these pathologies are as follows: Firstly, oil is one of the strategic commodities in the global scale. Developed countries are particularly sensitive about the security of supply of oil, which is one of the main inputs of production. Developed countries keep the natural resource abundant areas under political and military pressure. Political leaders of natural resource-rich countries, instead of taking responsibility of their own citizens, focus on the military and political support of the global powers to maintain the current regime.

The fact that the governments are not dependent on the financial support of their citizens makes them not worry about increasing public expenditures on human capital such as health or education. Secondly, in democratic regimes, the main income source of government is taxes. Individuals may consider involving in politics as a right to check whether this source of income is being used effectively. Neverthless, in some natural resource-rich countries, government revenues rely on natural resource revenues rather than direct taxes, which discourages individuals' aspirations to enter politics to involve the process of using tax revenues by political powers. Thirdly, in developing natural resource-rich countries, public revenues are largely driven by a few foreign oil companies and public-run natural resource companies. In that context, public incomes and expenditures cannot be transparent (Moore, 2004. p. 306-308). In another study, Moore stated that contrary to developed countries, in less-developed regions, unearned income sources are shown as bases of revenue rather than tax incomes. In underdeveloped countries whose economies are predominantly based on unearned income sources, which are expressed as income from natural resources or development aids, a culture of negotiation in accordance with democratic processes on public expenditure and public revenues has not developed (Moore, 2001. p. 389). Hong (2018) argues that, despite the abundance of natural resources, the lack of adequate investments on health is related to opportunity that natural resources provide authoritarian leaders with the possibility of production uncorrelated with labor force. The lack of sufficient resources for public expenditures in natural resource-rich countries can be explained by the problem of social rigidity. Especially in natural resource-rich countries, industry leaders in natural resources use their high income to expand their political influence. High-income groups can act to maximize their personal interests by ignoring the whole community, and they can make legal arrangements parallel to rent seeking initiatives and ensure that policies prior to their sectors are implemented. Such attempts lead to a reduction in public expenditures which are critical for improving human capital power, such as health (Zhuang and Zhang, 2016. p. 4).

The relationship between the natural resources abundance and health can be put forth by examining the relationship between the income of natural resource-rich countries and the health indicators. Healthcare performance of resource-rich countries can be evaluated by looking at indicators such as infant and child mortality, average life expectancy, public and private health expenditures. The main reason for the scope of the research consists of Gulf Cooperation Council (GCC) countries is that these countries are oil-rich countries except Bahrain, oil exports have a high share in total exports and public revenues are mainly based on oil revenues. Besides, as Selim and Zaki (2014. p. 3) point out, in these countries where growth performance is directly affected by volatility in natural resource prices and there are not enough initiatives to develop other sectors other than oil, natural resource revenues are used mainly for the legitimacy of power and the stability of the regime.

Empirical investigation of insufficient allocation of resources in areas like healthcare that improves human capital power will provide a scientific basis for these determinations.

The second important point in the study is the preference of health expenditures indicator in the investigation of the relationship between the abundance of natural resources and health.

For the analysis, health expenditure data were used because of the availability of data and because this is the variable that directly reflecting natural resource revenues. It is noteworthy that it is a legal obligation in Saudi Arabia and the other GCC countries to provide free health care to citizens. Compared to other high-income countries, the percentage of public health expenditures to total health expenditures is relatively high in GCC countries. On average, the share of public health expenditures in health expenditures in GCC countries is 72.5%, while in other high income countries it is 62.2%. In the GCC countries, the health care financing system is in the process of development, and health care is financed by revenues from natural resources such as oil. In some countries, other sources of income are being used for healthcare financing, but these sources still remain at very low levels (Alkhamis et al, 2014. p. 70, 72 and 79). In this study, the relationship between the increase in oil revenues and the health expenditures was analyzed by considering financing healthcare expenditures with natural resource revenues.

The relationship between the variables was investigated by panel causality test because of its advantages expressed in the econometric model part. Based on the findings of the study, we concluded that resource curse hypothesis is partially valid. The main difference of this study from similar studies is that, to the best of our knowledge, this is the first study to examine the relationship between the increase in oil revenues and health expenditures in the preferred period for GCC countries. In the first part, the literature research, in the second part, econometric model and in the third part, the scope of the study and the analysis results are explained.

2. LITERATURE REVIEW

The importance of investigating the impact of resource abundance on human capital investments such as education and health in natural resource-rich countries is that human capital is one of the main determinants of long-term economic growth. Countries that allocate sufficient sources for human capital investments will achieve high economic growth performance. Raheem et al. (2018), using data from 18 Sub-Saharan African countries for the period 1995-2013, investigated the impact of healthcare and education expenditures on economic growth as well as the positive results of investing natural resource revenues on education and health which are considered as the human capital development indicators of natural resource revenues. It was concluded that public expenditures on education and health have a positive impact on economic growth. Besides, increasing public health expenditures led per capita GDP growth by more than 3.1%. These results pointed the necessity and priority of allocating more share of natural resource income on health.

In the human capital literature, there are not many studies investigating the relationship between the abundance of natural resources and health expenditures or the relationships between other health related indicators. In studies examining the effects of natural resources on human capital investments, natural resource abundance or natural resource dependence variable is mostly used. In his study that was investigated the relationship between natural resource and human development indicators, Daniele (2011. p. 567) explained that while the degree of dependence on natural resources would be measured by the share of mine and fuel in total export, natural resource abundance could be measured by the share of per capita and per square kilometer of underground assets.

The theme of this study is to investigate the extent to which natural resource revenues are transferred to health expenditures and to investigate the relationship between oil revenues and health expenditures. No matter natural resource abundance or natural resource dependence is taken as an indicator in researches; natural resource is the key variable in both cases. Natural resource dependence is heavily increased by the abundance of natural resources. Therefore, in this paper, regardless of resource abundance or resource dependence, the causal relationship between the increase in oil revenues and health expenditures, was investigated. The findings of similar studies are summarized below, as they also show the relationship between these variables.

Cockx and Francken (2014) investigated the impact of natural resource wealth on public health expenditures by using the data from a number of countries with different levels of development for the period 1995-2009. The test results showed that there is a strong reverse causality relationship between the natural resource abundance and natural resource dependence and public health expenditures. Cockx and Francken (2015) conducted a similar study for the Middle East and North Africa (MENA) region. The authors tested the data of the countries in this region for the period 1995-2009 and found a significant reverse causality relationship between health expenditure and natural resource dependence which is measured as the share of natural resource wealth in total wealth and health expenditure.

Also, in many studies it was stated that the increase in degree of dependence on oil wealth in MENA countries increased the effect of natural resource curse. Zhan et al. (2015), using the data of China's 31 provinces for the period 1999-2009, investigated whether natural resources caused natural resource curse for human capital development. In the regions which have high natural resource dependence, local authorities spend less on education or health that have positive effects on human capital. In the study, it is emphasized that in natural resource-rich regions, citizens and government authorities show myopic behaviors that ignore human capital development. Zhuang and Zhang (2016) investigated the relationship between the abundance of natural resources and healthcare services in the Shanxi region of China. Empirical results showed that coal-rich local governments allocate more sources to administrative expenditures and spend less for health services. In this study, it is also stated that human capital investments are neglected due to political myopia and natural resource curse hypothesis is valid. Wigley (2017) compared the performance of oil-rich countries and oil-poor countries in improving child health services. The researcher tested the data of 167 countries for the period 1961-2011 and found that oil poor countries showed a better performance than oil-rich countries in reducing the mortality of children under 5 years of age. Chang and Wei (2019) examined the impact of natural resources on malaria using the data from 107 countries for the period 2000-2014. According to the empirical results, natural resources abundance is positively related to the high number of deaths and illnesses resulting from malaria. Likewise, in countries whose national wealth is based on natural resources, the natural resources abundance is negatively related to HIV/AIDS, infant mortality and health expenditures. Hong (2018) investigated the impact of the abundance of natural resources on public services by using data from 288 provinces of China for the period 1992 to 2010. It was concluded that the abundance of mines (coal and oil production) caused local administrations to provide less education and health services. In this study, it is emphasized that oil and coal production negatively affects public services that contribute to the development of human capital. Madreimov and Li (2019) examined the relationship between natural resources and life expectancy as an indicator of quality of life, using data from 67 countries for the period 1990 to 2011. The authors found a U-shaped relationship between natural resource dependence and life expectancy. Empirical results of the study showed that natural resource dependence has a positive effect on life expectancy in the short term. However, this effect reverses in the long term. In the long term, natural resource dependence adversely affects human development. Gearhart and Michieka (2019) investigated the validity of the natural resource curse hypothesis by examining the impact of natural resource abundance on health efficiency in Appalachia, one of the poorest regions in the US but having abundant natural resources such as coal, natural gas and oil. The data of the region were tested for the period 2012-2016 and it was found that natural resource production worsened the health efficiency and thus the natural resources curse emerged. Negative results are due to employment in the natural resource sector and air and water pollution. According to the results, policy makers should implement the improvement strategies in education; besides, there must be wise policies to reduce alcohol, smoking and obesity to improve public health.

There are also studies that searched a positive or multiple relationships between the natural resources abundance, health expenditures and health outcomes. Anshasy and Katsaiti (2015) investigated the impact of economic dependence on different natural resources on health expenditures and health outcomes using the data from 118 countries for the period 1990 to 2008. Countries were divided into four groups based on resource type and resource density. The empirical findings are as follows:

- The level of health expenditures is increasing in countries with high mineral resource density. However, there is no significant relationship between natural resource density and health outcomes
- Diabetes and obesity rates remain low if more hydrocarbon resource revenue is generated in energy-dependent economies (based on oil, natural gas and coal revenues). However, especially in countries where there is no democracy regime, the share of public health expenditures decreases as the economy grows due to the increase the intensity of hydrocarbon sources.

Cotet and Tsui (2013) investigated the relationship between oil and growth, and oil wealth and health improvement indicators, using worldwide data on the discovery and production of oil. In the study, it was found that the natural resource curse hypothesis is not valid. The results show that there is a positive relationship between oil abundance and long-term growth. Besides, even with low level of institutional development, high oil revenues do not weaken economic growth performance. Furthermore, there is a positive trend in life expectancy and infant mortality rates in oil-rich countries. By comparison, people in oil-rich countries benefit more from healthcare improvements. It is also emphasized that in nondemocratic countries, the recovery tendencies in the health systems which are financed by oil was higher.

3. ECONOMETRIC FRAMEWORK

Consideration of possible cross-sectional dependence among countries is important when using panel causality tests. Because the oil rents for GCC countries rely on global oil prices and fluctuations in global oil prices affect the entire GCC countries in a similar way, cross-sectional dependence is expected among those countries. Pesaran (2006) stated that there would be a significant bias and size distortions in the testing methods when cross-sectional dependence is neglected and that testing cross-sectional dependence was an important issue in panel data analysis.

Lagrange multipliers (LM) test, developed by Breusch and Pagan (1980), is frequently used in the literature to determine cross-sectional dependence. Pesaran (2004) suggests a cross-section dependency (CD) test and states that this test can be used when both $T\to\infty$ and $N\to\infty$. Also, Pesaran et al. (2008) state that power of the CD test considerably decreases when the population average pairwise correlations are zero. In this context, Pesaran et al. (2008) suggested a bias adjusted LM test statistic where the exact means and variance of the LM test statistic are used (LM_{adj}). They stated that the adjusted test statistic follows asymptotically normal distribution. The null hypothesis for each of the three tests indicates the presence of cross-sectional dependence, and hence the rejection of the null hypothesis suggests the lack of cross-sectional dependence in the panel. We employ all three tests in order to find out whether there is cross-sectional dependence.

The second issue when conducting a panel causality test is to determine whether slope coefficients are homogenous in each cross-section. Granger (2003) stated that imposing the joint zero restriction to test causality relationship in panel dimension leads to strenghten the null hypothesis. Breitung (2005) stated that heterogeneity that resulted from country-specific reasons cannot be determined when assuming homogeneity for parameters.

Swamy (1970) suggested a test for the homogeneity of the slope parameter when testing the dispersion of slope coefficients. The test is called as $\tilde{\Delta}$ test in the literature. Also, the test statistic suggested by Swamy (1970) requires a panel data in which N is small relatively T. Pesaran and Yamagata (2008) developed the standardized version of the test developed by Swamy for the test of homogeneity of slope coefficients in large panel. Test statistics developed by Pesaran and Yamagata (2008) is called as $\tilde{\Delta}_{adj}$. The null hypothesis of both $\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$ tests is that slope coefficients are homogeneous. Therefore, the rejection of the null hypothesis indicates heterogeneity in the slope coefficients.

When there is a cross-sectional dependence and the slope coefficients are heterogeneous, the panel causality test proposed by Kónya (2006) is the most appropriate. Because when applying the Konya panel causality test, the seemingly unrelated regression (SUR) model is taken into consideration and it is well known that SUR model provides unbiased estimator in the case of cross-sectional dependence. Additionally, since the Konya panel causality test provides test results for each cross-section separately it enables slope coefficients to be heterogeneous.

Moreover, the panel causality test developed by Kónya (2006) is more advantageous when compared to the conventional causality test. First, when there is a contemporaneous correlation among the countries in the panel, the estimates that are obtained from the vector autoregressive (VAR) model results will be inefficient because the estimates of VAR model are obtained by using the ordinary least squares (OLS) method. Therefore, Kónya (2006) stated that the equation system should be defined as the SUR model instead of VAR model to overcome this problem when causality relationship is examined. It is stated that cross-sectional contemporaneous correlation is taken into consideration in the SUR system and the SUR model provides more efficient estimates than the VAR model. Second, panel causality test is carried out by imposing zero restriction to the lagged coefficients and critical values are obtained using the bootstrap method. In this context, the test does not require investigation the stationarity of variables and also cointegration relationship for non-stationary variables. Finally, since causality relationship can be investigated in cross-section dimension separately, the causality relationship for each of the cross section can be interpreted.

In order to investigate the country-based Granger causality relationship between natural resource rents (NR) and health expenditures (HE), initially, the following two-variable VAR model should be estimated:

$$HE_{i,t} = \alpha_{1,i} + \sum_{l=1}^{mlHE_i} \beta_{1,i,l} HE_{i,t-1} + \sum_{l=1}^{mlNR_i} \gamma_{1,i,l} NR_{i,t-1} + \varepsilon_{1,i,t}$$

$$NR_{i,t} = \alpha_{2,i} + \sum_{l=1}^{mlHE_i} \beta_{2,i,l} HE_{i,t-1} + \sum_{l=1}^{mlNR_i} \gamma_{2,i,l} NR_{i,t-1} + \varepsilon_{2,i,t} \quad (1)$$

In equation (1), i denotes countries, t denotes time dimension and l denotes lags of the variables. $\varepsilon_{1,i,t}$ and $\varepsilon_{2,i,t}$ are assumed to be white noise and there might be a relationship for any of the countries, but it is assumed to be unrelated for all countries. Also, HE_t and NR_t are assumed to be stationary or cointegrated and thus, level or first differences of the variables are used depending on the characteristics of the series while investigating a causal relationship.

In this context, in order to say that there is a one way causality relationship from *NR* to *HE,* all $\gamma_{1,i}$ in the first equation should be statistically different from zero, and all $\beta_{2,i}$ in the second equation should be statistically zero. When all $\beta_{2,i}$ in the second equation are statistically different from zero, and all $\gamma_{1,i}$ in the first equation are statistically zero, it can be said that there is a one way causality relationship from *HE to NR*. The presence of bidirectional causality relationship between *NR* and *HE* suggest that all $\gamma_{1,i}$' in the first equation and all $\beta_{2,i}$' in the second equation are statistically different from zero. However, when all $\gamma_{1,i}$' in the first equation and all $\beta_{2,i}$' in the second equation are statistically equal to zero, there is no causality relationship between *NR* and *HE*.

Since two different models are required to be estimated in order to investigate a causality relationship between two variables for a country, an equation amounting to 2N should be estimated to investigate a causality relationship within the context of equation (1). If we divide the equation system in equation (1) into two groups, the first group can be designed to show the equations for *HE* and the second group can be designed to show the equation for *NR*. In other words, instead of *N* number of the VAR system, we can consider the two-equation system as follows:

$$HE_{1,t} = \alpha_{1,1} + \sum_{l=1}^{mlHE_1} \beta_{1,1,l} HE_{1,t-1} + \sum_{l=1}^{mlNR_1} \gamma_{1,1,l} NR_{1,t-1} + \varepsilon_{1,1,t}$$

$$HE_{2,t} = \alpha_{1,2} + \sum_{l=1}^{mlHE_1} \beta_{1,2,l} HE_{2,t-1} + \sum_{l=1}^{mlNR_1} \gamma_{1,2,l} NR_{2,t-1} + \varepsilon_{1,2,t}$$

$$\vdots$$

$$HE_{N,t} = \alpha_{1,N} + \sum_{l=1}^{mlHE_1} \beta_{1,N,l} HE_{N,t-1} + \sum_{l=1}^{mlNR_1} \gamma_{1,N,l} NR_{N,t-1} + \varepsilon_{1,N,t} \quad (2)$$

$$NR_{1,t} = \alpha_{2,1} + \sum_{l=1}^{mlHE_i} \beta_{2,1,l} HE_{1,t-1} + \sum_{l=1}^{mlNR_i} \gamma_{2,1,l} NR_{1,t-1} + \varepsilon_{2,1,t}$$

$$NR_{2,t} = \alpha_{2,2} + \sum_{l=1}^{mlHE_i} \beta_{2,2,l} HE_{1,t-1} + \sum_{l=1}^{mlNR_i} \gamma_{2,2,l} NR_{1,t-1} + \varepsilon_{2,2,t}$$

$$\vdots$$

$$NR_{N,t} = \alpha_{2,N} + \sum_{l=1}^{mlHE_i} \beta_{2,N,l} HE_{1,t-1} + \sum_{l=1}^{mlNR_i} \gamma_{2,N,l} NR_{1,t-1} + \varepsilon_{2,N,t} \quad (3)$$

When compared to equation (1), this alternative formulation is seen to have two important characteristics. First, each equation in equation (2) and equation (3) might have different pre-determined variables. In case that there is a link between each regression equation, there will be contemporaneous correlation within the system. Therefore, these equation systems are defined as SUR model instead of VAR model. Second, since country-based bootstrap method will be used to obtain critical values, there is no need for *HE* and *NR* to be stationary. In other words, when investigating the causality relationship between the variables, there is no need to investigate the stationary or cointegration relationship of the series since critical values obtained by using bootstrap method.

According to the SUR equation system, in order to determine the causality relationship running from *NR* to *HE*, all $\gamma_{1,i}$ in equation (2) should be statistically different from zero, and all $\beta_{2,i}$ in equation (3) should be statistically equal to zero. When all $\beta_{2,i}$ in equation (3) are statistically different from zero, and all $\gamma_{1,i}$ in equation (2) are statistically zero, there is a one way causality relationship from *HE to NR*. The presence of bidirectional causality relationship between *NR* and *HE* suggest that all $\gamma_{1,i}$' in equation (2) and all $\beta_{2,i}$' in equation (3) are statistically different from zero. When all $\gamma_{1,i}$ and all $\beta_{2,i}$ in equation (2) and equation (3) are statistically equal to zero, it is said that there is no causality relationship between *NR* and *HE*.

The most appropriate estimation method for equation (2) and equation (3) changes depending on the characteristics of the error terms. When there is no contemporaneous correlation among the countries, each equation can be considered as a classic regression model. In such a case, each of the equations can be estimated using OLS method, and OLS method provides the best unbiased linear estimators. On the other hand, when there is a contemporaneous correlation among the countries, the OLS estimators will lose their efficiency. In this case, equation (2) and equation (3) should be estimated by using the generalized LS method or the maximum likelihood method. Kónya (2006) suggested the use of SUR estimators, developed by Zellner (1962), when there is a contemporaneous relationship among the countries.

Kónya (2006) suggested a bootstrap method to obtain critical values for the test statistic. Bootstrap method is a simple resampling method. The following steps should be followed in order to obtain critical values based on bootstrap:

Step 1: Under the null hypothesis stating that there is no causal relationship from *NR* to *HE,* Equation (2) is estimated and residuals are obtained as follows:

$$e_{H_0,i,t} = HE_{i,t} - \hat{\alpha}_{1,i} - \sum_{l=1}^{mlHE_1} \hat{\beta}_{1,i,l} HE_{1,t-1} \qquad i = 1, \ldots, N \text{ and } t = 1, \ldots, T \quad (4)$$

Step 2: Residuals obtained in the first step are resampled. In order to be able to consider the contemporaneous cross-correlations in residuals, resampling of residuals is carried out by considering the residuals of the entire countries instead of each country. Bootstrap residuals are called as $e^*_{H0,i,t}$.

Step 3: Under the assumption that there is no causality from *NR to HE,* bootstrap sample of *HE* is calculated with the formula given below:

$$HE^{*}_{i,t} = \hat{\alpha}_{1,i} - \sum_{l=1}^{mlHE_1} \hat{\beta}_{1,i,l} HE^{*}_{1,t-1} + e^{*}_{H_0,i,t} \qquad t = 1,\ldots,T^{*} \tag{5}$$

Step 4: Considering the values of $HE^*_{i,t}$ values instead $HE_{i,t}$ values and in order to test the null hypothesis stating that there is no causality for each of the country without putting any restrictions, the Wald test is calculated.

Step 5: Step 2 and 4 are iterated many times and empirical distribution is developed for Wald test statistics and bootstrap critical values are obtained based on the percentages selected from the sample distribution.

We also examine the dynamic relationship between natural resource rents and health expenditures by using the asymmetric causality test. In this context, it will be investigated whether increases or decreases in natural resource rents have an effect on health expenditures regarding positive and negative shocks. Thus, the validity of the natural resource curse hypothesis can be examined. In the study, the causality relationship between natural resource rents and health expenditures will be considered using the Kónya (2006) panel causality test, but positive and negative shocks series will be determined using an approach developed by Hatemi (2012). Before determining the asymmetric causality relationship between *NR* and *HE,* positive and negative shocks for the variables are obtained as follows:

$$HE_t = HE_{t-1} + \varepsilon_{HE_t} = HE_0 + \sum_{i-1}^{t} \varepsilon_{HEi} \tag{6}$$

$$NR_t = NR_{t-1} + \varepsilon_{NRt} = NR_0 + \sum_{i-1}^{t} \varepsilon_{NRi} \tag{7}$$

where $t = 1,2,\ldots,T$, constant terms HE_0 and NR_0 denote initial values and ε_{SHi} and ε_{DKGi} denote white noise residuals. Positive and negative shocks are defined as follows respectively:

$$\begin{aligned} \varepsilon^{+}_{HEi} &= \text{mak}\left(\varepsilon_{HEi},0\right), \varepsilon^{+}_{NRi} = \text{mak}\left(\varepsilon_{NRi},0\right), \\ \varepsilon^{-}_{HEi} &= \min\left(\varepsilon_{HEi},0\right), \varepsilon^{-}_{NRi} = \min\left(\varepsilon_{NRi},0\right) \end{aligned} \tag{8}$$

where $\varepsilon_{HEi} = \varepsilon^{+}_{HEi} + \varepsilon^{-}_{HEi}$ and $\varepsilon_{NRi} = \varepsilon^{+}_{NRi} + \varepsilon^{-}_{NRi}$. Based on this,

$$HE_t = HE_{t-1} + \varepsilon_{HEt} = HE_0 + \sum_{i-1}^{t} \varepsilon^{+}_{HEt} + \sum_{i-1}^{t} \varepsilon^{-}_{HEt} \tag{9}$$

$$NR_t = NR_{t-1} + \varepsilon_{NRt} = NR_0 + \sum_{i-1}^{t} \varepsilon^{+}_{NRt} + \sum_{i-1}^{t} \varepsilon^{-}_{NRt} \tag{10}$$

Finally, positive and negative shocks of each variable can be defined cumulatively: $HE^{+}_t = \sum_{i-1}^{t} \varepsilon^{+}_{HEt}$, $HE^{-}_t = \sum_{i-1}^{t} \varepsilon^{-}_{HEt}$, $NR^{+}_t = \sum_{i-1}^{t} \varepsilon^{+}_{NRt}$ and $NR^{-}_t = \sum_{i-1}^{t} \varepsilon^{-}_{NRt}$.

Here, it should be considered that each positive and negative shock has a permanent effect on the reference variable. The next step is to test the causality relationship between these variables. To obtain the causality relationship between positive and negative shocks, equation (2) and equation (3) are estimated for those variables and the Konya panel causality test is employed.

4. EMPIRICAL RESULTS

The purpose of the study is to investigate the causality relationship between natural resource rents and health expenditures for the (GCC Countries), consisting of the United Arab Emirates, Bahrain, Qatar, Kuwait, Saudi Arabia and Oman. The main reason for selecting the GCC countries as the sample of the study is that economies of those countries rely on oil, they are oil exporters and their oil rents have an important part in public revenues.

Oil rents are generally considered in the empirical literature to represent natural resources abundance. For example, Hong (2017) used oil rents as a measure of natural resource abundance and he indicated that it is a suitable indicator to measure resource abundance of a country. We consider the oil rents to GDP ratio for the natural resource abundance in this study. In addition, the share of oil rents in GDP shows the real dimension in the economy.

Education and health variables are taken into consideration to measure the effects of natural resource abundance on human capital. Because focus is given to education which is one of the elements of human capital, the ratio of public health expenditures in GDP is considered as an indicator of health. The reason for considering government health expenditures is that, as mentioned before, the ratio of government health expenditures in GCC countries in total health expenditures exceeds 70%.

Annual data for the period of 2000-2016 is used to investigate the causality relationship between the variables. All variables are obtained from the World Bank World Development Indicators database. The beginning of the sample period is determined as 2000 because the data on government health expenditures for the selected countries could not be obtained before 2000. In this context, we have panel data consists of 6 countries and 17 year periods and total observation is 102.

Descriptive statistics for the variables are provided in Table 1. According to the data in Table 1, it is found out that the share of government health expenditures in GDP for GCC countries does not exceed 5% and that average health expenditures are determined between 1.7% and 2.9%. When considered in terms of both average health expenditures and maximum health expenditures, it is seen that the country which allocates the biggest share of health expenditures in GDP is Saudi Arabia, and the country with the least share is Qatar. When the ratio of oil rents in GDP is considered, it is seen that this ratio is quite high for the countries except for Bahrain and that the ratio of oil rents in GDP for Kuwait has increased to 61%. At the same time, while the average share of oil rents in GDP for Kuwait has been measured as 48%, this ratio for Bahrain is determined to be 2.5%. The statistics in Table 1 clearly shows

Table 1: Descriptive statistics

	Health expenditures/GDP (%)					
	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
Mean	2.503	2.420	2.490	1.749	2.908	2.082
Median	2.462	2.256	2.430	1.546	2.788	1.913
Maximum	3.228	3.377	3.850	2.648	4.107	2.984
Minimum	2.111	1.512	1.586	1.177	1.889	1.319
Std. Dev.	0.326	0.591	0.620	0.510	0.585	0.574
Skewness	0.671	0.293	1.053	0.626	0.543	0.030
Kurtosis	2.548	1.940	3.491	2.004	2.741	1.407
	Oil rents/GDP (%)					
Mean	3.597	48.268	36.646	28.700	40.598	21.132
Median	3.651	49.205	37.768	30.797	42.525	21.689
Maximum	5.047	61.231	46.199	38.880	54.260	28.790
Minimum	1.811	31.640	18.157	11.732	19.434	10.828
Std. Dev.	0.861	9.357	7.707	7.449	9.710	5.432
Skewness	−0.221	−0.272	−1.102	−0.928	−0.683	−0.310
Kurtosis	2.458	1.807	3.678	3.407	2.736	2.049

that all the countries except Bahrain are rich in natural resources in terms of their oil rents.

In order to determine whether there is cross-sectional dependence across the members of panel, three different tests (LM, CD and LM_{adj}) have been applied and the results are provided in Table 2. The results in Table 2 suggest that the null hypothesis of no cross-sectional dependence can be rejected at 1% significance level according to the three tests and it has been concluded that there is cross-sectional dependence. This result is consistent with the theoretical expectations because oil rents are determined based on the global oil prices and changes in global oil prices affect the oil rents of the countries in the same direction and at the same time. This leads to find cross-sectional dependence across the members of panel. The presence of cross-sectional dependence shows that instead of the LS method, using the SUR method is more appropriate for model estimations. Table 2 also provides slope coefficient homogeneity test results. According to both test results, the null hypothesis of slope coefficient homogeneity has been rejected at 1% significance level. This result indicates that the slope coefficients vary across the members of panel. Therefore, it can be said that the use of Panel VAR or panel vector error correction models, which assume countries are homogenous regarding their slope coefficients, can produce biased results when conducting panel causality test. The presence of both cross-sectional dependence and heterogeneity among the members of panel shows that it will be more suitable to use the Konya panel causality test.

The results of panel causality test from oil rents to health expenditures for GCC countries are provided in Table 3. When conducting the causality test, optimal lags length have been determined according to the Akaike information criterion and in order to obtain critical values bootstrap method with 1000 time repetitions are used. According to the results provided in Table 3, the null hypothesis of oil rents are not a Granger cause of health expenditures and cannot be rejected for all the countries except for Bahrain. On the other hand, we determine the presence of causal link running from the oil rents to health expenditure at 5% significance level for Bahrain. These results indicate that there

Table 2: Cross sectional dependence and homogeneity test results

LM	55.66 [0.000]
CD	5.067 [0.000]
LM_{adj}	15.78 [0.000]
$\tilde{\Delta}$	5.266 [0.000]
$\tilde{\Delta}_{adj}$	5.768 [0.000]

The values in brackets are P-values

is not a relationship between natural resource rents and health expenditures for GCC countries except for Bahrain. This result partially confirms the validity of the resource curse hypothesis and it states that natural resource rents have no effect on health expenditures. On the other hand, a significant relationship has been found between natural resource rents and health expenditures for Bahrain. Especially when compared to the other countries in the sample, Bahrain's having the lowest oil rent makes this result more remarkable. In this context, relatively low level of natural resource rents in Bahrain and the presence of significant causality relationship between natural resource rents and health expenditures indicate that the resource curse hypothesis is not valid for Bahrain.

It is well known that the natural resource curse hypothesis puts forward that there is an inverse relationship between natural resource rents and human development indicators. According to this, a decrease in health expenditures is expected as oil rents increase, and in this case the causality relationship between the variables should be asymmetric rather than symmetric. Therefore, in order to investigate whether the resource curse hypothesis is valid for GCC countries, it is also necessary to apply asymmetric causality test. Within this framework, first, positive shock series have been calculated for oil rents and negative shock series have been computed for health expenditures. Then, we examine the existence of Granger causality from increases in oil rents to decreases in heath expenditures and the results are provided in Table 4. According to the results in Table 4, the null hypothesis stating that "an increase in oil rents is not a Granger cause of a decrease in health expenditures" is only rejected for the United Arab Emirates. This result shows that the resource curse hypothesis

Table 3: Causality relationship between oil rents and health expenditures

Country	Test statistics	%1 Critical value	%5 Critical value	%10 Critical value
Bahrain	12.498**	15.321	9.200	6.695
Kuwait	1.428	18.476	9.426	6.499
Oman	0.136	16.883	8.827	6.364
Qatar	1.743	16.079	11.005	7.651
Saudi Arabia	1.008	20.904	11.389	7.676
UAE	3.501	19.959	8.763	5.800

**causality relationship at a significance level of 5%

Table 4: Causality relationship from positive oil rents to negative health expenditures

Country	Test statistics	%1 Critical value	%5 Critical value	%10 Critical value
Bahrain	2.045	47.396	26.790	18.743
Kuwait	0.029	48.542	25.511	17.745
Oman	0.561	35.884	21.303	15.181
Qatar	2.325	40.032	22.375	16.755
Saudi Arabia	1.062	39.614	23.068	15.751
UAE	21.253**	28.359	19.937	13.826

**causality relationship at a significance level of 5%

is valid and that there is an inverse relationship between oil rents and health expenditures in the United Arab Emirates.

5. CONCLUSION AND POLICY IMPLICATIONS

The natural curse hypothesis that indicates inverse relationship between natural resources rents and human development indicators has been widely examined in the literature. In this study, we focus on GCC countries and analyzed the presence of the relationship between oil rents and health expenditure by means of panel causality test suggested by Kónya (2006).

Empirical results showed the lack of causality relationship between oil rents and health expenditures for all GCC countries except for Bahrain. The lack of causality relationship between the two variables means that the variables are not related and oil rents have no effect on health expenditures. This result shows that the resource curse hypothesis is partially valid. In order to determine the validity of the resource curse hypothesis for GCC countries, the asymmetric causality test has also been carried out. In this context, whether there is a relationship between an increase in oil rents and a decrease in health expenditures is investigated. As a result of the asymmetric panel causality test, the null hypothesis can be rejected only for the United Arab Emirates. This result confirms the validity of the natural resource curse hypothesis in the United Arab Emirates. In other words, it can be said that an increase in oil rents in the United Arab Emirates decreases health expenditures.

Bahrain is the only country among GCC countries which is not rich in natural resources. The studies in the literature find evidence in favor of the relationship between oil rents and health expenditure for the countries having low oil rents and these findings are consistent with our results for Bahrain. The lack of causality relationship among the variables for GCC countries shows that the natural resource curse hypothesis is partially valid as the rejection of the hypothesis requires the presence of causality relationship running from natural resources to health expenditure.

It is remarkable to see that an increase in oil rents in the United Arab Emirates decreases health expenditures, that is, the natural resource curse hypothesis is valid for this country. Because the most notable improvement tendencies in terms of diversification in production while reducing the oil dependence of the economy in GCC countries are seen in the UAB. Despite this partial difference, when compared to the other countries within the same group, the United Arab Emirates is not only a powerful country regarding its oil reserves but also its oil rents are substantially high. Therefore, it is not surprising to obtain findings that support the natural resource hypothesis. Despite the concrete developments towards changing the production strategy, it is seen that policy makers do not allocate enough amount of source regarding health, which is one of the basic components of human capital.

To the best our knowledge, there is no study in the literature that investigates the relationship between health expenditures and natural resource rents by using a panel causality test. The studies in the literature generally analyze the relationship between the two variables using panel regression models and focuses on the simultaneous relationship between the variables. Also, a causality analysis focuses on a dynamic relationship rather than a simultaneous relationship between the variables. Therefore, it is not possible to directly compare the results of this study to the results of those in the literature. Different results were obtained in the studies in which the relationship between natural resource rents and health expenditures was investigated. For example, Nikzadian et al. (2019) found a result similar to the one we determine for Bahrain in our study. Nikzadian et al. (2019) found a positive relationship between oil rents and health expenditures for the OPEC countries. As in Hong (2017), Cockx and Francken (2017) and Kim and Lin (2017), we find evidence in favor of natural resource curse hypothesis in the UAE. Abdel-Latif et al. (2018) did not find a significant result between oil prices and health expenditures. Hamdi and Sbia (2013) did not find a causality relationship from public revenues (a big part of the public revenues for those countries consists of natural resource rents.) to public expenditures for GCC countries.

To sum up, the empirical results for the causality relationship between oil rents and health expenditures do not mean that health expenditures in GCC countries are inadequate. This study did not investigate the level of the health expenditures in GCC countries. It investigated whether an increase in oil rents had a positive effect on health expenditures and no relationship was found between oil rents and health expenditures in most of the countries included in the analysis. The fact that "an increase in oil rents has no effect on health expenditures" means that the expectation of improvement tendencies in health increase production by increasing labor productivity is not so strong.

When the production structures of the GCC countries are considered, the most important problem is that the economies of these countries mostly rely on oil. Fluctuations in oil prices and particularly retreatment of prices cause negative effects on rents, and this has a negative effect on both growth performance and budget balances. Labor productivity is one of the main factors that determine the success of the diversification of production strategy. Increasing labor efficiency is possible. However, increasing labor efficiency come true with more sources allocation to health reforms and recovery policies, after an effective cost analysis. It may be also a wise policy to investigate the successful countries' experiences before stating the health reforms.

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