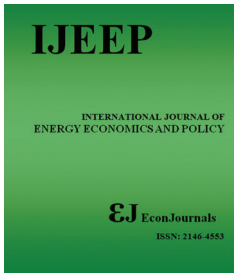

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Relationship Between Oil Revenues and Education in Gulf Cooperation Council Countries

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ABSTRACT

Education is one of the basic components of human capital. Political authorities try to increase their economic growth performances by increasing education expenditures. However, in many resource-rich countries, it is observed that the governments are not sensitive about education and that the education indicators are not very good. The aim of this study is to investigate the relationship between oil revenues and education by using the data of four oil exporting Gulf Cooperation Council member countries for the period between 2001 and 2017. The total number of students enrolled in post-secondary education, general programs, general and private high school education institutions were selected as the indicators of education. Since there was no cross sectional dependence, panel ARDL (PMG) and group mean DOLS tests that do not consider cross sectional dependence but consider heterogeneous cross-sections were used in this study. It was observed that there was a negative relationship between oil revenues and educational level for the relevant group of countries in the long term. According to this result, it was concluded that there was no strong awareness of the importance of education in the countries those are included in the analysis, and that the resources were not sufficiently transferred to the increase of human capital power.

Keywords: Oil Revenue, Education, Gulf Cooperation Council Countries
JEL Classifications: N35, P48, Q34

1. INTRODUCTION

Human capital power is the most important variable that positively affects the economic growth performance for all countries with poor or rich natural resources. The increase in human capital power has direct and indirect positive effects on economic growth. Education and health are the main determinants of human capital. Improvement in education and health increases human capital power. In the analysis of the effects of the two main components of human capital, education and health, on economic growth performance, either both variables are included in researches together, or only one of the variables is selected in order to analyze the effects of each variable separately and to make a detailed assessment. In this study, education was discussed.

There are many studies on the role of education in determining the economic growth performance. Hanushek and Ludger (2007) investigated the effects of the quality of education measured by mental abilities rather than the indicators such as schooling rate and educational status. The authors determined that the quality of education had very significant effects on individual earnings, income distribution and economic growth. Aghion et al. (2009) indicated that they supported the hypothesis that some education investments increased the economic growth. According to the results of their study, 4-year college education investments in all states in the USA increased the economic growth.

Since there are strong positive relationships between education and economic growth, developed countries, as well as developing countries aiming high and stable growth performance transfer a significant portion of their sources of funds to education. However, the fact that this trend does not apply to a significant portion of the countries with rich natural resources has been supported by many research findings. In those studies, it was indicated that there

was a relatively low economic growth performance in countries with abundance of natural resources, and even, the economic development was weak, in other words, the natural resource curse hypothesis[1] was valid, and that this problem was due to the fact that sufficient resources were not transferred for education.

Since there are many channels effective in the relationship between the abundance of natural resources and economic growth, it cannot be explained by education alone. Sala-i Martin and Subramanian stated that there were three channels explaining the relationship between the abundance of natural resources and economic growth in the literature. According to the authors, the first channel was the rent-seeking channel. The struggle to get the higher amount share from the rent provided by the abundance of natural resources leads to the functioning of the rent-seeking channel. The second one was the channel of volatility in commodity prices. Richness of natural resources refers to being open to volatility in commodity prices. The volatility of commodity prices negatively affects the economic growth. The third one was the Dutch disease channel. Since the real exchange rate will be overvalued along with the increasing demand for natural resources, in other words, with a positive shock, constriction trend will emerge in trade sectors (Sala-i-Martin and Subramanian, 2003. p. 5-6). In addition to these channels, the education channel is one of the prominent channels in explaining the negative effects of the abundance of natural resources on economic growth (Guo et al., 2016). In the studies on the countries with natural resource curse, it was indicated that the necessary sensitivity was not displayed to human capital investments in general and education in particular, the expenses related to education were insufficient, and the variables related to education such as schooling rate were weak.

Some important reasons for poor education in the countries with rich natural resources are presented below:

1. Looking after individual interests rather than public interests: In the countries with rich natural resources, the government has strong sources of income. Based on the realities of the country, the income obtained from natural resources are usually used for individual purposes with the understanding of rent-seeking rather than productive activities that will increase the economic growth performance. The abuse of natural resources leads to the recession of funding opportunities that should be transferred to the fields that will increase the economic growth performance, such as education (Rodriguez and Sachs, 1999. p. 278; Kim and Lin, 2017. p. 93).

The abundance of natural resources increases the tendency to highlight the personal interests of managers rather than public interests. This leads to the strengthening of corruption in the countries where democracy is weak. As it was also stated by Bhattacharyya and Hodler (2010), the increase in corruption due to the abundance of natural resources is a problem specific to the countries with low level of democratization, low quality and weak democratic institutions. In their study, Bhattacharyya and Hodler (2010) tested the data of 124 countries for the period between 1980 and 2004, and they determined that the abundance of natural resources increased corruption if the quality of democratic institutions fell below a certain threshold level. In the study of Bhattacharyya and Hodler (2010), it was revealed that there was insufficient sensitivity to education despite the abundance of natural resources in the countries with rich natural resources that were included in the study. On the other hand, in the study, it appeared that insensitivity to human capital investments was not valid for all countries with rich natural resources. The authors emphasized that strong democratic structures and institutions in the countries with rich natural resources such as Australia and Norway put the principles of transparency and accountability into practice, and a barrier was established against corruption trends.

2. Less dependence on tax revenues in financing of public expenditures: In countries where there is no abundance of natural resources, tax revenues are the strongest source of income of the governments for financing of public expenditures. Therefore, it is necessary to act very responsibly for public expenditures. On the contrary, since the abundance of resources in the countries with rich natural resources will make a significant contribution to the increase of public revenues, the ratio of dependence on tax revenues of the governments is low. Due to the low dependence on tax revenues, governments have a wide initiative in determining the areas of expenditures and are not anxious about increasing public expenditures such as education and health expenditures to get the support of the citizens (Kim and Lin, 2017. p. 93).
3. Overconfidence in the abundance of natural resources: Education investments have a vital role in the economic development of countries. In the countries with rich natural resources, the abundance of resources prevented to understand the importance of education. Besides, the richness of natural resources led to insensitivity, and even blindness in the long term growth performance. There is an inverse relationship between the abundance of natural resources and participation in education at all levels. In these countries, a significant part of the active labor force prefers to be employed with low qualification in the sectors based on natural resources. Individuals who prefer to work in natural resource incentive sectors, such as agricultural or natural resource extraction sectors, do not make an effort to improve themselves and also do not take sufficient steps for the education of their children. Since natural resources are considered the most important wealth (assurance) for individuals, they neglect the have quality education which is necessary for the development of production knowledge and ability (Gylfason, 2001. p. 850 and 858).
4. Income transfer practices in the countries with rich natural resources: The countries that are prominent in terms of the richness of natural resources transfer income to their citizens in different ways. For instance, cash transfer practices are implemented in Kuwait, direct transfers and wage premium practices are implemented in Saudi Arabia, and wage premium and guaranteed employment practices are implemented in the United Arab Emirates. The major drawback of these types of unconditional income transfers is that they demotivate the individuals and diminish their attempts to develop their skills

1 The concept of resource curse hypothesis was proposed by Auty (1993). There are many studies demonstrating the validity of this hypothesis. For example, Sala-i-Martin and Subramanian (2003); Satti et al. (2014).

and improve educational levels in order to generate more income (Araji and Mohtadi, 2018. p. 4).

5. Demand for unskilled labor: The increase in unskilled labor wages puts the young in a serious dilemma. Young people may be involved in the labor market by being attracted by the wage increase in unskilled jobs, and they may also prefer to receive education to be entitled to high skilled labor wages in the future. In the countries with rich natural resources, low skilled labor is mainly employed in natural resource sectors. The increase in the prices of natural resource leads to an increase in demand for labor by increasing the export of this sector. It is usually observed that young people are sensitive to the increasing demand for labor and prefer to work instead of continuing their education (Álvarez and Vergara, 2016).

There are some other reasons for poor education in the countries with rich natural resources. In many country-case investigatations it was concluded that, one or more of the above-mentioned reasons may apply to each country. At this point, the relationship between the abundance of natural resources and education should be investigated first. The results of the analysis are aimed to explain the channels of the abundance of natural resources affecting economic growth. Such studies are evaluated within the scope of literature to explain the natural resource curse hypothesis. There is an extensive literature investigating the relationship between the abundance of natural resources and economic growth. However, there are not many studies specifically investigating the relationship between the abundance of natural resources and the indicators of education. The increase in the number of studies will contribute to the development of human capital literature, and also, research findings can be considered as a source of information for human capital policies.

The aim of this study is to investigate the relationship between oil revenues and education by using the data of four oil exporting Gulf Cooperation Council (GCC) member countries (Kuwait, Qatar, Bahrain and Oman) for the period between 2001 and 2017. The criteria of the availability of data and the abundance of natural resources were taken into account in deciding the countries to be included in the study. The indicators such as public and private education expenditures, literacy rate, number of students and graduates, and the number of teachers per student can be used to represent education for examining the relationships between the variables. In this study, the total number of students enrolled in post-secondary education, general programs, general and private high school education institutions was preferred as the indicator of education for investigating the relationship between oil revenues and education. This indicator is considered as a signal that education is affected by natural resource revenues. As mentioned above, in the studies on the countries with rich natural resources, it was determined that individuals did not continue their education after a certain level of education. Álvarez and Vergara (2016) and Araji and Mohtadi (2018) achieved similar results to this determination. It is necessary to keep in mind that each country needs high skilled human capital power as well as intermediate and low skilled labor.

In the study, Panel ARDL (PMG) and Group Mean DOLS tests that do not consider cross sectional dependence but consider heterogeneous cross-sections were used since there was no cross sectional dependence. It was observed that there was a negative relationship between oil revenues and the total number of students enrolled in post-secondary education, general programs, general and private high school education institutions for the relevant group of countries in the long term.

The difference of this study from similar studies is that it was the first study investigating the relationship between oil revenues and education by using the data of the countries covered by the analysis for the relevant period, as far as we know. The study consisted of two parts. Firstly, the literature survey was presented, and then, the data set, methodology and analysis results were discussed.

2. LITERATURE SURVEY

Within the scope of the literature survey, the results of the studies investigating the role of education in terms of economic growth performance in the countries with rich natural resources will be summarized firstly. The investigation of the relationship between education and the abundance of natural resources becomes important along with the determination of the positive effect of education on economic growth.

Bravo-Ortega and Jose (2005) tested the data of the countries from different regions for the period between 1970 and 1990. According to the empirical results, it was determined that the abundance of natural resources negatively affected the economic growth in the countries with low levels of human capital (average schooling year), and that this effect decrease in case of the abundance of human capital. Behbudi et al. (2010) tested the data of the group of countries they classified as the main oil exporting countries and other oil exporting countries for the period between 1970 and 2004. The test results showed that the effects of human capital (education) on economic growth differed by the groups of countries. While there was a negative relationship between human capital and economic growth in the first group of countries, there was a positive relationship between the variables in the second group of countries. In his model, Wadho (2014) reported that the effect of the abundance of natural resources on economic growth depended on the inequality in access to education, and political participation. In the study, it was emphasized that a high growth rate would be achieved if the inequality in access to education was relatively low and political participation had a relatively high cost. In order to reveal under which conditions natural resources would have positive effects in terms of economic growth, Zalle (2019) investigated the relationship between both variables by considering the variables of institutional quality and human capital (education). For this purpose, he tested the data of 29 African countries for the period between 2000 and 2015. According to the test results, human capital investments and the fight against corruption would reveal the positive effects of natural resources.

Douangngeune et al. (2005) performed a comparative analysis on education and economic development for Thailand, Japan and Korea. In the study with long-term historical statistics, it was reported that there was an abundance of resources (abundance of land) in Thailand although there was a relative scarcity of resources in Japan and Korea. Nevertheless, Thailand fell behind

both countries in terms of economic growth performance. Thailand failed to deliver a strong performance regarding the improvement of agricultural productivity, and industrialization. According to the results of the analysis, the abundance of land had a negative effect on education investments. Thailand failed to allocate the income obtained from the land into education investments. Japan and Korea were more successful in making education investments. Papyrakis and Gerlagh (2007) tested the data of 49 states of the USA for the period between 1986 and 2001 and investigated the effects of the abundance of natural resources on investment, education (schooling), openness, economic growth through R & D expenditures. According to the obtained results, the abundance of natural resources decreased the investment, education, openness and R & D expenditures but increased corruption. Blanco and Grier (2012) tested the data of 17 Latin American countries with high abundance of natural resources and resource dependence for the period between 1975 and 2004, and they determined that oil export had a long-term positive effect on physical capital but a long-term negative effect on human capital (average schooling year). Cockx and Francken (2016) tested the data of 140 countries for the period between 1995 and 2009 and determined the validity of public education expenditures resource curse. According to the results of the study, comparing with its share in GDP, the abundance of natural resources accompanied lower public education expenditures. Álvarez and Vergara (2016) investigated the relationship between the abundance of natural resources and the educational level by using local (municipal) data for the period between 2000 and 2013 in Chile. In the study, it was determined that high natural resource export decreased the level of education by demotivating young people to continue to higher education. Hong (2017) associated the effect of the abundance of natural resources on social expenditures with the governing structure of countries. The author tested the data of authoritarian regimes for the period between 1972 and 2008 and determined that oil abundance had a negative effect on education and health expenditures in those regimes. It was emphasized that less investment was made in human capital in oil-rich dictatorships, and that health and education expenditures decreased when oil revenues increased in an authoritarian economy. In the study, analyses were also performed for democratic regimes. According to the test results, oil wealth had no systematic effect on social welfare expenditures in democratic countries. Since there is no election concern and opportunity of unlimited use of oil revenues in democratic regimes, it is not easy to reduce social expenditures. Araji and Mohtadi (2018) tested the data of 46 countries in the Middle East and MENA region for the period between 1980 and 2009, and they investigated the effect of unexpected increase in natural resource revenues on human capital accumulation in the countries with rich natural resources. The empirical results pointed that, collective flow of natural resource income to individuals negatively affected the enthusiasm for investment in higher education in the countries with rich natural resources where the level of technological development is low.

Stijns (2006) investigated the relationship between the abundance of natural resources and human capital accumulation by considering a large number of indicators related to the abundance of natural resources. In the study, average year of education, net secondary school enrollment rate, adult literacy rate and life expectancy at birth were selected as the indicators of human capital accumulation, and public education expenditures were selected as a percentage of total expenditures. Natural resource wealth and natural resource revenues had a significant relationship with the improvement of the indicators of human capital accumulation. James (2017), who tested the US state-level data for the period between 1970 and 2008, rejected the view that the abundance of natural resources had a reducing effect on education expenditures. Not only the variable of education expenditures was used in the study. The variables such as relative teacher wages, enrollment rate and teacher-student ratio and high school graduation rate were also included in the analysis.

Some important results obtained are presented below:

- The public education expenditures were higher in the states with rich resources compared to the states with the scarcity of resources. During the analysis period, education expenditures per capita (public and private sector) were higher by 6% in the states with rich natural resources compared to the states with poor natural resources. This difference further increases in the periods during which energy prices increase.
- In oil-rich states, the wages of teachers were higher especially in the periods with high oil prices.
- Teacher-student ratio was not affected by oil boom.
- The enrollment rate in public schools was higher especially in the periods with high oil prices.
- The boom trends in the oil sector increased the attractiveness of employment in the sector by triggering the wage increases and caused high school students in working age to leave their schools without graduation.

Sun (2019), who tested data of 31 Chinese provinces for the period between 1999 and 2015, determined that there was a positive relationship between natural resource dependence and public education expenditures, and that natural resource dependence had a crowding effect on public education expenditures. In the study, it was emphasized that the abundance of natural resources would provide resources for education expenditures. The provinces included in the analysis were classified under three regions as eastern, central and western regions. The crowding-out effect was valid only in the eastern region with respect to the relationship between the variables. Crowding-out effect was observed in the other two regions. Accordingly, it was concluded that the resource blessing hypothesis was valid rather than resource curse.

3. THE DATA AND ESTIMATION STRATEGY

3.1. Data Set

GCC that was established in Saudi Arabia in 1981 has 6 members consisting of Saudi Arabia, Kuwait, United Arab Emirates, Qatar, Bahrain and Oman. The common feature of these countries is that they are at the forefront with respect to oil wealth on a global scale, except for Bahrain. In this study, the cointegration relationship between oil revenues and human development was investigated for Gulf countries. We could not reach qualified data for the United Arab Emirates and Saudi Arabia. Therefore, 4 GCC countries (Kuwait, Qatar, Bahrain and Oman) were included in the analysis.

According to 2018 and 2019 data of the R.T Ministry of Trade, the oil reserve of Kuwait is 101.5 billion barrels. The share of revenues obtained from the exports of oil and oil products in export is around 90%. Qatar's oil reserves are 25.2 billion barrels, and their export revenues consisted of oil by 49% and LNG by 40%. Although Bahrain is a non-oil rich country, the share of oil revenues in export revenues is quite high. In addition to 2.5 million tons of oil produced in the country, Saudi Arabia donates 8 million tons of oil every year. The revenues obtained from oil production and processing have 60% share in export revenues. In Oman, approximately 70% of export revenues are based on oil. The discovered presence of oil of the country is 5.5 billion barrels.

The reason for choosing oil revenues for analysis was that this variable is considered as a strong indicator in terms of the abundance of natural resources or natural resource dependence[2]. The abundance of resources is measured by the share of natural capital in total national capital, as it was demonstrated in the study of Stijns (2006). In the study of Stijns (2006), resource rent for each natural resource was also mentioned. It is necessary to get a certain income from these resources in order to investigate the macroeconomic effects of the abundance of natural resources. Oil revenue is one of the strongest sources of income for the countries with rich natural resources in the study. Therefore, the effects of oil revenues were investigated in this study.

The analysis period covered the years 2001-2017. The estimating equation is presented in Equation (1).

$$Education_{it} = \mu_{it} + \beta_1 oil_{it} + \beta_2 revenue_{it} + \beta_3 population_{it} + e_{it} \quad (1)$$

In Equation (1)'de $education_{it}$ indicates the education variable, oil_{it} indicates the oil revenue variable, $revenue_{it}$ indicates the GDP per capita, and $population_{it}$ indicates the country's population. e_{it} are error terms, and μ_{it} is the constant variable. In the study, *i:* And *t:* Indicate the countries and time dimension, respectively.

The education variable is the total number of students enrolled in post-secondary education, general programs, general and private high school education institutions. The selection of the variable was primarily based on the availability of data. Oil revenue is the difference between crude oil production cost and production revenues. The GDP series is obtained by adding taxes to gross value added generated by all established producers in the economy and by the removal of subsidies. Per capita output series is obtained by dividing the GDP series by population. Population variable is the mid-year total population value. All citizens were included in the definition of population regardless of their legal status or nationality while performing the calculation. All variables were collected from the World Bank website. Oil revenues and income per capita are in dollars. The natural logarithms of the series were used. The descriptive statistics of the series are presented in Table 1.

In Table 1, the mean, median, maximum and minimum values of the logarithmic series, and standard errors and number of observations are illustrated. The mean value of the Lnegitim series is approximately 11. It appears that the mean value of the Lnoil series is 3, the mean value of per capita revenue series is 10, and the mean value of the lnpopulation series in 14.

3.2. Methodology and Empirical Analysis

Since the time dimension of data especially on education is small for the selected countries, the panel data methodology was applied. Panel data methods allow controlling individual heterogeneity, reducing the effects of relationships between descriptive variables and enhancing the effectiveness of estimations and the degree of freedom. The stationarity will be analyzed at first in order to examine the relationships between series. In the unit root analysis of series, tests which do not consider cross sectional dependence ([Levin et al., (2002), Harris and Tzavalis (1999), Breitung (2005), Hadri (2000), Im et al. (2003), Maddala and Wu (1999), Fisher type Choi (2001)]) can be used as well as other tests which consider cross-sectional dependence (MADF (Taylor and Sarno, 1998), SURADF (Breuer et al., 2002), Bai and Ng (2004), CADF (Pesaran, 2006) and PANKPSS (Carrion-i-Silvestre and Sansó, 2006) can be also used.

The CADF test is based on the addition of the first differences and lagged values of the cross-sections to the standard ADF regression. This test is a test that can be used when both T> N and N> T, and allows the analysis of the cross-sectional dependence and the stationarity of the panel data. The CADF test developed by Pesaran (2006) performs a unit root test for the individuals who form the panel and establishes the stationarity based on the arithmetic mean of them. The CADF estimation equation is shown in Equation (2).

$$\Delta y_{it} = \alpha_t + \beta_i y_{i,t-1} + y_t f_t + \varepsilon_{it} \mathrm{t} = 1,2,3,\ldots, \quad \mathrm{N\ ve\ t} = 1,2,3,\ldots,\mathrm{T} \quad (2)$$

The CIPS test allows analyzing of the unit root status for the whole panel. The CIPS test is derived from the CADF test. The test statistic and hypotheses are as follows:

Table 1: Descriptive statistics

Statistics	Lneducation	Lnoil	Lnrevenue	Lnpopulation
Mean	10.969	2.959	10.228	14.469
Median	11.066	3.454	10.072	14.640
Maximum	11.958	4.114	11.351	15.355
Minimum	9.636	0.594	9.044	13.329
Std. Dev.	0.782	1.075	0.612	0.5600
Observations	68	68	68	68

2 Erdoğan, et al.: Relationship Between Oil Revenues and Education in Gulf Cooperation Council Countries is also used. As it was indicated in the study of ElAnshasy and Katsaiti (2015), "resource dependence is measured based on the share of resource dependence exports in total and the share of natural resource revenues in GDP. ElAnshasy and Katsaiti (2015) considered agricultural exports as one of the natural resource items. Accordingly, resource dependent and resource intensive economies will be mentioned if the share of agricultural exports in total exports exceeds 10%, mining income exceeds 5% of GDP, and revenues obtained from energy sources such as oil, gas and coal exceed 20% of GDP." It is possible to perform analyses based on the criteria of resource dependence or abundance of resources. In this study, the countries included in the analysis were generally oil-rich countries, and the share of oil revenues in GDP and total foreign trade revenues was quite high, as it was previously mentioned. Therefore, the relationship between direct oil revenues and education is investigated without getting into discussions of natural resource (oil) abundance or natural resource (oil) dependence.

$$CIPS = N^{-1}\sum_{i=1}^{n} CADF_t \quad (3)$$

H_0: Series is not stationary,
H_1: Series is stationary.

In our study, firstly the cross-sectional dependence of series was analyzed in order to select the appropriate unit root analysis. The test results on the cross-sectional dependence of series are shown in Table 2.

According to Table 2, the basic hypothesis based on the assumption of the lack of cross-sectional dependence for all series is not rejected, and it is concluded that the series have cross-sectional dependence. In the unit root analysis of the series, the CIPS test that considers cross-sectional dependence was utilized. The CIPS test results are shown in Table 3.

According to Table 4, the basic hypothesis cannot be rejected for the lneducation, lnoil and lnrevenue series, and it is concluded that the series have unit root. On the other hand, the basic hypothesis was rejected for the Inpopulation series, and it was concluded that the series is stationary. Taking the first difference of the series is not always sufficient for the determination of stationarity. Table 5 shows the test results for the first differences of the series.

Table 5 shows the stationarities of the series when the first differences are taken. All series were found to be stationary for both the constant model and the constant model with trend. After the stationarities of the series are found, then the existence of cointegration relation can be examined. However, it should be determined which of the cointegration analyses that do not consider cross-sectional dependence (first generation) and the cointegration analyses that consider cross-sectional dependence (second generation) will be preferred for the analysis. The second important point here is the problem of homogeneity. Because of T>N in our study, Peseran CD and L Madj tests were used to investigate the cross-sectional dependence of the cointegration model. For the homogeneity test, Pesaran and Yamagaha (2008) test was preferred. The test results are shown in Table 5.

When the results in Table 1 are examined, for the Equation (1), the basic hypothesis assuming that there is no cross-sectional dependence both for Pesaran CD test and L Madj test proposed by Pesaran et al. (2008), and it is concluded that the series have no cross-sectional dependence. On the other hand, when the results of homogeneity test are examined, the basic hypothesis assuming that the slope coefficient is homogeneous for both test statistics is rejected, and it is concluded that the model is heterogeneous. Since there is no cross-sectional dependence in our study, the Panel ARDL (PMG) and Group Mean DOLS tests which do not consider the cross-sectional dependence and consider the heterogeneous sections will be utilized.

Pesaran et al. (1999) suggested the PMG (the pooled mean group/panel ARDL) methodology that allows for the estimation of both short-term and long-term slope coefficient within the scope of the panel cointegration analysis. This method is adapted to the ARDL model to allow the change of constant variable, short-term coefficients and error term between sections. In other words, while this method does not allow the change of long-term coefficients between units, it allows heterogeneity and the exchange of error correction term between groups in the short-term period. This method requires a great time dimension. Since the panel ARDL is the form of standard ARDL method with unit effects included, the correlation between the error term and the estimators whose difference was deducted from the average causes the results to be biased. In our study, the time dimension is small as well as the section dimension cannot be increased. Thus, Arrelano and Bond (1991) estimator is used to eliminate the bias problem. For the panel ARDL, the short-term and long-term estimation equations are seen in Equation (4) and Equation (5), respectively.

$$Education_{it} = \mu_{it} + \sum_{j=1}^{p} \beta_1 oil_{it} + \sum_{j=0}^{p} \beta_2 revenue_{it} + \sum_{j=0}^{p} \beta_3 population_{it} + e_{it} \quad (4)$$

Table 2: Cross-sectional dependence test

Variables	CD-test	P-value
Lneducation	4.520	0.000
Lnoil	8.460	0.000
Lnppulation	9.700	0.000
lnrevenue	9.280	0.000

Table 3: CIPS unit root analysis test

Variables	CIPS test	
	Test stat. constant model	Test stat. constant model with trend
Lneducation	−1.108	−1.334
lnoil	0.076	−1.877
Lnpopulation	−5.180***	−5.399***
Lnrevenue	−0.910	−1.811

***. ** and * means stationarity levels of 1%, 5% and 10%, respectively. For the constant model, the critical values at 10%, 5% and 1% are −2.18, −2.33 and −2.64 respectively, and for the constant model with trend, the critical values at 10%, 5% and 1% are −2.73, −2.89 and −3.2 respectively

Table 4: CIPS unit root analysis test

Variables	CIPS test	
	Test stat. constant model	Test stat. constant model with trend
Dlneducation	−2.464**	−2.947***
Dlnoil	−3.363***	−3.262***
Dlnrevenue	−3.014***	−2.747

***. ** and * means stationarity levels of 1%, 5% and 10%, respectively. For the constant model, the critical values at 10%, 5% and 1% are −2.18, −2.33 and −2.64 respectively, and for the constant model with trend, the critical values at 10%, 5% and 1% are −2.82, −3.02 and −3.46 respectively

Table 5: Cointegration model: Cross-sectional dependence and homogeneity test

Test	Test stat.	Probab.
CD (Pesaran 2004)	−0.481	0.315
LMadj (Pesaran et al., 2008)	−0.126	0.550
Δ	2.720	0.003
$\tilde{\Delta}$	3.649	0.000

$$\Delta education_{it} = \varnothing_i EC_{it} + \sum_{j=1}^{q-1} \theta_1 \Delta education_{it}$$
$$\sum_{j=1}^{p} \theta_2 \Delta oil_{it} + \sum_{j=0}^{p} \theta_3 \Delta revenue_{it} +$$
$$\sum_{j=0}^{p} \theta_4 \Delta population_{it} + \in_{it} \quad (5)$$

Unlike Equation (1), Equation 3 shows the EC: Error correction coefficient.

Kao and Chiang (2000) suggested a DOLS (dynamics OLS: Dynamics EKK) estimator obtained using EKK analysis in order to estimate a cointegration regression equation: The Dynamics OLS estimation equation is shown in Equation (6).

$$y_{it} = \alpha_i + \beta x_{it} + \sum_{j=q1}^{j=q2} c_{ij} \Delta x_{it-j} + V_{it} \quad (6)$$

In Equation (5), c shows the lagged values of lags and leads. The DOLS coefficient is obtained from Equation (7).

$$\hat{\beta}_{DOLS} = \left[\sum_{i=1}^{N} \sum_{t=1}^{T} q_{it} q_{it}^{'} \right]^{-1} \left[\sum_{i=1}^{N} \sum_{t=1}^{T} q_{it} \hat{y}_{it}^{*} \right] \quad (7)$$

Pedroni (2001) adapted the group estimator equation to DOLS method by including average values into the DOLS equation for each section by taking into account of heterogeneity between sections.

$$\hat{\beta}_{DOLS} = \frac{1}{N} \sum_{i=1}^{N} \left\{ \left(\sum_{t=1}^{T} q_{it} q_{it}^{'} \right)^{-1} \sum_{t=1}^{T} q_{it} \hat{y}_{it}^{*} \right\} \quad (8)$$

The results of Panel ARDL and Group Mean DOLS test preferred for the research of the relationships between the series are shown in Table 6.

Table 6: Panel ARDL and DOLS test results

Variables	Panel ARDL			
	Coeff.	Std. error	t-stat.	Probability
Long-term relationship				
Lnoil	-0.182	0.032	−5.724	0.000
Lnpopulation	2.333	0.195	11.973	0.000
Lnrevenue	0.100	0.026	3.878	0.001
Short-term relationship				
EC	−0.926	0.563	−1.645	0.112
D (lneducation$_{t-1}$)	−0.177	0.347	−0.510	0.615
D (lnoil)	0.056	0.120	0.467	0.644
D (lnoil$_{t-1}$)	0.015	0.060	0.257	0.799
D (lnpopulation)	3.376	2.407	1.402	0.173
D (lnpopulation$_{t-1}$)	−10.052	6.197	−1.622	0.117
D (lnrevenue)	−0.059	0.102	−0.578	0.568
D (lnrevenue$_{t-1}$)	0.035	0.064	0.544	0.591
C	−20.700	12.673	−1.633	0.115
Trend	−0.075	0.049	−1.523	0.140
Group mean DOLS				
Lnoil	−0.116	0.048	−2.431	0.020
Lnpopulation	0.114	0.117	0.973	0.336
Lnrevenue	0.217	0.122	1.773	0.084

The delay count of dependent and independent variables for Panel ARDL model (Schwarz information criteria) was determined by automatic selection, and the maximum delay count was selected 2 because the time dimension is short. The processor and successor delay for DOLS model was selected by automatic selection (Schwarz information criteria) and the maximum delay count was selected 2. Since our model is heterogenous, the group mean method was preferred

When the results obtained from Table 6 are examined, it is seen that the effect of oil revenues, as constituting the focus of the study, on education is negative. In other words, a one-unit increase in oil revenues results in 0.18-unit decrease in the total number of students enrolled in post-secondary education, general programs, general and private high school education institutions according to the panel ARDL model while it results in 0.11-unit decrease according to the group mean DOLS model.

On the other hand, it is seen that according to the Panel ARDL model, the error correction coefficient for the short-term is statistically insignificant and there is no short-term relationship between the series. When the long-term relationship is examined, it is seen that total population and per capita income have a positive effect on education, and the population have a greater positive effect on education compared to per capita income. When the results of the group mean DOLS model are examined, it is seen that per capita income and population have a positive effect on education level and the effect of per capita income on education level is greater.

4. CONCLUSION AND POLICY IMPLICATIONS

The relationship between education as one of the basic components of human capital and abundance of natural resources was investigated for four oil exporting GCC member countries. In this study, whether the increase in oil revenues has a negative effect on the development of human capital was discussed. As a human capital indicator, the total number of students enrolled in post-secondary education, general programs, general and private high school education institutions was selected. In order to analyze the relationship between variables, it was concluded that there is no relationship in the short them within the scope of Panel ARDL model when the relationship between the series is addressed. However, it was observed that there was a cointegration relationship between the series in the long-term according to Panel ARDL and group-mean DOLS methods. One-unit increase in oil revenues in the long-term results in a 0.18 decrease according to Panel ARDL and 0.11-unit decrease according to DOLS methods. In this context, it was determined that there is a negative relationship between oil revenues and education level for the related country group in the long term.

The fact that in countries with rich natural resources, there is a negative effect on education despite high revenue obtained from production and exportation of natural resources shows that the resource curse hypotheses is valid in terms of education in the countries included

in the research. The possible reasons for the negative relationship between natural resource revenues and education are:

- Due to the fact that public revenues are mainly derived from oil revenues, the governments do not feel responsible for education expenditures and are not oppressed by citizens compared to the countries where public expenditures are financed by taxes.
- In the countries with rich natural resources, there are direct and indirect external interventions on oil production and how the oil revenues obtained will be used. On the other hand, it is impossible to have exact information about public expenditures and distribution. This causes managers to have initiative in many fields.
- There is excessive reliance on natural resource wealth. The human capital being one of the main determinants of long-term economic growth is underestimated.

It is not possible for countries with rich natural resources to maintain long-term high wealth level and to have international competitiveness only through oil production and exportation. In order to achieve sustainable high growth performance, they should take the countries which are successful on education, on R&D and technological development, and on allocating resources to the investments on improving other sectors as a model to encourage the development of non-oil industries, and increase the share of high value-added products in total exportation in foreign trade sectors. The qualified and highly-educated labor force is the main determinant of the success of the structural transformation process. Specially trained individuals will participate in the workforce in related fields by playing a role in R&D and technology development activities according to their field of work and interest, and will be responsible for the management of the structural transformation process.

Democratization of the country and enhancement of accountability and transparency levels will play an important role for policy-makers to direct oil revenues to areas such as education and health, rather than directly their individual initiatives.

In countries which have rich natural resources but not completed the democratization process yet, the enhancement of accountability and control mechanisms will also contribute to make significant progress in the fight against corruption, to use obtained resources in a more efficiently and productively manner, and to increase budgetary allocations for areas such as education and health.

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