Investigation the Links between Foreign Investment, Economic Growth and Energy Usage: Organization of the Islamic Conference Countries

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ABSTRACT

The vital importance of energy on one hand and its scarcity on the other hand requires the greater attention of the economic activists to use make a more efficient use of this production factor. Due to the difference between various energy resources as well as different performance of countries in using energy resources from technical and technological viewpoint, the investigation of the relationship between energy consumption (EC) and macroeconomic variables especially in Islamic countries is an outstanding issue. The purpose of the current study was to investigate the relationship between foreign investment, financial development (FD) and foreign trade with EC in member countries of the Organization of the Islamic Conference during the period of 2000-2014 using panel data approach. The results of the study indicated that foreign trade, investment and FD had a positive significant effect on the EC in the studied countries. Moreover, the greatest effect was attributed to the foreign trade.

Keywords: Foreign Trade, Foreign Investment and Financial Development, Energy Consumption, Islamic Countries
JEL Classifications: F0, O5

1. INTRODUCTION

Energy is a prominent factor in economic, trade interaction improvements which are essential inputs to achieve sustainable development especially in developing countries. In developing countries, due to the economic growth, population growth and industrialization, energy consumption (EC) is increasing rapidly (Omri and Kahouli, 2014; Amri, 2016; Ibrahiem, 2015). In order to meet to the growing needs of the people it is required to produce commodities as far as possible. Economic theories have proved that policies made with the aim of strengthening the financial sector can decrease the information and transaction costs and also it can increase the production by improving the productivity to affect the EC. Investment and foreign trade are among important factors that can increase EC. On the other hand, investment can affect the EC directly or indirectly. Investment expand the output by increasing the number of manufacturing enterprises and increases the EC. The growth of production lead to the economic growth through the inter-sectorial growth and

the result of the corresponding process is the greater demand for energy. Moreover, the output growth increases demand for labor force and improves the incomes of economic agents. Finally, the income increase leads to an excess demand for consumption goods and increases the EC as well (Sadorsky, 2013). Abdouli and Hammami (2017) investigated the causal links between environmental quality, foreign direct investment (FDI), and economic growth for 17 MENA countries over the period 1990-2014. Their findings showed that bidirectional causality between economic growth and CO_2 emissions; as well as bidirectional causality between FDI stocks and CO_2 emissions, while there is unidirectional causality from FDI inflows to economic growth. Also, Lee (2013) showed that the FDI inflows strongly leaded to economic growth and it has no relation to clean energy use in the G20. Paramati et al., (2016) investigated the impact of both FDI inflows and stock market developments on clean energy use across 20 emerging market economies, spanning the period 1991-2014. Their results urged that both policy makers and governments in these emerging market economies should initiate

effective public-private-partnership investments in clean energy projects by providing lucrative incentives, which, in turn, will encourage both domestic and foreign investors to invest more in clean energy projects and, eventually, moving these economies towards sustainable economic growth.

The Organization of the Islamic Countries (OIC) is the second international after the United Nations which includes 57 Islamic countries in almost four continents. Except for Albania and Turkey which are considered as European countries and Surinam which is the American member of the OIC, all other members of the organization are located in Asia and Africa. Also, the members of the OIC based on a formal classification are divided into three groups including Arab, African and Asian countries. Arab member countries of the Persian Gulf Cooperation Council are considered as the main center of power in the OIC. OIC member countries generally include countries which have features in common and historical, geographical and cultural closeness. Their main point of aggregation is religion. OIC member countries constitute the major oil exporting countries. These countries are considered as the greatest producer and the greater consumer of the energy in the world. The total value of the foreign trade for the OIC member countries in 2014 was almost 4 billion dollars. Two thousand billion dollars refers to the exports and the remaining is attributed to imports. The trade share of the OIC member countries in the global trade is <12%. OIC member countries own about 70% of the energy resources and 40% of the natural resources all over the world (World Bank, 2014).

Most of the scholars believe that the expansion of the trade and industrial exports increase the volume of the economic activities especially polluting activities and the utilization of the energy resources. Also, the increase of the soar of the competitive pressure between the domestic firms and their rivals cause the appropriate environmental legislation to fade out in the host country and the increased environmental pollution through the indiscriminate use of energy. On the other hand, other researchers believe that due to the countries reaction to the competitive pressure of the trade expansion, the use of resources will be more efficient based on the relative advantage so that the energy waste especially energy emissions in the host country will reduce (Sadorsky, 2013). EC in addition to being influenced by developments in the domestic economy is affected by changes in foreign trade and foreign investment. The interaction of EC with takes place by foreign investment and foreign trade (imports) and mainly through trade liberalization. Talking about the nature of the trade on the EC, it can be stated that developing countries due to the light handed environmental regulations against polluting manufacturing industries compared to developed countries have a comparative advantage. The result is that the developed countries transfer their active polluting industries to the developing countries. Therefore, the effects of the trade volume on the EC in these countries is different and multi-dimensional (Taylor, 2003). The relationship between import and EC is justifiable. The distribution of the imported commodities needs an appropriate transportation network fuels by energy. Moreover, the imported goods due to the combination of the commodities can affect EC. Durable imported commodities like automobiles, refrigerators etc. are

all energy consuming and the increase of the demand for such imported commodities increases the demand for energy (Borozan, 2013). Therefore, it can be stated that the import of the industrial commodities in order to replace them with domestic commodities which are produced with high EC can decrease the EC of the host country. But if the imports of were machinery and capital and intermediary goods the EC increased. The effects of industrial commodities imports on the EC can be positive or negative (Chapman and Suri, 1998). Taking into account the above factors, the purpose of the current study was to investigate the relationship between the direct foreign investment, financial development (FD) and foreign trade with EC in OIC member countries during period from 2000 to 2014 using panel data approach.

2. LITERATURE REVIEW

Trade include the import and export of the commodities and theoretically there are various reasons for why export can affect EC. In order to increase the exports, the machinery and equipment for loading and transportation of export goods should be sent to the ports, airports or unloading stations. Machinery and equipment in the manufacturing process and transportation of goods for export requires a primary energy and any increase in exports leads to the growth economic activity and the increase of the energy demand. Therefore, the export of manufactured goods requires energy for transportation meaning that without enough energy for transportation, export expansion is weakened (Abedin et al., 2015). Also, imports can affect the EC. If imports include machinery, equipment and new technology, it increases the output and the energy utilization. Moreover, the imports of goods is done through the transportation system which increases the demand by the transportation system (Sadorsky, 2013). Most of the researchers consider that the relationship between energy, labor and capital in normal conditions as substitution type, however, in the short run as the production structure can't react to the increase of the prices the relationship between capital and labor will be complementary. However, investment expands production and increase the number of factories resulting in increase in the EC (Gurgul and Lach, 2012). Sadorsky investigated the FD and EC in the central and Eastern Europe for nine countries. The results of the study indicated that there was a positive significant relationship between the FD and EC. Among the analyzed variables only the volume of transactions was considered as a financial index which had a positive significant effect on the EC. On the other hand, Tang and Tan (2014) studied the relationship between the EC, FD, economic growth, foreign investment and relative prices in Malaysia during the period from 1972 to 2009 using Johansen and bounding test and investigated the effects of the FD on the EC. Based on the results of the study they recommended a dual strategy to the policy makers. On one hand, increasing the investment in the energy infrastructures to provide enough energy for the financial sector and economic development and on the other hand, encouraging the research and development process in green technologies including appropriate soil, environmental protection techniques and sustainable farming activities in order to decrease the consumption of the fossil fuels. Gurgul and Lach (2012) obtained a direct causal relationship between FD and EC. Shahbaz and Lean (2012) investigated the relationship between

the economic growth, urbanization and investment. Gurgul and Lach (2012) obtained a direct causal relationship between FD and EC. The results of the study indicated that there was a long run relationship between foreign trade and demand for energy. Islam et al. (2014) indicated that the economic growth and FD affected the EC in the short run and ling run horizons, but the relationship between the population and energy is significant only in the long run.

Khatun and Ahamad (2015) examined the causal relationship between FDI in the energy and power sector, and economic growth in Bangladesh for the period 1972-2010 and it confirmed a causal relationship for the energy use equation in the long run. Nasreen and Anwar (2014) examined the causal relationship between trade liberalization and EC. The study, in the form of Granger for 15 selected Asian countries during the period 1980 to 2011, and based on the results, bidirectional relationship between trade liberalization and EC were achieved in the short and long term.

Jebli and Youssef (2015) explore the relationship between foreign trade and their EC. The study for 11 African countries over the period 1908-2008 in the form of methods and techniques Granger cointegration panel approaches ordinary least squares (OLS) and fully modified OLSs was performed. Based on the regression results in the short term we see a dual relation between foreign trade and EC by at least square techniques, foreign trade and a significant positive impact on EC.

Halicioglu (2015) examines the impact of exports on EC. This study, using autoregressive distributed lags for the period 2008-1968 for Turkey was done. Results of a significant positive relationship between these variables showed EC. Also in this study using a dynamic Granger causal relationship between EC and exports were also examined. Ali is a one-way communication of test results showed energy exports. Kyophilavong et al. (2015) investigated the relationship between economic growth, EC and trade openness in Thailand using Bayer and Hanck cointegration method and the results confirm the presence of cointegration between the variables and the existence of bidirectional causality between economic growth and EC, and between EC and trade openness.

Finally, Abedin et al. (2015) investigated the relationship between the FDI, FD and foreign trade with EC in ASEAN countries during the period from 1998 to 2013. The results of the study indicated that there was a positive and significant relationship between FDI, foreign trade and FD with EC.

3. MODEL AND VARIABLES

The model used in the current study was obtained from the study of Abedin et al. (2015) as follows:

$$LEC_{it} = \beta_1 LFD_{it} + \beta_2 LTR_{it} + \beta_3 LFDI_{it} + \varepsilon_{it} \qquad (1)$$

Where, L was the logarithmic transformation. The logarithmic form of the models was used in this study. The reason is that the defined model will be a constant elasticity model and the estimated

coefficients could be interpreted as elasticity. On the other hand constant elasticity are more appropriate policy recommendations.

3.1. EC
EC in the current study was included based on the EC per capita in the model. In other words, kilogram EC per individual was included to the model.

3.2. FD Index
Which was defined as the ratio of the total facilities granted by domestic banks to customers to the gross domestic product (GDP) (Litao, 2013).

Foreign trade which was defined as the sum of imports and exports divided into the GDP to smooth survey data.

3.3. FDI
Which was defined as the investment of a corporation or an individual in another country in order to trade or produce an output. The total volume of the investment of the foreign countries in the host country was used as the criterion for the measurement of the foreign investment. The required data were obtained from the World Bank website.

4. ESTIMATION OF THE MODEL

Using traditional estimation methods in econometrics is based on the assumption of stationary of variables. Therefore, in order to avoid the estimation of a spurious regression it is necessary to examine and tested the stationary of variables. To investigate the stationary of variables in panel data approach particular tests can be used. The current study used the Levine and Lin, Shin and Pesaran stationary tests for the investigation of stationary of variables in panel data approach. The results of the stationary test were presented in Tables 1 and 2.

According to the results of Tables 1 and 2, we confirm most variables are I(1), then we use panel cointegration tests examining the relationship among the four variables. We employ three kinds of panel cointegration tests, that is Pedroni's, Kao's and Johansen's Fisher panel cointegration tests. For starting to discuss the long-run relationship, we have calculated the Kao's tests for the homogeneous panel, where the null hypothesis is the absence of cointegration.

Table 1: Results of the stationary test using LL test

Variable	Evaluation method	Test statistics	P value	Stationary or no stationary
LEC	Level	0.41653	0.6615	No stationary
	1st difference	−13.6840***	0.0001	Stationary
LFDI	Level	0.87505	0.8092	No stationary
	1st difference	−8.12941***	0.0001	Stationary
LFD	Level	−2.87489**	0.0020	Stationary
LTR	Level	−2.10878**	0.0175	Stationary

**indicates that the estimated parameters are significant at the 5% level. ***indicates that the estimated parameters are significant at the 1% level. LL: Levine and Lin, EC: Energy consumption, FD: Financial development

Table 3 reports the results of Kao's residual panel cointegration tests, which rejected the null hypothesis of no cointegration for the EC and other variables at the 1% significance level, so that there is existence of cointegration. Table 4 shows the results of Pedroni residual cointegration test. There are two parts in Table 4 the first four test statistics are computed by the "within" dimension (panel statistics). If the null is rejected, then ECs are cointegrated for all variables. The last three test statistics are computed by the "between" dimension (group statistics).

In Table 4, most of the estimate results of the Padroni's panel cointegration tests indicate that the null of no cointegration can be rejected at the 5% significant level. This displays that the changes

of EC in these countries are connected with other macroeconomic variables. However, the results in Table 4 are inconsistent; some statistics are significant, but there are some exceptional results. Due to the data applied in this paper are panel data, the varied results can be caused by the different relationships between EC and other macroeconomic variables in these countries. The result of the Johansen's Fisher panel cointegration test summarizes in Table 5, are fairly conclusive: Fisher's tests, no matter with the Trace test statistics or max-Eigen test statistics, support the presence of a cointegrated relation among the four variables at the 1% significant level.

We can conclude from those results of panel cointegration tests, there is a panel long-run equilibrium relationship among the EC, FD index, FDI and GDP move together in the long run.

4.1. Results of the Diagnostic Tests
Various tests can be used for testing the strength of different models. The most common tests include Chow and Hausman tests. The Chow tests is used to select between pooled data and panel data methods of estimation. The null hypothesis refers to the pooled data and H_1 refers to the panel data approach. The fixed effect can be accepted when the difference between cross sections can be explained by an intercept in the model. But the pooled data method of estimation uses similar intercepts. If the null hypothesis was rejected the Hausman test can be used for the selection of the appropriate model. The Hausman test is based on the existence or non-existence of the relationship between the error terms of the estimated regression and the explanatory variables of the model. If such a relationship exists between the error terms of the estimated regression and the explanatory variables the fixed effect model is used. The null hypothesis of the Hausman test stated that there wasn't any relationship between the explanatory variables and the error terms.

4.2. The Results of the Model Estimation
In order to choose between panel data and pooled data estimation methods the Chow test was used. The null hypothesis of the Chow test can be defined as follows:

H_0: Pooled data.

H_1: Panel data.

The results of the Chow test indicated that the results of the F-statistic confirmed the use of panel data approach against the pooled data. The results of the test was presented briefly in Table 6.

Results of the Chow test confirmed the estimation of panel data against pooled method in both the estimated models. To conduct

Table 2: Results of the stationary test using Shin and Pesaran test (level)

Variable	Evaluation method	Test statistics	P value	Stationary or no stationary
LEC	Level	2.15056	0.9842	No stationary
	1st difference	−12.8861***	0.0001	Stationary
LFDI	Level	0.9794	2.04148	No stationary
	1st difference	−8.67464***	0.0001	Stationary
LFD	Level	−1.11596	0.1322	No stationary
	1st difference	−12.6094***	0.0001	Stationary
LTR	Level	−1.25358	0.1050	No stationary
	1st difference	−11.3117***	0.0001	Stationary

***indicates that the estimated parameters are significant at the 1% level. EC: Energy consumption, FD: Financial development

Table 3: Kao's residual cointegration test results

ADF	Statistic	P value
	−4.01***	0.0001

The ADF is the residual-based ADF statistic. The null hypothesis is no cointegration. ***Indicate that the estimated parameters are significant at the 1% level

Table 4: Pedroni's residual cointegration test results

	Statistics	P value
Within group		
Panel v-statistic	−24.15040	1.0000
Panel rho-statistic	1.297434	0.9028
Panel PP-statistic	−1.875223**	0.0481
Panel ADF-statistic	−2.413421***	0.0079
Between group		
Group rho-statistic	2.731180***	0.0033
Group PP-statistic	−2.743165***	0.0030
Group ADF-statistic	−0.964665	0.1674

The null hypothesis is that the variable are not cointegrated. Under the null hypothesis, all the statistics are distributed as normal distributions. The variance ratio test is right-sided, while the others are left-sided. ** and ***indicate that the estimated parameters are rejects the null hypothesis of no cointegration at the 5% and 1% levels. Newey-West bandwidth selection using Bartlett Kemel cross method statistical probability. ADF: Augmented Dickey–Fuller, PP: Phillips–Perron

Table 5: Johansen Fisher panel cointegration test

Hypothesized number of CE (s)	Fisher statistics* (from trace test)	P value	Fisher statistics* (from max-Eigen test)	P value
None	232.2***	0.0000	196.3	0.0000
At most 1	85.24***	0.0000	69.88	0.0001
At most 2	43.21	0.0892	42.23	0.1067
At most 3	26.58	0.7375	26.58	0.7375

*Asymptotic P values are computed using a Chi-square distribution. ***indicate that the test statistics are significant at the 1% level. Fisher's test applies regardless of the dependent variable

the Hausman test, first we estimated the model with fixed effects and then the Hausman test was conducted. Results of Hausman test were presented in Table 7 which confirmed the estimation of the fixed effect model against the random effect model.

The results of the estimation using fixed effect approach were presented in Table 8.

The results of the Table 8 indicated that the estimation of the model had good results from the view point of statistical indicators. The F-statistic confirmed the significance of the total regression. In other words, the hypothesis that the coefficients of the explanatory or independent variable of the model were simultaneously equal to zero was rejected and the whole regression was significant. The determination coefficient of the model was equal to 86% which indicated that 86% of the changes in the dependent variable could be explained by the explanatory variables of the model which showed the goodness of fit.

Based on the results of Table 8 foreign trade had a positive significant effect on the EC. Various reasons could be presented about the relationship between exports imports and EC. The machinery and equipment which are used in the production process of the exported goods requires a great deal of energy. The increase of the exports shows the increase of the economic activities and the demand for the energy. On the other hand, changes in the EC can affect the exports because energy is considered as one of the main inputs for production and exported goods transportation. The export of the manufactured goods and inputs requires to fuel the transportation. Therefore, energy is considered as an important input in the expansion of the imports and exports.

Based on the results of the study FDI had a positive significant effect on the EC. On the other hand, FDI increased the EC. Based on the harbor pollution hypothesis, developing countries had comparative advantage in the production of pollutants due to the weak environmental regulations. Therefore, the inflows of the

Table 6: Results of the Chow test

Chow test	Result	P value	F statistic
	H_0	0.0001***	259.31

***indicates that the estimated parameters are significant at the 1% level

Table 7: The results of the Hausman test

Hausmana test	Result	P value	F statistic
	H_0	0.0001***	16.72

***Indicates that the estimated parameters are significant at the 1% level

Table 8: Results of the estimation of the models

Independent variables	Coefficient	t value	P value
LFDI	0.034	4.85**	0.032
LFD	0.149	2.55***	0.0001
LTR	0.132	2.00**	0.046
C	6.08.903	24.73***	0.0001
R^2=0.89	P=0.000	F-statistic	176.30***

**indicates that the estimated parameters are significant at the 5% level. ***indicates that the estimated parameters are significant at the 1% level. EC: Energy consumption, FD: Financial development

foreign investments to developing countries is done in polluting sectors with high EC and increases the EC.

According to the results of the Table 8, the FD had a positive significant effect on the EC. In other words, FD increased EC in the studied countries. The increase of the FD in an economy and the accessibility to the financial resources increase the EC through the increase of the domestic demand and the production as the results. The growth of the output increases the economic growth through inter-sectorial growth which leads to the greater demand for energy. Moreover, the output growth increases demand for labor force and improves the incomes of economic agents. Finally, the income increase leads to an excess demand for consumption goods and increases the EC as well.

5. CONCLUSION

The relationship between the EC and economic development after the first oil crisis in 1973 had a considerable effects on the increase of the oil prices. The vital importance of energy on one hand and its scarcity on the other hand requires the greater attention of the economic activists to use make a more efficient use of this production factor. Due to the limitations and the scarcity of the resources especially energy and also the role and the importance of this factor in the supply chain has been considered both as the final commodity for the consumers and the production input in producing the commodities, the investigation of the determinant of the energy demand has received great attention during the recent decades.

The purpose of the current study was to investigate the relationship between foreign investment, FD and foreign trade with EC member countries of the Organization of the Islamic Conference during the period of 2000-2014 using panel data approach. The results of the study indicated that foreign trade, investment and FD had a positive significant effect on the EC in the studied countries. During the recent years has considerably increased. Based on the obtained results of the study a great deal of attention should be paid to the energy demand and FD and appropriate policies should be adopted in order to respond the energy demand. Also, on the close relationship between the oil and gas markets in the shadow of globalization process and scarce and non-renewable energy resources, oil sanctions against Iran, will slow down the development of energy resources in Iran. Therefore, the increase of the productivity and technological modernization of production equipment to reduce EC to increase the efficiency of production is very essential.

Given the positive relationship between trade and EC in countries being studied, it is necessary to adopt and implement reasonable policies consistent with the role of energy trade, sustainable development and growth and economic development provide walked. Security of energy supply, considering the economy and the environment and increasing energy efficiency, use of renewable energy and incentive policies, punitive as the most important management practices can be used by policy makers. Thus, the reduced fossil fuel consumption and also provides the possibility of substitution of other energy sources as well as the commercial sector energy needs is met.

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