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The Role of Energy Supply in Economic Growth: Evidence from the Oil Importing Countries

Ghazi A. Samawi[1]*, Metri F. Mdanat[2], Talah S. Arabiyat[3]

[1]Department of Management Sciences, German Jordanian University, Jordan, [2]Department of Management Sciences, German Jordanian University, Jordan, [3]Department of Management Sciences, German Jordanian University, Jordan.
*Email: ghazi.samawi@gju.edu.jo

ABSTRACT

The main purpose of this study is to explore and analyse relationships between energy supply and economic growth. Path analysis and structural equation modelling have been used to analyse the direct and indirect effects of energy supply on economic growth by identifying the form of the relationships between them and the role of mediating variables. Energy supply was found to be strongly correlated with economic growth and to have a number of other relationships and effects on the economy. It was also found that mediating variables had different relationships and effects on the economy based on the source of energy. This result confirms that changes in energy suppliers seem to reflect changes in the political economy of the country rather than shifts in energy use. The influence of the political economy and the preferential treatment of supplying energy to oil importing countries below market price were found to have mixed effects on economic growth for both trade and budget path models.

Keywords: Energy Supply, Economic Growth, Structural Equation, Path Analysis
JEL Classifications: Q41, O4, Q43, C32

1. INTRODUCTION

Limited energy supply coupled with an unstable political environment can negatively affect the development of a country and limit the potential growth of its economy. Sustainability of supply is a crucial factor in this context. An energy shortage can have a major impact on energy security and on economic and social welfare (Halldórsson and Svanberg, 2013). An inadequate energy supply can lead to rapid increases in costs of production and transportation. During the last decade, political instability in the Middle East and North Africa (MENA) region forced many oil importing countries (OICs) to change their energy supply sources. The energy sectors of OICs are characterized by great heterogeneity at the individual country level (Cohen et al. 2011), rapidly increasing energy demand (5-8% annually), low efficiency, subsidized energy prices, a limited share of renewable energy and weak energy management (Bergasse et al., 2013). Therefore, maintaining an affordable and reliable supply of energy is important for economic stability and energy sustainability (International Energy Agency, 2011). The World Energy Council (2013) defines energy security as "the effective management of primary energy supply from domestic and external sources, the reliability of energy infrastructure, and the ability of energy providers to meet current and future demand". Therefore, ensuring sustainable energy supply and flow of energy to the economy are critically important to achieving economic growth (Urciuoli et al., 2014). Ultimately, quality of life will be affected (Halldórsson and Svanberg, 2013). Moavenzadeh (2013) argues that reducing energy supply barriers will boost growth more than removing tariffs. According to Cohen et al. (2011), diversification in sources of oil supply has not increased for most countries since 1990.

Therefore, OICs will continue to face a shortage of energy, instability and increased production costs, hindering their economic development. Stern and Cleveland (2004) agree on the existence of strong causality and correlation effects between energy and economic growth. They show that correlation and regression analysis does not imply causality from one variable to another and recommend that future research should explicitly model these effects. Unlike earlier ones, the present study

constructs path analyses to examine the impact of energy supply on economic growth by examining both direct and indirect effects. Various factors contribute to a shortfall in energy supply to a country. This raises two fundamental questions: Which suppliers have the most negative impacts on the economy, and which paths offer the most attractive options for supplying energy to the country? This study attempts to answer three additional questions: To what extent does sustainable energy supply promote growth? Is there a relationship between energy supply and economic growth? If there is a relationship, which energy supplier is desirable for promoting growth? The main objectives are to identify existing energy supply relationships and to analyse the direct and indirect effects of energy supply on economic growth. Previous studies have explored the correlative and causal relationships of economic growth with energy consumption and energy security (Labandeira and Manzano, 2012), but less is known about the direct and indirect effects on economic growth of obtaining energy from one county rather than another. This study examines these effects. In particular, we use structural equation modelling (SEM) and path analysis to test the relations between energy supply and growth. This approach allows us to understand patterns of correlations and variation among energy suppliers. The contribution of this study to the literature is the measurement of the direct and indirect effects of energy supplies on economic growth.

This paper proceeds as follows. The next section reviews the relevant literature to establish existing knowledge of the relationships between energy supply and economic growth. It also offers an overview of OICs in the MENA region. The methodology section includes details of the conceptual model and hypotheses, then the results are analysed and discussed. Finally, future research directions are suggested and limitations addressed.

2. LITERATURE REVIEW

The relationship between energy and economic growth has received increasing attention from developing and developed countries after the oil shocks and energy crises of the last three decades. Although much has been written about the relationship between energy and economic growth (Kilian, 2007; ADB et al., 2009; Bouoiyour and Selmi, 2012; Shahateet, 2014; IMF, 2016), studies relating energy supply to economic growth are rare; to the best of our knowledge, few studies (Bergasse et al., 2013; Cohen et al., 2011) have addressed this topic by constructing diversification indices within the sources of energy production. Some have used different indicators and indices to measure the economic effects of energy security and disruption (Keppler, 2007; Gupta, 2008; Markandya and Pemberton, 2010). Bergasse et al. (2013) examine the relationships between energy supply, demand policies, economic and social development, while Le Coq and Paltseva (2009) show that supply risk differs not only among countries but also among energy sources. Other studies have focused on the causality between energy consumption and economic growth (Vlahinić-Dizdarević and Žiković, 2010). For instance, Siddiqui (2004) and Asafu-Adjaye (2000) argue that there is both unidirectional and bidirectional causality from economic growth to energy. Mozumder and Marathe (2007) found unidirectional causality from economic growth to energy consumption, while Shiu and Lam (2004) report unidirectional causality from energy consumption to growth and Jumbe (2004) found bidirectional causality between energy consumption and growth in Malawi. Stern (1999) argues that energy is a crucial input in production and a requirement for economic and social development which at the same time can stifle economic growth. Conversely, Stern (1993) and Cheng (1995) found that energy had an insignificant effect on growth and that there was no causality in either direction. According to Hamilton (2005), one simple framework for thinking about the effects of energy supply disruption is to examine the production function of a particular firm, using OLS regression of quarterly gross domestic product (GDP) growth on lags of oil price. Chalvatzis and Ioannidis (2017) employed energy indices to analyse the energy security of some southern European OICs and examine how these countries were affected by the 2008 financial crisis. They found that energy supply diversity and energy independence improved the overall energy security outlook.

2.1. Energy Supply in MENA

The MENA region has about 60% of global oil reserves and 40% of gas reserves (Cordesman and Al-Rodhan, 2006). Egypt has the third largest gas reserves in Africa (Bahgat, 2012), constituting the main source of gas for neighbouring countries such as Israel, Jordan, Syria and Lebanon, through the Arab Gas Pipeline (Shiraz, 2013). However, MENA countries are deficient in energy supply risk management; they have faced energy supply disruption and increasing oil prices in recent years, leaving them vulnerable to energy shocks as well as to natural catastrophes, equipment failure and demand risks (Asbjørnslett, 2008; Manuj and Mentzer, 2008). On the other hand, sustainable energy supplies and lower oil prices have helped OICs to reduce external vulnerabilities and fiscal risks (IMF, 2014). MENA OICs are characterized by limited resources, growing populations and constrained financial circumstances. Aligning scarce resources with priorities is a major policy challenge for their economies in general and for the energy sector in particular, as these countries face growing energy demand, limited resources and heavy dependency on energy imports. Frequent disruptions in energy supply chains and natural gas flows require imports of expensive energy products to meet the growing demand for electricity generation and industry operations. Most of the MENA OICs have minimal local production of energy from crude oil, natural gas and renewable sources, accounting for under 5% of energy consumption. Around 90% of their energy is therefore imported from neighbouring countries and international markets (IMF, 2016), representing a financial burden of almost 18% of GDP. One of the main objectives of OICs is to supply their economies with sufficient affordable energy. During the last three decades, the changing political economy in the region has markedly affected the sources of Jordan's energy imports. For example, before 1990, Jordan's main energy supplier was Saudi Arabia, then Iraq became the main supplier after its invasion of Kuwait. Subsequently, Iraq's contribution to Jordan's energy supply declined from 95% in 1995 to 1% in 2005. Between 2003 and 2006, Saudi Arabia and others supplied more than 80% of Jordan's energy.

2.2. Energy Supply and Economic Growth

The relationship between energy and economic growth has been examined at different levels. Most such studies have investigated

the relationship between energy use and economic growth (Belke et al., 2010; Farhani and Rejeb, 2015; Wang et al., 2016) or the causality between energy and economic growth (Stern, 2000). According to Vlahinić-Dizdarević and Žiković (2010), if causality runs from energy to GDP, this would imply that a reduction in energy imports would harm economic activity. van Zon and Yetkiner (2003) conclude that the rate of growth depends negatively on the rate of growth of energy prices. Energy supply contributes to economic growth in several ways. First, it creates jobs in extracting, transforming and distributing energy. Second, energy is an input for nearly all goods and services. According to the Asian Development Bank (ADB et al., 2009), the lack of affordable and reliable electricity supply in some south Asian countries severely constrains business and economic growth. Although Kilian (2007) found no reason to expect large economic effects of oil price rises through higher production costs where the share of oil in GDP is relatively small, a report by the International Monetary Fund (IMF, 2016) notes significant effects of energy price shocks on the economy and their transmission channels in OICs. It shows that these countries are heavily dependent on imported energy, so that any change in energy prices has a dramatic effect on economic performance. Similarly, Hunt et al. (2001), Hamilton (2003) and Bernanke (2006) report negative correlations between oil prices and economic activity. Some studies have found no effect of energy consumption on economic growth in MENA countries (Shahateet, 2014), whereas others (Bouoiyour and Selmi, 2012) report mixed results. The IMF (2016) concludes that energy shocks have had a positive and statistically significant effect on the economies of Jordan and Tunisia but have had no statistically significant effect on those of Lebanon or Morocco.

3. METHODOLOGY

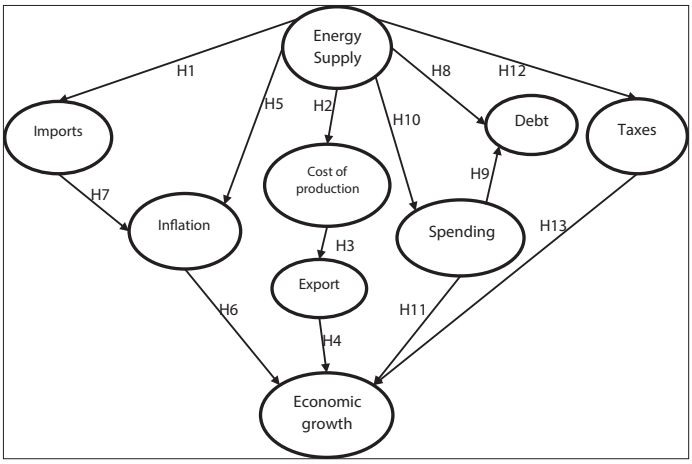
3.1. Conceptual Model

Figure 1 is a conceptual model of the relationships between energy supply and economic growth, where spending, taxes, debt, imports, exports, inflation and cost of production are the key mediators between these variables. The following section defines each path and explains the development of the hypotheses representing the proposed relationships.

3.2. Hypothesis Development

Against a background of persistent energy price fluctuations and energy route disruptions, debate continues about how to mitigate their negative effects and reduce oil dependency. Changing energy sources or suppliers entails considerable switching costs, which Jordan experienced when switching away from importing energy from its neighbour, Iraq. Similarly, the blockage of energy supplies from Russia to Europe increased both costs and energy insecurity for European economies (Rademaekers et al., 2017). The transitional mechanism of energy supply and its direct and indirect effects on the economy can be depicted in terms of a number of paths. First, energy price affects imports, exports and inflation, which in turn affect the trade balance, current account and hence economic growth. Second, energy prices affect spending, taxes and the budget deficit, as well as public debt, in turn affecting economic growth. Third, energy prices affect the cost of production, which in turn affects export competitiveness, economic activity and

Figure 1: Path analysis of the relationship between energy supply and economic growth



economic growth. These transitional mechanisms have a strong combined impact on the economy. A few studies (e.g. Bergasse et al., 2013) have also directly explained the relationship between energy supply and economic growth as an intermediate factor of production. For instance, the neoclassical production function explains how to achieve economic growth by increasing inputs or improving their quality. Based on this approach, energy inputs have an indirect importance and have been seen as intermediate inputs that play an indirect role in economic growth.

Energy price rises are expected to continue in the future, thus increasing pressure and imbalances at the micro and macro levels in most OICs. We summarize these effects in the following hypotheses:

H1: Energy supply has a positive impact on imports.
H2: Energy supply has a positive impact on the cost of production.
H3: The cost of production has a positive impact on exports.
H4: Exports have a positive impact on economic growth.
H5: Energy supply has a positive impact on inflation.
H6: Inflation has a positive impact on economic growth.
H7: Imports have a positive impact on inflation.

Energy supply has direct and indirect effects on taxes, spending, debt and thus on economic growth. In most OICs, energy taxes are considered an important source of revenues. The budgetary effects of increasing energy costs include higher government spending and increased public debt, while economic growth can be affected by increased spending, debt service and budget deficit. Accordingly, the following hypotheses will be tested:

H8: Energy supply has a positive impact on debt.
H9: Spending has a positive impact on debt.
H10: Energy supply has a positive impact on spending.
H11: Spending has a positive impact on economic growth.
H12: Energy supply has a positive impact on taxes.
H13: Taxes have a positive impact on economic growth.

3.3. Methods of Analysis

This study uses the SEM and path analysis techniques to describe the complex sequential relationships between energy supply and economic growth. We investigate these relationships by

constructing a trade path model of the direct and indirect effects of energy supply on imports, exports, cost of production, inflation and thence on economic growth, and a budget path model which portrays the direct and indirect relationships of energy supply with taxes, spending, debt and thence economic growth. The advantage of path analysis over regression is that it performs multiple regression analyses while producing an overall assessment of the model's fit, usually based on chi-squared statistics and maximum likelihood estimation (du Toit and Browne, 2007). Therefore, we use path analysis with maximum likelihood estimation(Maruyama, 1998). In addition, correlation and regression techniques do not capture the indirect effects hypothesized here.

Quarterly data spanning the period 2000-2015 are used in this study and all variables are expressed as natural logs. A time-series SEM model must have a long sequence of observations (Asparouhov et al., 2016). According to Sivo (2001), fitting multiple indicator time series models within the context of SEM is proper and useful. The main sources of data are World Integrated Trade Solution, the IMF and the Jordanian Ministry of Finance and Central Bank. This approach seeks to describe the effects on the economy of changes in energy supply through multiple suppliers. The model includes variables that are assigned to different levels in a sequence of influences. Mathematically, path analysis consists of a repeated sequence of multiple correlation calculations from a correlation matrix, following the sequence of influences. This approach allows us to measure the direct and indirect effects of each variable. Table 1 lists and explains the dependent variable and the independent variables, including energy supply, hypothesized to affect economic growth.

4. RESULTS

Table 2 presents the correlations between energy suppliers and economic growth, imports, exports, the cost of production, inflation, taxes and spending. Energy supplies from Saudi Arabia, Egypt and the international market are positively correlated with economic growth, while energy supply from Iraq is negatively correlated with economic growth. All correlations are significant, except for debt and inflation in the case of Iraq. This result reflects the special relationship whereby Iraq supplied Jordan with energy below the international market price. It can be seen from Table 2 that the Pearson correlation between energy supply from Iraq and economic growth is −0.305, revealing a weak negative relationship between energy supply and economic growth. The sig. (2-tailed) value indicates a statistically significant correlation between energy supply, economic growth and other predicted variables. One of the main objectives of our study is to illustrate not only the correlation between energy supply and economic growth but also indirect and direct effects. Therefore, we conducted path analyses corresponding to the hypotheses as set out in Figure 1.

The fit analysis of the structural model is shown in Table 3. The fit indicators Chi-squared, root mean square error of approximation, incremental fit index, normed fit index and comparative fit index are all above the acceptable level, which means that these models have a certain level of fit (Moss, 2016). The path analysis models showed some interesting results in terms of fit, as explained in Table 3.

The results in Table 4 depict the following results. First, energy supply from Iraq had a direct negative effect on imports and cost of production, and a minimal positive effect on inflation (0.03). Second, the effect of imports on economic growth was negative but not significant (0.06). Third, the indirect impact of imports on inflation was positive (0.28). Fourth, the effect of energy supply on the cost of production was negative, reflecting the dependency of the economy on imported energy and the government's policy to increase energy prices. Fifth, the effect of the cost of production on exports was positive, reflecting the government's subsidy of exports. The effect of exports on economic growth was negative, indicating the weakness of the export base and competitiveness. However, the path analysis also shows the positive effects of cost of production on inflation (0.15) and the positive indirect effect of inflation on economic growth. The total effect of energy supply from Iraq on the cost of production was negative (−0.038), due to the direct effect of energy imports from Iraq: when imports from Iraq rose by one unit, the cost of production fell by 0.038 units. The total effect of energy supply from Iraq on imports was also negative (−0.121) but not significant. The total effects of energy supply on growth, exports and inflation were all negative (−0.036, −0.053, −0.009), due to the indirect effect of importing energy from Iraq. There are several possible reasons for this negative effect on the economy: The fact that Jordan used to import energy from Iraq below the market price, the narrow and weakened export base, the subsidy system which favours some sectors of the economy, the inefficient use of energy and the increased cost of production.

Table 1: List of variables

Dependent and independent variables	Variable	Description
Dependent variable		
Economic growth	Y	Measured by log of GDP
Independent variables		
Cost of production	X1	Measured by producer price index
Inflation	X2	Measured by consumer price index
Spending	X3	Measured by government spending
Imports	X4	Imports of goods and services excluding energy imports
Exports	X5	Measured by total exports
Energy supply	X6	Measured by energy imports from main energy suppliers
Debt	X7	Measured by internal and external public debt
Taxes	X8	Represented by sales tax on domestic goods and special taxes

GDP: Gross domestic product

Table 2: Correlations

Energy supplied by	Export	Import	Debt	Inflation	Cost of production	Spending	Sales tax	Economic growth
Iraq								
Pearson correlation	−0.421**	−0.504**	−0.131	−0.271	−0.302*	−0.478**	−0.400**	−0.305*
Sig. (2-tailed)	0.002	0.000	0.354	0.052	0.030	0.000	0.003	0.028
N	52	52	52	52	52	52	52	52
Saudi Arabia								
Pearson correlation	0.765**	0.826**	0.572**	0.683**	0.708**	0.814**	0.733**	0.716**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	64	64	64	64	64	64	64	64
Egypt								
Pearson correlation	0.802**	0.852**	0.538**	0.690**	0.750**	0.854**	0.732**	0.739**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	64	64	64	64	64	64	64	64
International market								
Pearson correlation	0.839**	0.894**	0.902**	0.940**	0.896**	0.855**	0.849**	0.919**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	64	64	64	64	64	64	64	64

***Significant at 0.001, **Significant at 0.05, *Significant at 0.01

Table 3: Results of structural model fit analysis

Fit indicator	Energy supply from							
	Trade path model				Budget path model			
	Iraq	SA	Egypt	Inter-national market	Iraq	SA	Egypt	Inter-national market
RMSEA	0.776	0.683	0.669	0.602	0.350	0.338	0.357	0.308
IFI	0.726	0.796	0.811	0.851	0.912	0.924	0.918	0.943
NFI	0.721	0.790	0.805	0.846	0.902	0.914	0.909	0.934
CFI	0.721	0.793	0.809	0.85	0.910	0.922	0.917	0.942
Chi-squared	233.611	182.175	175.031	143.097	52.417	49.224	54.062	41.760
	P<0.000	P<0.000	P<0.000	P<0.000	P<0.000	P<0.000	P<0.00	P<0.000

RMSEA: Root mean square error of approximation, IFI: Incremental fit index, NFI: Normed fit index, CFI: Comparative fit index

Table 4: Trade path effects

Country effects	Direct effects	Indirect effects	Total effects
Iraq			
Prodⁿ cost	−0.038	0	−0.038*
Import	−0.121	0	−0.121
Inflation	0.03	−0.039	−0.009***
Export	0	−0.053	−0.053***
Growth	0	−0.036	−0.036***
Saudi Arabia			
Prodⁿ cost	0.093	0	0.093***
Import	0.183	0	0.183***
Inflation	−0.018	0.071	0.053***
Export	0	0.131	0.131***
Growth	0	0.143	0.143***
Egypt			
Prodⁿ cost	0.094	0	0.094***
Import	0.179	0	0.179***
Inflation	−0.026	0.077	0.051***
Export	0	0.132	0.132***
Growth	0	0.138	0.138***
International market			
Prodⁿ cost	0.195	0	0.195***
Import	0.327	0	0.327***
Inflation	0.049	0.072	0.121***
Export	0	0.274	0.274***
Growth	0	0.314	0.314***

***Significant at 1%, *Significant at 10%

Table 4 shows that energy supply from Saudi Arabia differed in its effects on the economy from other suppliers; most notably, the total effect on growth was positive (0.143). Thus, due to the indirect effect of energy imports from Saudi Arabia, when these rose by 1, growth rose by 0.143 points. The total effects on the economy included an increase in imports, inflation and cost of production, except for the direct effect on inflation, which was found to be negative. Among the reasons for this are the cost of energy imports and the removal of energy subsidy that had negative effects on the economy. The analysis shows that the indirect effects of energy supply from Egypt were greater than the direct effects and led to increases in inflation, export and growth by 0.077, 0.132 and 0.138 respectively. The direct effects of energy supply from Egypt were found to be on production costs, imports and inflation. The data show that energy supply from Egypt directly caused increases in production costs and imports of 0.094 and 0.179 respectively, while reducing inflation by 0.026. The indirect effects were a slight increase in inflation (0.077) and increases in exports and growth of 0.132 and 0.138 respectively. Energy supply from the international market directly caused increases in inflation, production costs and imports by 0.049, 0.327 and 0.195 respectively. Hence, the indirect effects on inflation were minimal. Overall, energy supply from international markets led to increased exports and economic growth, but at the same time, it had adverse effects on the cost of production and inflation.

The data in Table 5 show that the direct effects on the economy of obtaining energy from the international market were increased public debt, government spending and taxes, while the indirect effects included an increase in taxes collected from energy and growth. The overall effects of energy supply from Iraq were to reduce taxes, spending, debt and growth. By contrast, energy supply from Saudi Arabia had positive effects on taxes and growth, but negative effects on spending and debt.

The results in Appendices 1 and 2 also support the contention that energy supply has different effects on the economy depending on whether energy is supplied at or below market price. The study supports five of the hypotheses comprising the trade path model and rejects the other two. H1 is supported by data on supplies from Saudi Arabia, Egypt and the international market. Interestingly, links between imports and growth were found to be insignificant; therefore, H2 is not supported. The link between energy supply and cost of production as indicated by H3 is also supported if energy is supplied below or at market price. H6 is rejected if energy is supplied from Egypt or Saudi Arabia, whereas it is supported by supplies from the international market. H7 is supported by all energy suppliers. The results for the budget path model are not exceptional if both historical relations and political economy are taken into consideration. For instance, H10 and H12 are rejected if energy is imported from Iraq, while H8 is rejected if energy supplies come from Saudi Arabia or Egypt. Interestingly, all six hypotheses (H8-H13) are supported if energy is supplied by the international market.

5. CONCLUSION AND IMPLICATIONS

Most OICs struggle to maintain an affordable and reliable supply of energy to ensure economic stability and energy sustainability. According to the World Energy Council (2016), energy sustainability is based on three core dimensions: Energy security, energy equity and environmental sustainability. While ensuring sustainable energy supply is a very important factor, other mediating factors are also important when measuring direct and indirect effects on economic growth. In addition, the results of path analysis indicate several important points for policymakers. When OICs review their energy policies and strategies to ensure sufficient and sustainable flows of energy to their economies, they should take account of the direct and indirect effects of energy supply, although changes in energy suppliers seem to reflect changes in the political economy of the country rather than shifts in energy use. The influence of the political economy and the preferential treatment of supplying energy to OICs below market price were found to have mixed effects on economic growth for both the trade and budget path models. Furthermore, direct and indirect negative effects on the economy indicate the importance for policymakers of focusing more on the diversification of energy suppliers and markets in order to enhance export competitiveness and compete in international markets. There are several potential energy suppliers and routes between Jordan and other countries in the region; among the government's available options are negotiations with international gas companies and with other countries to import natural gas from Qatar, the Gaza strip or Israel. The main aim of the study was to make policymakers aware of the direct and indirect effects of energy supply on economic growth. The results suggest that each energy supplier will have mixed effects on the importing economy. One supplier cannot simply be ranked over another without taking account of the effects on the economy of each source of supply. Our results imply that this study can be used by future researchers to measure and analyse the effects of energy supply on economic growth. Another possible study of the effects of energy supply on economic growth would involve expanding the models by introducing additional independent variables and countries. Meanwhile, the findings of this study should be interpreted in light of some limitations. First, data were collected from only one OIC, so the findings might not hold true for others. Second, the methodology used needs to be interpreted carefully using time series data, because the total population was not sufficiently large to appraise possible changing patterns from 2000 to 2015. Finally, the use of monthly, cross sectional or panel data would be more appropriate in this case.

Table 5: Budget path effects

Country effects	Direct effects	Indirect effects	Total effects
Iraq			
Taxes	−0.126	0	−0.126*
Debt	−0.074	0	−0.074***
Spending	−0.033	−0.095	−0.128
GDP	0	−0.126	−0.126***
Saudi Arabia			
Taxes	0.132	0	0.132***
Debt	0.097	0	0.097
Spending	0.048	0.086	0.134**
GDP	0	0.142	0.142***
Egypt			
Taxes	0.125	0	0.125***
Debt	0.087	0	0.087**
Spending	0.065	0.069	0.134***
GDP	0	0.135	0.135***
International market			
Taxes	0.253	0	0.253***
Debt	0.09	0.153	0.243*
Spending	0	0.196	0.196**
GDP	0	0.299	0.299***

***Significant at 0.001, **Significant at 0.05, *Significant at 0.01. GDP: Gross domestic product

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APPENDICES

Appendix 1: Results of regression weights of trade path model

Energy supply effects	Direction		Estimate	SE	CR	P	Hypothesis	Supported
ES from Iraq	→	Import	−0.121	0.045	−2.698	0.007*	H1	No
ES from Iraq	→	Production cost	−0.038	0.028	−1.365	0.172	H2	No
Production cost	→	Export	1.407	0.069	20.389	***	H3	Yes
Export	→	Growth	0.199	0.019	10.574	***	H4	Yes
ES from Iraq	→	Inflation	0.03	0.003	8.762	***	H5	yes
inflation	→	Growth	1.979	0.134	14.798	***	H6	Yes
Import	→	Inflation	0.279	0.009	29.605	***	H7	Yes
ES from Saudi Arabia	→	Import	0.183	0.016	11.623	***	H1	Yes
ES from Saudi Arabia	→	Production cost	0.093	0.012	7.95	***	H2	Yes
Production cost	→	Export	1.407	0.069	20.389	***	H3	Yes
Export	→	Growth	0.199	0.024	8.395	***	H4	Yes
ES from Saudi Arabia	→	Inflation	−0.018	0.005	−3.506	***	H5	No
inflation	→	Growth	1.979	0.136	14.552	***	H6	Yes
Import	→	Inflation	0.271	0.020	13.750	***	H7	Yes
ES from Egypt	→	Import	0.179	0.014	12.909	***	H1	Yes
ES from Egypt	→	Production cost	0.094	0.01	9.008	***	H2	Yes
Production cost	→	Export	1.407	0.069	20.389	***	H3	Yes
Export	→	Growth	0.199	0.023	8.645	***	H4	Yes
ES from Egypt	→	Inflation	−0.026	0.004	−5.946	***	H5	No
Inflation	→	Growth	1.979	0.144	13.785	***	H6	Yes
Import	→	Inflation	0.316	0.018	17.574	***	H7	Yes
ES from Int. market	→	Import	0.327	0.021	15.87	***	H1	Yes
ES from Int. market	→	Production cost	0.195	0.012	15.991	***	H2	Yes
Production cost	→	Export	1.407	0.069	20.389	***	H3	Yes
Export	→	Growth	0.199	0.031	6.476	***	H4	Yes
ES from Int. market	→	Inflation	0.049	0.011	4.43	***	H5	Yes
Inflation	→	Growth	1.979	0.129	15.318	***	H6	Yes
Import	→	Inflation	0.107	0.023	4.715	***	H7	Yes

***Significant at 1%, *significant at 10%. ES: Energy supply

Appendix 2: Results of regression weights of budget path model

Energy supply effects	Direction		Estimate	SE	CR	P	Hypothesis	Supported
ES from Iraq	→	Debt	0.071	0.021	3.37	***	H8	Yes
Spending	→	Debt	0.872	0.069	12.614	***	H9	Yes
ES from Iraq	→	Spending	−0.02	0.019	−1.042	0.298	H10	No
Spending	→	Growth	0.51	0.06	8.515	***	H11	Yes
ES from Iraq	→	Taxes	−0.09	0.039	−2.319	0.02*	H12	No
Taxes	→	Growth	0.232	0.048	4.801	***	H13	Yes
ES from Saudi Arabia	→	Debt	−0.022	0.019	−1.171	0.242	H8	No
Spending	→	Debt	0.888	0.107	8.262	***	H9	Yes
ES from Saudi Arabia	→	Spending	0.044	0.014	3.12	0.002**	H10	Yes
Spending	→	Growth	0.51	0.06	8.476	***	H11	Yes
ES from Saudi Arabia	→	Taxes	0.132	0.015	8.556	***	H12	Yes
Taxes	→	Growth	0.232	0.048	4.8	***	H13	Yes
ES from Egypt	→	Debt	−0.054	0.018	−2.945	0.003**	H8	No
Spending	→	Debt	1.051	0.11	9.564	***	H9	Yes
ES from Egypt	→	Spending	0.055	0.012	4.434	***	H10	Yes
Spending	→	Growth	0.51	0.06	8.478	***	H11	Yes
ES from Egypt	→	Taxes	0.125	0.015	8.521	***	H12	Yes
Taxes	→	Growth	0.232	0.048	4.8	***	H13	Yes
ES from Int. market	→	Debt	0.204	0.027	7.567	***	H8	Yes
Spending	→	Debt	0.201	0.093	2.162	0.031*	H9	Yes
ES from Int. market	→	Spending	0.09	0.03	2.993	0.003**	H10	Yes
Spending	→	Growth	0.51	0.056	9.09	***	H11	Yes
ES from Int. market	→	Taxes	0.253	0.02	12.778	***	H12	Yes
Taxes	→	Growth	0.232	0.049	4.719	***	H13	Yes

***Significant at 1%, **Significant at 5%, *Significant at 10%. ES: Energy supply