Energy Policy 50 (2012) 795–801

Contents lists available at SciVerse ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

The causal relationship between energy consumption and economic growth in Lebanon

Leila Dagher*, Talar Yacoubian

American University of Beirut, Department of Economics, P.O.Box 11-0236, Riad El-Solh, Beirut 1107 2020, Lebanon

HIGHLIGHTS

- We investigate the energy-GDP nexus for Lebanon.
- Evidence of a bidirectional relationship both in the short- and the long-run is found.
- Reducing outages by expanding electric capacity should thus be prioritized.
- The energy plan calling for a 5% reduction in energy consumption needs to be revised.
- Development of domestic energy sources will help in mitigating energy supply shocks.

ARTICLE INFO

Article history:
Received 27 March 2012
Accepted 15 August 2012
Available online 7 September 2012

Keywords:
Energy consumption
Economic growth
Granger causality

ABSTRACT

This paper investigates the dynamic causal relationship between energy consumption and economic growth in Lebanon over the period 1980–2009. Within a bivariate framework, imposed on us due to data limitations, and in an effort to increase the robustness of our results, we employ a variety of causality tests, namely, Hsiao, Toda-Yamamoto, and vector error correction based Granger causality tests. We find strong evidence of a bidirectional relationship both in the short-run and in the long-run, indicating that energy is a limiting factor to economic growth in Lebanon. From a policy perspective, the confirmation of the feedback hypothesis warns against the use of policy instruments geared towards restricting energy consumption, as these may lead to adverse effects on economic growth. Consequently, there is a pressing need to revise the current national energy policy that calls for a 5% energy conservation target. Also, to shield the country from external supply shocks, given its substantial dependence on energy imports, policymakers should emphasize the development of domestic energy resources. Further, the most pertinent implication is that relaxing the present electric capacity shortages should be made a national priority, in view of its potential positive effect on the economy.

1. Introduction

Since the seminal study of Kraft and Kraft (1978), probably motivated by the oil price shock of 1973, the relationship between energy consumption and economic growth, aka the energy-GDP nexus has been abundantly studied. Examining the energy-GDP nexus is of interest mainly due to its far-reaching policy implications. The type of relationship can be classified into four testable hypotheses. First, if a unidirectional relationship running from energy consumption to economic growth is found, then the economy is said to be an energy dependent one and any energy policy encouraging conservation[1] might adversely affect economic growth. This is known as the growth hypothesis. Second, if the inverse relationship is found, i.e. causality running from GDP to energy consumption, then energy policy will not affect growth, but changes in GDP will directly result in changes in energy consumption. This is known as the conservation hypothesis. Third, a bidirectional or mutual relationship confirms what is known as the feedback hypothesis. In the fourth case, no evidence of any relationship between the two variables is found. This is often referred to as the 'neutrality hypothesis.' In the first three cases, national energy and environmental policies must be carefully designed to take the energy-GDP relationship into consideration.

As a result of the growing interest in climate change and the focus of mitigation activities on the energy sector, as well as the rising cost of energy, energy conservation policies have seen a strong come-back in many countries. However, as can be seen from the relationships presented above, at least in one of the cases, such a policy might negatively impact the economy. In this

* Corresponding author. Tel.: +961 3308891; fax: +961 1744461.
E-mail address: ld08@aub.edu.lb (L. Dagher).

[1] Although energy conservation can take different forms, what we are specifically referring to in this paper is a decrease in energy consumption that is not due to improvements in energy efficiency.

0301-4215/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.enpol.2012.08.034

paper, we examine the case of Lebanon for several reasons. First, in spite of the abundance of studies in this field, none has examined the energy-GDP relationship for Lebanon. One study looked at the electricity-GDP relationship and found evidence supportive of the growth hypothesis (Abosedra et al., 2009). A major drawback of this study is that the authors apply the standard Granger causality tests without explicitly testing for the stationarity of the employed variables.

Second, electricity consumers in Lebanon experience extensive power rationing. If our findings support the growth hypothesis, then this rationing would be harming the economy and eliminating or at least reducing the power outages should be high on the national agenda.

Third, the country is vastly dependent on imported energy. If evidence of an energy-dependent economy is found, then the economy would be highly sensitive to external energy shocks, and policymakers should hence prioritize the development of domestic energy resources.

Finally, the Lebanese government has recently (and for the first time) set a 5% energy conservation target as part of its energy policy (Ministry of Energy and Water (MEW) Lebanese Republic, 2010). Consequently, the type of relationship between energy consumption and GDP is of critical importance, since if this relationship runs from energy consumption to GDP then such a policy might have a negative impact on GDP growth. This study, by shedding some light on the role of energy consumption in economic development, aims at providing insights into the above-mentioned issues that can serve as a basis for future energy and environmental policies.

The remainder of the paper is structured as follows. Section 2 provides a brief review of the literature. In Section 3 we present an overview of the energy sector and the economy in Lebanon, highlighting the country's particularities. Section 4 outlines the model and econometric methodology employed, followed by a presentation and discussion of the results in Section 5. Finally, in Section 6, we offer some concluding remarks on the results and some policy implications.

2. Literature review

Some researchers have chosen to examine single countries, while others have studied several countries simultaneously in a panel data analysis framework. Typically, aggregate energy consumption is used as a proxy for energy consumption, but sometimes more disaggregated levels (e.g. residential, commercial, etc.) or specific energy sources have been examined (coal, nuclear, etc.). The main trend tends to be a bivariate analysis; the two variables being energy consumption and GDP (see inter alia, Altinay and Karagol, 2004; Ghosh, 2002; Soytas and Sari, 2003; Yoo, 2005). Bivariate models are especially attractive in that they can be used for countries that suffer from a complete lack of data on some variables of interest (Zachariadis, 2007), as is typical in many developing countries. In a recent survey, Payne (2010) notes that 26 of the 35 studies surveyed employ bivariate models. Some other studies have conducted multivariate analyses based on theoretical considerations such as demand or production functions. The former typically includes the price of energy as a third variable (see inter alia, Asafu-Adjaye, 2000; Bloch et al., 2011; Masih and Masih, 1997, 1998) and the latter usually includes measures for capital and labor (see inter alia, Apergis and Payne, 2009a, 2009b; Oh and Lee, 2004; Stern, 1993, 2000; Wolde-Rufael, 2009).

Recently, some studies have tried to find linkages with the environmental pollution-economic growth nexus usually investigated within the "Kuznets curve" framework, and have thus included emissions as a third variable in their model (see inter alia, Menyah and Wolde-Rufael, 2010; Nasir and Rehman, 2011; Pao and Tsai, 2010).

Generally speaking, existing studies have yielded conflicting results even for the same country. Researchers have attributed this divergence to differences in model specifications, sample periods, and estimation and testing methodologies (Apergis and Payne, 2011). An exhaustive review of the literature can be found in Payne (2010) or Ozturk (2010). Overall, these reviews highlight the importance of using large samples and multivariate models, when data availability allows that.

Besides the immediate policy implications of the energy-GDP nexus, some researchers have gone one step further in their policy recommendations, by concluding which countries can successfully implement the Kyoto Protocol without hurting their economic growth and which ones cannot (Lee, 2006). Also, some researchers suggest that energy resource endowment might have an impact on the direction of causality. For example, Wolde-Rufael (2009) finds evidence supporting the growth hypothesis in oil rich countries, while Al-Iriani (2006), in contrast, finds support for the conservation hypothesis for the Gulf Cooperation Council (GCC) countries. Examining a group of African countries, Eggoh et al. (2011) find evidence that the energy consumption-economic growth relationship is different for energy exporters versus energy importers.

A few studies suggest that countries in comparable stages of development can adopt similar energy policies and strategies, because the causal relationship between energy consumption and growth depends in part on the country's stage of development. Apergis and Payne (2011) categorize 88 countries into four panels based on the World Bank income classification and conduct a multivariate panel analysis. They conclude that the relationship between electricity consumption and growth is a function of a country's stage of development. Bildirici and Kayikci (2012), in their turn, divide the Commonwealth of Independent States into three groups based on the income per GDP level and investigate the electricity-growth nexus by group. Similarly to Apergis and Payne (2011), they find that the electricity-GDP relationship does differ across groups.

In contrast, other studies have suggested that the energy-growth nexus is country specific, and hence one cannot generalize to include countries in the same stage of development or in the same geographical region. Akinlo (2008) explores the energy-growth relationship in 11 sub-Sahara African countries, and concludes that African countries cannot adopt the same energy conservation policies, but rather each country needs to develop its own energy strategy based on its peculiar characteristics. Similarly, Acaravci and Ozturk (2010) find different energy-growth relationships for each member of a set of 19 developed European countries. The results for four Asian developing countries investigated by Asafu-Adjaye (2000) and eight newly industrialized Asian countries investigated by Chiou-Wei et al. (2008) also confirm the hypothesis that the energy-growth relationship is not determined by the level of development in a country.

As noted earlier, in the existing body of the literature only one study investigates the electricity-GDP relationship for Lebanon (Abosedra et al., 2009). It is very likely that the unavailability of data was the main reason for excluding Lebanon from large panel studies especially when these are conducted within a multivariate framework (see e.g. Apergis and Payne, 2011; Costantini and Martini, 2010; Huang et al., 2008; Joyeux and Ripple, 2011; Lee and Chang, 2007; Mahadevan and Asafu-Adjaye, 2007; Narayan and Smyth, 2009; Narayan et al., 2010; Ozturk and Acaravci, 2011; Ozturk et al., 2010; Sharma, 2010).