Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia

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ABSTRACT

This paper assesses the relationship among energy consumption, financial development, economic growth, industrialization and urbanization in Tunisia from 1971 to 2008. The autoregressive distributed lag bounds testing approach to cointegration and Granger causality tests is employed for the analysis. The result confirms the existence of long-run relationship among energy consumption, economic growth, financial development, industrialization and urbanization in Tunisia. Long-run bidirectional causalities are found between financial development and energy consumption, financial development and industrialization, and industrialization and energy consumption. Hence, sound and developed financial system that can attract investors, boost the stock market and improve the efficiency of economic activities should be encouraged in the country. Nevertheless, promoting industrialization and urbanization can never be left out from the process of development. We add light to policy makers with the role of financial development, industrialization and urbanization in the process of economic development.

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1. Introduction

The objective of this paper is to assess the relationship among energy consumption, financial development, economic growth, industrialization and urbanization in Tunisia. Being one of the fastest growing economies in the North African region, Tunisia is an interesting case study as it faces energy shortage in fulfilling its growing energy needs. It is also important to investigate the direction of causal relationship between energy consumption and economic growth. If the causality runs from economic growth to energy consumption, energy conservation policies should be encouraged in reducing CO_2 emissions. On the other hand, the energy reduction policies may have inverse impact on economic growth if energy consumption Granger causes economic growth.

The role of financial development in an economy is widely discussed in the economic literature. Both cross-country and country-specific studies discussed the importance of financial development on economic growth. A well established and developed financial system increases the efficiency and effectiveness of financial institutions and boosts the innovations in the financial services delivery system. It also helps the advancement of technology, reduction of information cost and profitability of investment.[1]

Improvement in monetary transmission mechanism, as a result of financial liberalization, also encourages savings and investment and enhances economic growth. Literature shows that liberalization of financial markets leads to economic growth.[2] An opposite view is also found in the literature, which states that financial development is a result of economic growth.[3]

A pioneering study by Kraft and Kraft (1978) found that economic growth caused growing energy demand in the United States during 1947–1974. According to Wolde-Rufael (2009) and Apergis and Payne (2009a, 2009b, 2010), rise in energy demand in emerging countries is due to increases of income. To fulfill the growing needs of their people, the emerging countries need more production, which leads to more energy consumption.

Several control variables are used in literature to explain the relationship between energy consumption and economic growth. Population growth, urbanization and industrialization are among the important factors that will boost energy consumption. Rapid growth in population will lead to urbanization, which may further cause more usage of energy. On the other hand, industrialization affects the energy consumption directly and indirectly. Industrialization means enhancement of plants to expand production and hence energy consumption. Industrial growth contributes to economic growth through cross-sectoral growth that further

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[1] See Levine (1996), Bairer et al. (2004) and Abu-Bader and Abu-Qarn (2008) for more discussion.

[2] See Beakert and Harvey, 2000; Beakert et al. (2001, 2002, 2005) and Fung (2009).
[3] See Robinson (1952), Lucas (1988) and Stern (1989).

enlarges the demand for energy. Furthermore, industrial growth also increases the demand for labor and thus improves their income. The rise of income boosts the demand for consumer items such as cars, TVs, refrigerators, computers, etc., which increases the energy consumption.

Much of the literature on energy focuses on the nexus of output–energy, which portrays only a partial picture of the problem. According to Boulila and Trabelsi (2004), financial development causes economic growth in Tunisia, which may further cause more energy consumption. To the best knowledge of the authors, this is the only comprehensive study that takes into account financial development, industrialization and urbanization in the energy–growth nexus for Tunisia and uses the longest available data from 1971 to 2008, making the estimation more reliable. The finding may help policy makers to better understand some of the intricate development that confronts Tunisia.

The rest of the paper is organized as follows. Section 2 reviews the literature and Section 3 describes data and methodology. Results are reported in Section 4 and the conclusion is in Section 5.

2. Literature review

The relationship between financial development and economic growth is complex in both empirical and theoretical literatures (McKinnon, 1973; Bascom, 1994; Dow, 1996; Kaminsky and Schmukler, 2003; Claessens and Laeven, 2004). Without scanning the prevailing economic situation, steps taken for financial development and financial liberalization may be harmful to the economy (Stiglitz, 2000; Rogoff, 2004; Arestis and Stein, 2005). The competition between domestic and foreign banks makes the financial market more flexible and generates more and new opportunities for investment. This flexibility enhances the relationship between economic growth and financial development (Mankiw and Scarth, 2008; Karanfil, 2008; Sadorsky, 2010).

According to Karanfil (2009), the causality between economic growth and energy consumption is not justified just by a simple bivariate model.[4] He suggested adding one of the financial variables such as domestic credit to private sector, stock market capitalization or liquid liabilities into the model. He also argued that interest rate and exchange rate can affect the energy consumption through energy prices. In this regard, Stern (2000) indicated the omission of relevant variables from the model. Furthermore, positive and significant relationships between energy consumption and economic growth are found by Lee and Chang (2008) by including capital stock in the model for some Asian countries.

Bartleet and Gounder (2010) studied the casual relationship between energy consumption and economic growth using both bivariate and multivariate models. They found that economic growth, employment and energy consumption have cointegration relationship. The causality results show that economic growth causes energy consumption and economic activity determines the increase of energy demand. Using the neo-classical production function, they found that capital stock plays an important role in determining the direction of casual relationship between energy consumption and economic growth, and real GDP and employment also significantly affect the energy consumption.

Sadorsky (2010) used different indicators[5] of financial development in twenty-two emerging economies during the period

1990–2006. They found that the impact of financial development on energy demand is positive and significant but small. Shahbaz et al. (2010) suggested a significant and positive effect of financial development on energy consumption in Pakistan. The causality analysis indicated bidirectional casual relation between financial development and energy consumption. In Malaysia, Islam et al. (2011) revealed that financial development and economic growth have positive impact on energy consumption. Different from Pakistan, a unidirectional causality was found running from financial development to energy consumption in Malaysia.

On the energy–growth relation, Chontanawata et al. (2008) showed that energy consumption Granger causes economic growth in the OECD countries but the reverse happened in the non-OECD countries. They also commented that energy conservation policies may have inverse effect on economic growth. Ozturk et al. (2010) indicated that economic growth Granger causes energy consumption in the low income countries while feedback hypothesis is found in the middle income countries. Similarly, Ozturk and Acaravci (2010) revealed the bidirectional causal relation between energy consumption and economic growth in Hungary. Altunbas and Kapusuzoglu (2011) found no long-run causality between energy consumption and economic growth but short run unidirectional causality runs from economic growth to energy consumption in the United Kingdom.

Belloumi (2009) confirmed cointegration and bidirectional causal relationship between energy consumption and economic growth in Tunisia. However, by applying the bivariate Johansen cointegration and Granger causality approaches, their findings may be biased. Lütkepohl (1982) argued that omissions of important variables provide biased and inappropriate results on the relationship. Bartleet and Gounder (2010) also recommended incorporating other pertinent variables that also play an important role to elucidate the energy–growth nexus. Thus, we try to fill this research gap by investigating the relationship with a multivariate model.

3. Data and methodology

The sample used is annual data covering the period 1971–2008 taken from the World Development Indicators (WDI-CD, 2009). Energy consumption is measured by total energy consumption per capita (kg of oil equivalent). Domestic credit to private sector as share of GDP is the proxy for financial development.[6,7] Real GDP per capita measures the economic growth, industrial value added as share of GDP is the proxy for industrialization and urban population as share of total population is the proxy for urbanization.

Log–linear specification produces a better result compared to the linear functional form of model. Thus, all data are transformed to natural logarithmic. Modified from Sadorsky (2010), the basic

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[4] Kaplan et al. (2011) incorporated energy prices, capital and labor as important variables for demand and production models and confirmed feedback hypothesis between energy consumption and economic growth.

[5] FDI, deposit money to total bank assets as share of GDP, stock market capitalization as share of GDP, stock market turnover ratio and total stock market value traded over GDP.

[6] The measure for domestic credit is obtained from banking sector, including gross credit to various sectors but with the exception of credit to the central government. Banking sector includes monetary authorities, deposit money banks and other banking institutions for which data are available. It also includes institutions that do not accept transferable deposits but incur such liabilities as time and savings deposits. This is a broad measure for the development of financial sector.

[7] Several researchers have used liquid liabilities as share of GDP (LLY) to proxy for financial development (McKinnon, 1973; King and Levine, 1993). The measure does not present a true picture of financial development as it shows the volume of financial sector but not financial development. Increase in LLY does not show savings mobilization. This may misrepresent some nations having high indicator even with an underdeveloped financial market. Among other measures to proxy for financial development are the ratio of commercial bank assets to the sum of commercial bank and central bank assets. The most common proxy is domestic credit to private sector as share of GDP, e.g. (see Yucel (2009) for further details).