



# The short and long run causality relationship among economic growth, energy consumption and financial development: Evidence from South Mediterranean Countries (SMCs)



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## ABSTRACT

This study aims at examining the short-run and long-run causal link between economic growth, energy consumption and financial development by using data set of 6 SMCs for the 1995–2015 periods. The basic testing procedure requires four steps: ADF and PP unit root tests, Bound tests for Co-integration, ARDL approach and VECM method. The results confirm cointegration between the variables. It means that the long-run relationship exists. The short-run causal relationships (unidirectional) exist at least once for each country (except Egypt). The Granger causality results for individual countries give mixed results. These results urge for the attention of the policy makers in SMCs to design a comprehensive energy conservation policy to minimize the consequences of massive energy consumption on economic growth by adding financial development.

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## 1. Introduction

The world has known for over a century an important economic development. Industrial developments, the increase in the number of vehicles and domestic equipments have led to a significant increase in energy demand. Energy is an essential basis for social and economic development. States must ensure adequate supply of energy for their citizens while ensuring the sustainability of that supply. Energy supply is a permanent challenge for our societies, especially as the need for states continues to increase. Overall, the SMCs are facing rapid population growth coupled with relatively low incomes, as well as an accelerated pace of urbanization, added to significant needs of socio-economic development. This is reflected in a growing demand for energy services and associated infrastructure. Indeed, in all SMCs, energy demand is constantly increasing. To meet their energy needs, the SMCs use about 95% of fossil fuels. If the trend observed has continued for 30 years, energy consumption could increase by 65% between 2000 and 2025 and be 97% would be satisfied by fossil energies in 2025. Such a scenario will have many consequences, such as: increased energy dependency and insecurity, high energy bills (importing countries), reduced export profits (exporting countries), vulnerability of the production and

distribution system, high local air pollution and as well as climate change. In the same context, the question of financing goes far beyond that of mobilizing the financial resources of international cooperation. The financial development can provide efficient financial service for foreign banking markets, and improve the access of both foreign and domestic firms to financial goods and services (Dasgupta et al., 2001; Barth et al., 2004; Lee and Chang, 2008). According to Karanfil (2008) and (2009), the causality between economic growth and energy consumption is not justified just by a simple bivariate model. 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. Furthermore, Fung (2009) study found that an efficient financial system creates more products, and the inputs for these products increase the demand for energy. Thus, financial development is a factor which should be taken into account in energy consumption. (See Fig. 1.)

Sadorsky (2011) pointed three effective channels of financial development over energy consumption. First, there is a direct effect. When the financial development improves, consumers can borrow easier and cheaper in order to buy durable goods which consume a lot of energy. Secondly, improved financial development helps businesses to access to financial capital easily and less costly. Additionally, stock

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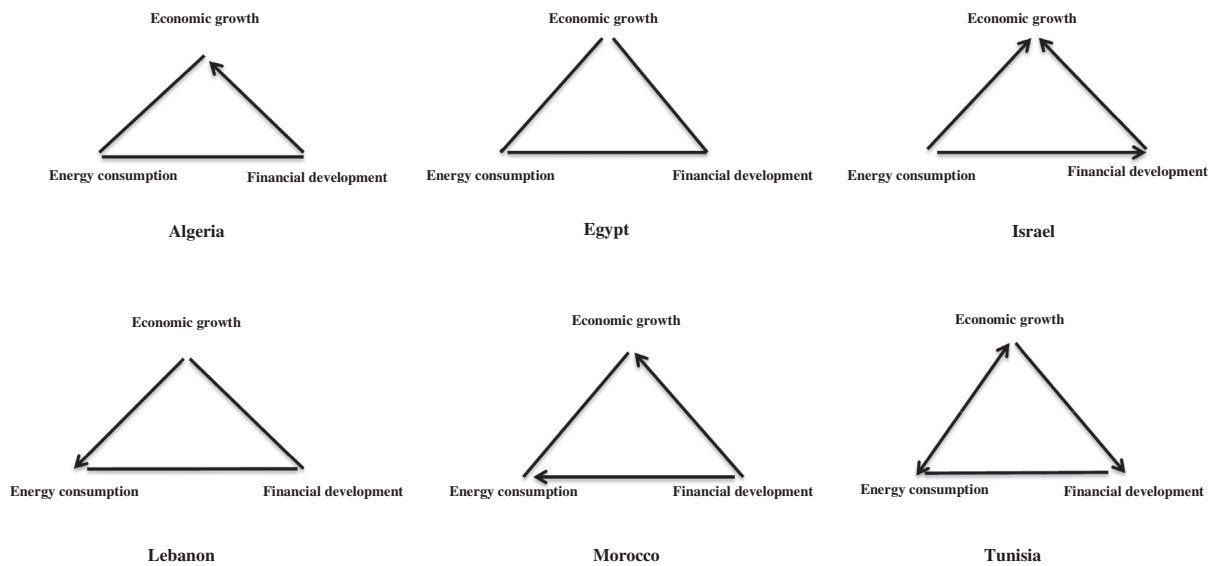


Fig. 1. Triangles of causality.

market development can also affect businesses by providing them with additional funding source. These ones can let businesses expand (business effect). Thirdly, the wealth effect: increased stock market activity usually affects the confidence of consumers and businesses by creating wealth effect. Increased economic confidence may expand the economy and promote energy demand. The relationship between financial development and energy consumption has been discussed in recent previous studies (Mielnik and Goldemberg, 2002; Sadorsky, 2011; Islam et al., 2013; Shahbaza et al., 2016). The econometric approach of empirical studies often is based on a linear dynamic panel model (Sadorsky, 2010; Ozturk and Al-Mulali, 2015; Shahbaz et al., 2017), autoregressive distributed lag (ARDL) bounds (Fuinhas and Marques, 2012; Shahbaza et al., 2016; Bekhet et al., 2017), a cointegration model (Islam et al., 2013; Mahalik et al., 2017), or Granger causality (Dan and Lijun, 2009; Furuoka, 2015). Energy is seen as the indispensable tool for sustainable development. In these circumstances, determining the causal link between energy consumption, financial development and economic growth is of particular importance to researchers and decision-makers. Indeed, it allows deducing the implications of adequate energy, economic and financial policies to achieve the objective of economic development. To the best of our knowledge, there has never been an attempt to investigate the short and long run causality among economic growth, energy consumption and financial development for SMCs. There are few studies available in the existing literature investigating the causal relationship between economic growth, energy consumption and financial development (Alam et al., 2015; Mahalik et al., 2017; Bekhet et al., 2017). According to the conclusion derived from these studies, the previous literature that focuses on the cointegration and causal relationship between growth, energy and financial development is not conclusive to provide policy recommendation that can be applied across countries. This paper therefore aims at fulfilling this gap and contributing to empirical literature. The purpose of this study is to investigate the relationship between economic growth, energy consumption and financial development in the 6 SMCs for the period 1995–2015 using multi-steps methodology: Stationary, Co-integration tests, autoregressive distributed lag (hereafter ARDL) and vector error correction model (hereafter VECM). The ARDL bounds testing approach investigates short run as well as long run parameter instantaneously.

The rest of the paper proceeds as follows: Section 2 provides a literature review on financial development, energy consumption and economic growth. Section 3 describes empirical methodology for this

study. Section 4 reveals empirical findings and discussion. Section 5 concludes with a summary of the main findings and policy implications.

## 2. Literature review

In the past few years, the causal link between energy consumption and economic growth has gained increasing attention in the recent literature (Islam et al., 2013; Khan et al., 2014; Shahbaz and Lean, 2012; Shahbaz et al., 2013a, 2013b; Omri and Kahouli, 2014a, 2014b; Mahalik et al., 2017; Bekhet et al., 2017). The empirical findings of the existing energy literature are not unambiguous due to the use of various econometric approaches such as correlation analysis, simple regressions, bivariate causality, unit root tests, multivariate cointegration, panel cointegration, VECM, ARDL, inter alia. However, the empirical studies that examine the relationship between financial development, energy consumption and economic growth in a systematic manner still lack. As Table 1 demonstrates, the findings of these studies are inconclusive. These empirical studies show a range of conflicting results: vary vastly in terms of signs, magnitudes and significance. Some researchers have found a negative relationship and no causal relationship between financial development and energy consumption (Mielnik and Goldemberg, 2002; Dan and Lijun, 2009; Shahbaz et al., 2013a, 2013b), while others detected a positive and a bidirectional causality between financial development and energy consumption (Sadorsky, 2011; Al-Mulali and Sab, 2012a, 2012b; Islam et al., 2013; Khan et al., 2014; Omri and Kahouli, 2014a, 2014b; Alam et al., 2015; Bekhet et al., 2017). To be more specific, Dan and Lijun (2009) apply Granger causality to test the relationship between energy consumption and financial development in China's Guangdong province. They showed that financial development failed to increase energy consumption. Furthermore, Sadorsky (2010) detected a direct link between financial development and energy consumption by using the dynamic panel method in 22 developing countries for the period of 1990–2006. His findings indicated that there was a significant positive relationship between financial development and energy consumption. In addition, Sadorsky (2011) examined the impact of financial development on energy consumption in a sample of 9 Central and Eastern European frontier economies. The empirical results, obtained from dynamic panel demand models, show a positive and statistically significant relationship between financial development and energy consumption. In a similar way, Xu (2012) investigated the nexus between financial development and energy consumption during the period 1999–2009 with a panel data set in 29

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