Financial development, environmental quality, trade and economic growth: What causes what in MENA countries ☆

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ABSTRACT

This paper examines the relationship between financial development, CO_2 emissions, trade and economic growth using simultaneous-equation panel data models for a panel of 12 MENA countries over the period 1990–2011. Our results indicate that there is evidence of bidirectional causality between CO_2 emissions and economic growth. Economic growth and trade openness are interrelated i.e., bidirectional causality. Feedback hypothesis is validated between trade openness and financial development. Neutrality hypothesis is identified between CO_2 emissions and financial development. Unidirectional causality running from financial development to economic growth and from trade openness to CO_2 emissions is identified. Our empirical results also verified the existence of environmental Kuznets curve. These empirical insights are of particular interest to policymakers as they help build sound economic policies to sustain economic development and to improve the environmental quality.

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1. Introduction

The relationship between energy consumption and economic growth has been the subject of considerable academic research over the past few decades (Omri, 2013). Various studies have focused on different countries, time periods, modeling techniques and different proxy variables which have been used for energy consumption and economic growth nexus (e.g., Apergis and Payne, 2009; Baranzini et al., 2013; Ghosh, 2010; Stern, 1993; Wolde-Rufael, 2005; Yuan et al., 2007), but in general the empirical results are mixed and have not reached a unique consensus (Chen et al., 2007; Omri, 2014). From the existing studies, one can observe that the Granger causality test has been widely carried out to study the direction of causality between the two variables

(Farhani et al., 2014). However, it is clear that the literature on energy consumption–growth nexus produced inconclusive results and there is a consensus neither on the existence nor on the direction of causality (Farhani et al., 2014). A major reason for the absence of consensus is that the Granger causality test in a bivariate framework is likely to be biased due to the omission of relevant variables affecting energy consumption and economic growth nexus (Stern, 1993).

This problem has led some recent Granger causality based-studies investigating the causal links between energy consumption and economic growth to incorporate capital and labor in the multivariate models (e.g., Apergis and Payne, 2010a; Bartleet and Gounder, 2010; Zhixin and Xin, 2011; Sadorsky, 2012; Shahbaz and Lean, 2012). Recently, some other studies have incorporated trade openness in the production function in order to investigate the relationship between economic growth, capital, labor and trade (e.g., Lean and Smyth, 2010a; Narayan and Smyth, 2009; and Sadorsky, 2012). In addition to energy and trade, some of the recent studies such as Islam et al. (2013) and Ozturk and Acaravci (2013) have included financial development in the production function. Financial development, which refers to a

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country's decision to allow and promote activities like increased foreign direct investment (FDI), increases in banking activity, and increases in stock market activity, presents one possible avenue for which economic growth can be increased (Sadorsky, 2010).

Several existing studies in energy economics have argued that energy consumption and economic growth may generate considerable pressure on the environment quality (e.g., Apergis and Payne, 2010b; Arouri et al., 2012; Omri et al., 2014; Shahbaz et al., 2013b; Tiwari et al., 2013). As often mentioned in the environmental Kuznets curve (EKC) literature, as output increases, carbon dioxide emissions increase as well until some threshold level of output was reached after which these emissions begin to decline. An assessment of the existing literature reveals that at the time of writing this work, papers by Ozturk and Acaravci (2013) in Turkey, and Shahbaz et al. (2013b) in South Africa, appear to be the only published papers specifically investigating the relationship between economic growth, energy, trade, financial development, and CO_2 emissions. The main contribution of these studies is to allow examining the causal relationships between economic growth, energy consumption, trade, financial development, and CO_2 emissions in an integrated framework and with a time series econometric model. Given that these five variables are strongly interrelated, the use of a naive bivariate or trivariate framework may be subject to the omitted variable bias (Ang, 2009; Jayanthakumaran et al., 2012).

The objective of this study is to use production function approach where GDP depends on CO_2 emissions, capital and others inputs such as financial development and trade. The extended Cobb–Douglas production framework helps us to explore the causal relationships among the variables: economic growth, capital, CO_2 emissions, financial development and trade. The variables are chosen to capture the particular characteristics of MENA countries. Our study thus contributes to the existing literature by giving the first integrated approach to examine the four-way linkages between economic growth, CO_2 emissions, financial development and trade in the Middle East and North Africa (MENA) region by using the simultaneous-equation models with both panel and time series econometric techniques for 12 MENA countries over the period 1990–2012. Specifically, this study uses four structural equation models, which allows one to simultaneously examine the impact of (i) CO_2 emissions, financial development and trade on economic growth, (ii) economic growth, financial development and trade on CO_2 emissions, (iii) economic growth, CO_2 emissions and trade on financial development, and (iv) economic growth, CO_2 emissions and financial development on trade. Therefore, more useful and reliable information can be provided to the policymakers to formulate effective policies to promote long-term economic growth for the MENA region. This region was chosen as the focus of this study because empirical analysis of countries in this region is relatively scarce. In addition, the characteristics of the countries in the MENA region are very suitable to the case of the present study, for example, this region has some of the largest energy reserves in the world. Yet, while the region is trying to industrialize and modernize its economies, there are the challenges of the carbon emissions. Moreover, energy consumption is the most significant source of pollution and, in terms of particulate matter concentrations, MENA represents the second most polluted region in the world – after South Asia – and the highest CO_2 producer per dollar of output.

The algorithm of the article is as follows: Section 2 briefly reviews the related literature, followed by Section 3 that is going to outline the econometric modeling approach and describe the data used, Section 4 depicts the empirical findings and the final section, Section 5, holds the concluding annotations and offers some policy implications.

2. Literature review

Several existing works on the nexus among economic growth and CO_2 emissions, financial development and trade are carried on a piecemeal basis without a comprehensive model in mind and thus ignore the potential interaction among the series. Thus this paper reviews the

literature under three subsections, i.e., (a) economic growth and CO_2 emissions; (b) financial development and CO_2 emissions (c) trade openness and financial development. We discuss them in turn below.

2.1. Economic growth and CO_2 emissions

The relationship between economic growth and CO_2 emissions has been intensively analyzed empirically over the past two decades. This nexus is closely related to testing the validity of the so-called environmental Kuznets curve (EKC) hypothesis. Several existing studies on this nexus have argued that the level of environmental degradation and economic growth follows the inverted U-shaped relationship. This U-shaped relationship is known as the Environmental Kuznets Curve (EKC) in the literature. This relationship has been examined since the 1990s after Grossman and Krueger (1991) and Selden and Song (1994) provided empirical evidence that economic growth leads to a gradual degradation of the environment in its initial stages and, after a certain level of growth, it leads to an improvement in the environmental conditions.

Following this seminal study, a number of works such as inter alia, Stern et al. (1996), Ekins (1997), Heil and Selden (1999), Managi and Jena (2008), Fodha and Zaghdoud (2010), Jaunky (2010), Ozturk and Acaravci (2010), and Saboori et al. (2012) tested the EKC hypothesis. However, these studies show a range of conflicting results.

Whereas some research found a linear relationship between CO_2 emissions and economic growth (e.g., Azomahou et al., 2006; Shafik, 1994) others reported an inverted U-shaped relationship (e.g., Lean and Smyth, 2010b; Saboori et al., 2012) or even an N-shaped relationship (e.g., Friedl and Getzner, 2003; Shafik, 1994) others showed no relationship (e.g., Richmond and Kaufmann, 2006). One limitation of this branch of the literature is that they are likely to suffer from the omitted variable bias problem for the simple reason that their empirical model is only a bivariate one.

For that reason, some studies included other potential determinants of CO_2 emissions such as trade openness in order to test the pollution haven hypothesis by Halicioglu (2009), Nasir and Rehman (2011); urbanization by Zhang and Cheng (2009), Hossain (2011), and Sharma (2011); and financial development by Ozturk and Acaravci (2013). However, the multivariate studies also produce conflicting results on the existence of EKC. While Ang (2007) for France, Jalil and Mahmud (2009) for China, Nasir and Rehman (2011) for Pakistan, and Omri (2013) for 12 MENA countries succeed in finding an inverted-U shaped curve between economic growth and CO_2 emissions, others could not (Halicioglu, 2009; Ozturk and Acaravci, 2010 all for turkey; Jaunky, 2010 for 36 high-income countries; and Menyah and Wolde-Rufael, 2010 for South Africa).

2.2. Financial development and CO_2 emissions

Financial infrastructure can enhance economic growth and lower CO_2 emissions (Tamazian et al., 2009). However, Sadorsky (2010) and Zhang (2011), argue that financial development increases CO_2 emissions. According to these studies, financial development leads to increase in CO_2 emissions in the following ways: First, stock market development helps listed enterprises to lower financing costs, increase financing channels, disperse operating risk and optimize asset/liability structure, so as to buy new installations and invest in new projects and then increase energy consumption and carbon emissions. Second, financial development may attract foreign direct investment so as to boost economic growth and increase carbon emissions. Third, prosperous and efficient financial intermediation seems conducive to consumers' loan activities, which makes it easier for consumers to buy big ticket items like automobiles, houses, refrigerators, air conditioners, washing machines, etc. and then emit more carbon dioxide (Zhang, 2011).

Recent studies which examine the relationship between financial development on CO_2 emissions are as follows: Tamazian and Bhaskara Rao (2010) argue that financial development in transition countries may exert evident influence on CO_2 emissions. Jalil and Feridun