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A contribution of foreign direct investment, clean energy, trade openness, carbon emissions and economic growth to energy demand in UAE

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ABSTRACT

This paper investigates the relationship between foreign direct investment, clean energy, trade openness, carbon emissions and economic growth in case of UAE covering the period of 1975Q1–2011Q4. We have tested the unit properties of variables in the presence of structural breaks. The ARDL bounds testing approach is applied to examine the cointegration by accommodating structural breaks stemming in the series. The VECM Granger causality approach is also applied to investigate the causal relationship between the variables. Our empirical findings confirm the existence of cointegration between the series. We find that foreign direct investment, trade openness and carbon emissions decline energy demand. Economic growth and clean energy have positive impact on energy consumption.

1. Introduction

The economic impacts of foreign direct investment have been analyzed thoroughly by scholars since a few decades. Earlier studies were developed by the seminal papers of Singer (1950), Prebisch (1950), Hymer (1960) and later by Buckley and Casson (1976). These studies have analyzed the impacts of FDI on economic growth for both target and receiving countries during the prosperous decades. Broadly, literature on FDI is divided in two axes. The first one analyses the effects of FDI on economic growth from microeconomic viewpoint (Ragazzi (1973), Stulz (1981), Doukas and Travlos (1988), Rivoli and Salorio (1996), Gorg and Greenaway (2002) among others) while the second one examines the impacts of FDI on economic growth from a macroeconomic viewpoint (Bos et al., 1974; Blomstrom and Kokko, 1996; Borensztein et al., 1998; Barrell and Pain, 1997; Carcovic and Levine, 2002). Nevertheless, the empirical studies reveal conflicting results in both levels (Hamdi et al., 2013). For example, numerous studies found that FDI can spur economic growth of the host country through capital accumulation, productivity efficiency, the diffusion of technologies and the introduction of new methods and procedures (Caves, 1982; Borensztein et al., 1998; Bende-Nabende et al., 2003). These studies showed that FDI promotes economic growth indirectly through the direct diffusion of technology which in turn augments the stock of knowledge in the host country through labor training and skill acquisition, new management practices and organizational arrangements (De Mello, 1999). In contrast, numerous microeconomic studies did not find evidence for horizontal technology transfer. Moreover, most of the empirical studies using the intra-industry sector might not be suitable for capturing wider spillover effects on the host economy, such as those created by backward and forward linkages with domestic firms (Alfaro et al., 2004; Shahbaz and Leitao, 2010). The study of Hanson (2001) finds weak positive impacts of FDI for receiver countries. Gorg and Greenaway (2002) reviewed a survey of intra-industry panel work in developing, developed and transitional economies. Their investigation shows that the evidence in support of positive spillovers is rather limited. However, the study of Lipsey (2002) reviewing the micro literature shows an evidence of positive spillover effects of FDI inwards in receiver countries.

Regarding macroeconomic studies,[2] results are also ambiguous (Findlay, 1978; Wang and Blomstrom, 1992; Saltz, 1992; Borensztein et al., 1998; Lipsey, 2002; Carkovic and Levine, 2002). Findlay (1978) showed that FDI raises the degree of technical progress in receiver countries via a contagion of the technology transfer. Borensztein et al. (1998) test the effects of foreign direct investment (FDI) on economic growth in a cross-country regression framework, utilizing data on FDI flows from industrial countries to 69 developing countries over the period 1970–89. They found that FDI affects positively economic growth through the upward of technological progress. Dolan and Tomlin (1980) empirically examined the effect of FDI on economic growth and they found that FDI was positively linked with growth of per capita income

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[2] Gorg and Greenaway (2002), Alfaro et al. (2004) and Lyroudi et al. (2004) provide an excellent review of literature on FDI-growth nexus.

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but that the stock of FDI had a negative effect on economic growth. Dauda (2007) argued that when a country chooses an export-promotion strategy, FDI will positively impact economic growth via trade openness. Similar results were found by Campos and Kinoshita (2002) in which FDI, in the form of pure transferred technology, has a positive and significant impact on economic growth. In contrast, Saltz (1992) empirically examined the FDI-growth nexus for a panel of 75 developing countries during the period 1970–1980. He found a negative relationship between the level of FDI and growth. Lyroudi et al. (2004) found that foreign direct investment does not have any significant relationship with economic growth for transition countries. Lipsey (2002) reviews the empirical studies on FDI-growth nexus and concludes that there is no reliable linkage between the volume of inward FDI stocks or flows relative to GDP and growth. The empirical investigation of Carcovic and Levine (2002) examining the FDI inflow-growth nexus for a panel of 72 countries during the period 1960–1995 revealed that FDI inflows did impact economic growth for both developed and developing economies. Balasubramanyam et al. (1996) examined the impacts of FDI on economic growth in developing economies. Their results reveal no evidence of FDI-led-growth in receiver countries with export based strategy but they found an evidence of FDI-growth in countries with an import substitution strategy.

Recently, several studies on FDI literature have been focused on the spillover effects of FDI on the environment (energy consumption, pollution, dioxide carbon emission, clean energy usage, etc.). These studies show that FDI could threat the environment on the one hand as it could be a source of energy reduction on the other hand. In general, these studies show that foreign direct investments may have positive externalities as explained before but also lead to negative externalities. For example, according to the constant return to scale of production function, foreign direct investment has a direct impact on production of the host country and hence economic growth depending on the country absorptive capacity. This may affect energy consumption and it is known as scale effect. The scale effect keeps energy intensity constant which is considered as indirect positive impact of foreign direct investment on energy consumption. The study of Mielnik and Goldemberg (2002) examined the foreign direct investment-energy consumption nexus while including economic growth as control variable in energy demand function. The sample incorporated 20 developing economies for short time span starting from 1987 and ends in 1998. The empirical results showed that the reduction in energy intensity is associated with a rise in foreign direct investment. They justified their results by the idea that foreign investors bring with them their own advanced technology while investing in developing economies to maximize the profits. As result, the domestic output rises with less energy consumption. However, Antweiler et al. (2001) came out with contradictory conclusions suggesting that foreign direct investment affects domestic production of host country but does not affect the energy intensity. With less extreme results and more rational, Cole (2006) claimed that impact of foreign direct investment on energy consumption diverges across the countries as economic environment, economic structure, the stage of development, and energy prices vary from country to another. Hubler (2009) inspected the impact of foreign direct investment and trading of energy-saving technologies on energy consumption within General Equilibrium frame work. He established that foreign direct investment could be considered as incentives to implement energy-efficient technology that decrease energy consumption. Later on, Hai (2009) validated the findings of Hubler (2009). Chima (2007), Xiaoli et al. (2007) and Zheng et al. (2011) which found support for argument by Mielnik and Goldemberg (2002) when investigating the relationship between foreign direct investment and energy intensity for both USA and China. Sadorsky (2010) studied the effect of foreign direct investment on energy consumption in a panel of 22 developing economies. The empirical exercise revealed that foreign direct investment boosts energy consumption as the increase of liquidity will encourage the proliferation of new plants and factories which in turn raises energy demand. Additionally, Lee (2013) inspected the impact of foreign direct investment and output growth on energy consumption and clean energy demand using the data of G-20 countries. The author found that the series are cointegrated and that foreign direct investment increases clean energy adoption. The existing literature also describes the causality's direction between foreign direct investment and energy consumption. For example, in case of South Africa, Dube (2009) explored the relationship between electricity consumption and economic growth by including foreign direct investment in electricity demand function. He confirmed a cointegration relationship between the series but only when foreign direct investment and electricity consumption are considered as forcing variables. The feedback effect is found between foreign direct investment and electricity consumption. In case of Malaysia, Tang (2009) found unidirectional causality running from foreign direct investment to electricity consumption in long run and feedback effect in short run by applying the VECM Granger causality approach. Zaman et al. (2012) stated that foreign capital inflow Granger causes electricity consumption. Lately, using panel cointegration framework, Lee (2013) explored a complex relationship between foreign direct investment, energy consumption, clean energy, CO_2 emissions and economic growth using data of G-20 countries. The empirical analysis suggested that foreign direct investment boosts the economic growth while reducing energy intensity by the mean of energy-efficient equipment. Foreign direct investment reduces CO_2 emissions. Further, the adoption of clean energy similarly improves economic growth.

In this paper, we will analyze the dynamic relationship between foreign direct investment, clean energy consumption, trade openness, carbon emissions and economic growth using energy demand in United Arab Emirates (UAE). The UAE is an interesting case study for several reasons. First, during the past few years the Emirates have been witnessing a buoyant economic growth thanks to high oil prices which generated massive oil revenues (Helmi and Sbia, 2013). Current economic dynamics of the UAE is also the result of the new vision and strategy adopted by the UAE government since the two decades. In fact, policymakers and the government have launched phenomenal investments to attract FDI and to encourage doing business in UAE. The goal was to diversify the UAE economy and to boost non-oil sector as natural resource are exhaustible. Consequently, the UAE have been witnessing huge inflows of capital and massive investment in all sector of economy including real estate, traffic airline, transport and also clean energy (especially renewable energy). The UAE has become the preferred destination for international companies and the hub of finance in Middle East and North African countries (MENA). Second, the UAE government has changed its vision toward the environment. The creation of a multi-billion dollar and multi-faceted investment company named Masdar to finance large-scale solar projects, clean-technology market and infrastructure projects in the best way reveals the determination of the UAE government to provide the renewable energy and carbon reduction targets. Moreover, the UAE government has encouraged international investors to invest in clean energy projects. Consequently, several national and international banks have quickly showed their willingness to fund renewable energy projects in the UAE. For example, well-known banks such as BNP Paribas, Société Générale and the National Bank of Abu Dhabi have recently financed the Shams 1 solar project: the largest concentrated solar power plant (CSP) in operation in the world.[3] Third, as the UAE is an OPEC member and an oil exporting country; therefore one could expect the negative impacts of FDI on energy usage and consumption. However, recent action of the UAE government may show the reverse. For all these reasons, we focus our study for the UAE context. We use a long quarterly data which cover the period from 1975QI to 2011QIV. By employing the autoregressive distributed lag (ARDL) bounds testing approach to cointegration (Pesaran et al., 2001), overall results reveal that foreign

[3] Shams 1 is located in Abu Dhabi; its capacity is 100-megawatt, and it will provide clean energy to power 20,000 homes in the UAE.