



Original article

The effects of FDI and energy consumption on environmental pollution in predominantly resource-based economies of the GCC

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ABSTRACT

This study empirically examine the effects of foreign direct investment inflows and energy consumption on environmental pollution in the GCC from 1990 to 2014. The study employed the Pooled Mean Group (PMG) methodology. The findings of the study discovered FDI inflows to have negative impact on the environment while energy consumption was detected to have positive impact and both were found to be statistically significant in explaining the extent of carbon emissions in the region. Additionally, higher disposable income, domestic investment, and FDI were detected to have significant influence on energy use in the GCC. The study also discovered how higher disposable income and FDI helps in improving environmental quality in the GCC. While energy use through domestic investment reduces it. Furthermore, relative income negatively impacts the environment through FDI. Our results did not support the idea that the selected GCC countries are pollution haven. The study conclude that for these countries to enjoy perpetual benefits of pollution free states, there is the need to prioritize full scale production of efficient, sufficient and sustainable green energy and ensure optimum energy mix management. This will reduce the level of CO₂ emission as a result of heavy energy consumption of these countries as discovered by the study.

Introduction

Since the emergence of the Environmental Kuznets Curve (EKC) hypothesis, there has been renewed interest on the effect of increased foreign direct investment (FDI) inflows on energy consumption and consequently environmental pollution [67]). There has also been the existence of substantial arguments that foreign investment policies in predominantly resource-based economies support extractive industries¹ which are frequently associated with negative environmental consequences [18]. Even though most resource-dependent economies (especially in Africa) are the least emitters of greenhouse gases (GHG) at the global stage [4]. However, the Gulf Cooperation Council (GCC), which are group of resource-dependent economies rank among the leading GHG emitters globally. The GCC's contribution to global CO₂ emission was approximately 8% in 2009 [7] and according to a 2010 World Bank data, Qatar is one of the largest GHG producers, emitting 40.3 tonnes per capita of CO₂ annually, which is almost 10 times higher than the global average of 4.6 tonnes per capita. Within the region, Kuwait, Oman, and the United Arab Emirates closely follow Qatar in CO₂ emissions with 31.3, 20.4, and 19.9 tonnes per capita respectively.

As a result of the continuous reliance on power sources from coal, fuel and other nonrenewable sources and the wide use of those factors that help maintain the quality of life (such as air conditioning systems, etc.) in the largely desert environment, CO₂ emission in the GCC has more than doubled from 1990 to 2009 [37]. Within this dimension, the GCC countries have continuously diffused large content of CO₂ emission into the globe, as a result of sufficient energy supply in the region from the aforementioned sources. Apart from the foregoing development, trading activities was observed to be rising significantly leading to a surge in FDI inflows from an average US\$1 billion between 1990 and 2000 to US\$28 billion in 2001–2011. In 2006 FDI in the GCC was found to be tenfold with a standing figure of US\$60 billion [74].

The relationship between energy consumption and economic growth in the GCC region, like many institutionally weak regions could be extremely affected by the improvement in the standard of living with little or no emphasis on environmental quality for some period (see Rafindadi [66,70,68,71]). Similarly, people in the region may be less conscious of pollution, and hence, may be unwilling to encourage either the formulation or the strengthening of environmental regulations. This issue is of great importance especially when considering the relative

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weakness of the region with respect to the efficient and effective formulation and enforcement of environmental regulation if compared with the advanced countries [8]. This development, to our view could have the tendency of turning the region into pollution havens by multinational corporations from advanced countries who are well known to be equipped with stringent environmental regulations, as a result, justifying the much discussed pollution haven hypothesis. However, this hypothesis has received little or no attention within the GCC context.

For instance, The leading studies of Mehrpooya et al. [50]; Ansong et al. [14]; Heuër [35]; dos Santos et al. [26]; Afkhami et al. [3]; Kolhe et al. [43] have failed to provide the effects of the dynamic link between FDI, energy consumption and environmental pollutions in the context of their respective case study areas. In contrast to that development, it is only the study of Aliyu and Ismail [4], that was found to have established some evidence on the linking relationship between trade and energy consumption (see also [56] as well as energy use and environmental pollution (see [5,9,22], in this respect it is conclusive to argue that the extant literature made little or no effort to account for the dynamic linking relationship between energy demand, FDI and environmental pollution. Furthermore, as pointed out by Hübler and Keller [36], most of the literature surveyed are more of micro-econometric analysis than the exhibition of realistic finding on the dynamics of FDI, energy consumption and the environment. In addition to the foregoing, the leading study of Aliyu and Ismail [4] attempted to provide an examination of how FDI, energy demand, and CO₂ emissions could combine to create a pollution haven hypothesis. However, this study used only cross-sectional data and did not provide any focus with respect to the GCC or resources rich nations. Although in the study of Aliyu and Ismail [4] the authors used comprehensive methodological approach to analyze the relationships between the variables, however, their study focused only on Africa which is among the least emitters of CO₂. In this respect generalizing their findings to heavy CO₂ emitting regions may lead to inaccurate policy decisions.

Unlike the previous studies, our study contributes to the extant literature in this field by integrating energy demand into FDI-pollution link. The study further analyses the effect of environmental regulation on the pattern of FDI inflows in the GCC and the possibility of testing the position of pollution haven hypothesis across the region. To achieve these objectives, the present study adopt the unique methods used by Cole and Elliott [24] and Antweiler et al. [15] framework which are found to be having the most parsimonious capabilities of separating environmental impact of FDI as well as analyzing the likely changes that could accrue with respect to pollution that may be emitted from variations in environmental regulations emanating from unequal income distribution between the region and other trade partners. There is paucity in the literature regarding the use of these methods and also in providing wider explanatory views on the extant relationship of the variables under survey from the GCC region as explained earlier.

Analyzing the pollution haven hypothesis in the GCC is important to its future environmental policy drive. If the analysis supports the presence of the hypothesis, it will guide policy makers in formulating the appropriate policies of eliminating or reducing the negative effect of pollutants that may be traceable to the wide existence of FDI in the region or the wrong use of energy mix to generate electricity. The rest of the paper is structured in the following way: the next section which is Section “Literature review” reviews some theoretical and empirical literature while, Section “Empirical models” is the Methodology section which presents the data, empirical model and other methodological guide adopted in the study. Results of the analysis are discussed in Section “Econometric methods”. While Section “Data source and description” is the conclusion and policy advice.

Literature review

The main idea behind the EKC is that economic growth affects the

environment in both a harmful and beneficial way see Rafindadi [67]. The EKC hypothesis was first examined by Grossman and Krueger [30]. The hypothesis states that the level of pollution in a country increases as the country develops, however, as rising incomes exceed a certain point, the effect begins to decrease. Although the literature suggests more than one hypothesis regarding the link between foreign investments, environmental regulation and environmental quality. One of the hypotheses, suggested as parts of the arguments put forward by the EKC hypothesis was the pollution haloes hypothesis. The assertion of this segment of the hypothesis was drawn from the neo-technological theory which believes that foreign investments inflow result in positive environmental effects. Suggesting that the prospects of sustainable ecology is increased by foreign investments through the transmission of those technologies that are friendly with the human environment particularly in the developed countries when compared with those in the developing countries (Hassaballa [34]; see also Rafindadi [67]).

Complementing the assertions of the earlier hypothesis was the proposition which maintained that the difference in environmental laws are in themselves elements that drive the free movement of capital across different borders through investments, and that the associated costs of controlling pollution is higher for developed countries relative to developing countries. This tends to assist developing countries in attracting environmental polluting multinational firms compared to developed countries. Accordingly, this leads to divergent and negligent environmental regulation in developing countries. To support the direction of this assertion Aliyu and Ismail [4] pointed out that the existence of divergent environmental laws in the developing countries made it possible for these countries to be vulnerable to the invitation of huge contaminants which is unlike those FDI's that operate in the developed countries that emit light pollutants in their host environment due to environmental laws which made them to use specialized equipment and machineries. This turns developing countries into pollution havens for firms moving away from developed countries [76].

Additionally and as parts of the EKC hypothesis, there is the structural linkages proposition which has traditionally been decomposed into the technique, composition and scale effects. The proponents of the technique effect are of the opinion that the continuous inflow of foreign investment leads to increased energy efficiency, thereby, reducing the amount of pollution generated to the environment, in other words there tends to be a fall in greenhouse emissions as FDI inflows increase. This assumption advocates that the strict environmental regulation in developed countries may likely push firms to engage in finding more environmental friendly and efficient technology to replace high pollution emission production process, which could eventually be transferred to developing countries through foreign investments, and as a result, reduce harm to the environment. Similarly, Grossman and Krueger [31]; Cole and Elliott [24]; and Rafindadi [67] continue to maintain the viewpoints that as the per capita income countries rises due to increased trade and economic growth, societal demand for better environmental quality will also rise in proportion to that increase.

Providing a divergent view among all the propositions put forward by the EKC hypothesis is the assertion of the composition effect proposition which maintains that following an incidence of trade openness, a country's production structure may change as specialization increases due to comparative advantage. Following to this development, each country moves to specialize in those activities or production it has a comparative advantage. Thus, the real influence of the composition effect on a country's environment is conditional on the determinants of its comparative advantage [24].

In contrast with the earlier discussed EKC hypothesis, it is important at this juncture to note that the scale effect proposition of the EKC hypothesis emphasised more on trade liberalization – or FDI-induced economic growth. The assumption is that, *ceteris paribus*, economic activities will increase as a result of liberalization or FDI inflows, energy demand and use. In other words, as the scale of energy consumption and economic activities expand in a country, the level of greenhouse

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