



Testing the moderating role of financial development in an environmental Kuznets curve: Empirical evidence from Turkey



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ABSTRACT

Employing second-generation econometric procedures that consider multiple structural breaks in the series, this article examines Turkey as a case study in the investigation of the moderating role of financial development in a conventional environmental Kuznets curve (EKC). The study uses two separate models for this purpose: (1) the main effects model and (2) the interaction effects model. The results of this investigation suggest a long-term equilibrium relationship between financial development and the EKC in Turkey, using both model options. Financial development has been found to moderate the effect of real output on carbon dioxide emissions in the shorter periods negatively, which signifies successful environmental performance and energy management. In comparison, financial development moderates the effect of real output on carbon dioxide emissions in the longer periods positively, and in which this finding again signifies that policies for energy savings and green house targets need to be established to target longer periods and energy management policies at higher levels of economic activity. The present study did not confirm a significant moderating effect of financial development on the impact of energy consumption on carbon dioxide emissions in the case of Turkey.

1. Introduction

The role of financial and stock markets in economies cannot be underestimated. There are many studies made in this field with this respect [50,59]. The investigation of the relationships between energy consumption, greenhouse gas emissions (GHGe), and economic growth have attracted significant attention in the energy economics literature of the last three decades. Although previous literature typically focused on the connection between economic growth, energy, and GHGe, the results are still inconclusive (see, for example, [49,2,28,67,9,22,57,73,5]). Some studies investigate the relationship between energy consumption and real income growth [23,43,49,53,58,62], while others test the validity of the environmental Kuznets curve hypothesis, which examines the relationship between GHGe and real income growth [22,27,33,44,54,68]. Still others investigate the joint relationship between energy consumption, carbon emissions, and economic growth in the existing literature [74,7,64,63,51,37]. Moreover, Several Researchers have been investigated the existence of EKC hypothesis extensively for the case of Turkey [53,3,36,60,25,65,32]. Some of the researchers suggest the existence of EKC hypothesis for Turkey while some of them find no evidence on the existence of EKC hypothesis for the case of Turkey. Mixed results indicate that existence of the EKC hypothesis with the

sub-segments of the economy still is an ongoing discussion. It is noteworthy that carbon dioxide emissions have been used extensively to proxy for GHGe in the energy economics literature. However, the relationship of energy and emissions with the particular segments or sectors of the economy, specifically the financial sectors, which is the focus of the current research, have been widely ignored in the related literature in this field.

Financial development might correlate either positively or negatively to environmental pollution. Several recent papers studied the environmental effects of financial sector development [17,39,61,66,76]. First, expansion in financial services results in higher energy demand; therefore, it is expected that financial development will positively influence the energy consumption process. On the other hand, with only a few exceptions, it is well documented that financial development generally results in a higher economic growth rate in the involved countries. Indeed, it is well recognized that financial development is crucial for economic growth [13]. Furthermore, it is a necessary condition for achieving a high rate of economic growth [16,56]. Nonetheless, some studies, such as by Gregorior and Guidotti [24], found that financial development significantly reduces economic growth for some countries (especially in Latin America) experiencing relatively high inflation rates. Consequently, this causal relationship generally remains unclear [41,13]). As a result of financial develop-

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ment, economic activity will increase mainly through credit expansion, investments, and stock markets. Foreign direct investments (FDI) and foreign trade are important channels through which financial development can contribute positively to the economy [39,47]. In a healthy financial environment, part of the credit will go to foreign-based investments, which will attract foreign direct inflows to the economy. Alfaro et al. [4] argue that well-functioning financial markets contribute to lowering the costs of conducting transactions and ensuring that the capital is allocated to the projects that yield the highest returns, and therefore enhance growth rates. In this respect, FDI can be a source of valuable technology and expertise that also fosters linkages with local firms and thus helps to jump-start an economy [4]. Ang [8] finds that the impact of FDI on output is enhanced through financial development. Therefore, it can be easily assumed that the financial sector is the main channel in which capital moves from abroad into the domestic economies. Hermes and Lensink [38] suggest that a developed financial system contributes positively to the process of technological diffusion associated with FDI. In the case of tourism, Zhang and Jensen [75] suggest that multinational tour operators and hotel chains have important advantages over the others in terms of reputation, branding, and the product recognition to attract tourists to the countries where they invest. Frankel and Romer [31] suggest that financial development may attract FDI and higher degrees of research and development (R & D), which result in an increase in the level of economic growth.

Candau [14] found that in liberalizing from high trade costs, countries could attract capital as well as labor; however, after a threshold of trade costs, opening trade generates return migration toward the periphery while capital remains agglomerated in the core. A well-functioning financial system will attract not only FDI, but higher foreign trading activities as well, which all result in economic growth. Therefore, it can be easily inferred that energy consumption in an economy will increase because of economic growth, which is stimulated by financial development. This might ultimately lead to an increase in the level of greenhouse gas emissions (GHGe).

A second perspective is that financial development might result in better environmental performance since it will encourage investments in environmental projects [39,6,70]. In this case, financial development might negatively influence the level of environmental pollution, while it may lead to a reduction in pollution levels through investments in environmental projects. Claessens and Feijen [20] regard a well-developed financial sector as a mechanism for carbon trading to provide incentives to mitigate GHGe. Recently, Al-Mulali et al. [6] suggested financial development increases environmental quality in long-run and short-run for 129 countries by providing loans and encouraging energy saving and renewable energy projects to reduce environmental degradation.

Although rare, as mentioned earlier, some recent studies have examined the empirical connections among financial development, energy consumption, and carbon dioxide emissions. Jalil and Feridun [39] investigated the impact of financial development, economic growth, and energy consumption on environmental pollution in China and found that financial development leads to a decrease in the environmental pollution level through mediating the roles of energy consumption, real income, and trade openness. The findings of Jalil and Feridun [39] thus confirmed the finance induced EKC hypothesis in the case of China. Again, in the Chinese context, Shahbaz et al. [66] confirm the existence of the feedback relationship between energy consumption and financial development. In contrast, Ozturk and Acaravci [61] find that financial development does not exert a statistically significant impact on carbon dioxide emissions in the long-term of the Turkish economy under the EKC framework. To proxy for a financial development variable, Ozturk and Acaravci [61] used the volume of domestic credits provided to the private sector as the percent to the gross domestic product in Turkey.

As mentioned previously, since development in the financial or

services sector comes with an increased demand of energy for various functions, the importance of energy for this sector is beyond debate. In this respect, examining the empirical relationships between energy, GHGe, and financial development with contemporary econometric approaches and the effective use of available variables and data is of interest to researchers; moreover, the conclusions drawn from such investigations are of more effective and efficient interest to policy makers and practitioners. It is expected that as the financial sector develops, it will start relying more on energy, which might lead to increases in the GHGe levels. Therefore, the methodology used in measuring the financial development variable deserves attention from researchers. Numerous studies have used various proxies for financial development. As Ang [8] also argued, the selection of key variables to proxy financial services, and therefore financial development, and measuring the extent and efficiency of financial intermediation are the major problems in the empirical economics literature. Levine et al. [52] maintain that constructing measures to reflect the ability of different financial systems should be essential for researchers. Beck et al. [12] constructed a database for various measures of financial development, which has subsequently shed light for researchers. To investigate the role of economic sectors, such as finance, in the relationships between real income, energy consumption, and climate change, or simply in the traditional EKC of countries, it is also important that new alternative econometric models receive attention from researchers.

1.1. Aim and the importance of the present study

Against this backdrop, the present study introduces a new mechanism for investigating the moderating role of the financial sector in the traditional EKC for the case of Turkey. Previous studies estimated extended versions of the EKC under growth or simple regressions. In the statistical theory, moderation occurs when the interaction between two variables also depends on a third variable. Therefore, the third variable is called the “moderator” [10]. The moderating role of variables is introduced through constructing and adapting interaction variables. To investigate the moderating role of financial development in the traditional EKC of Turkey, the present study contributes to the literature by adapting interaction variables into time series data for the first time, to the best of the author's knowledge.

1.2. The Turkish financial system

Turkey has an emerging economy, which has been volatile throughout its history. Hitherto, financial markets have shown a similar trend. Since the 1980s, Turkey has had to adopt several stabilization programs to stabilize price levels and achieve sustainable growth during the liberalization processes [34]. Throughout a highly volatile era of almost 30 years, Turkey attracted foreign investors (multinational companies) using certain policy tools, as documented in Gungor et al. [34]. This resulted in good subsequent foreign direct investment (FDI) inflows. In 2000, FDI inflows increased from 817 million USD to 1719 million USD, by a total of 5328 foreign capital firms [26].

Recent developments in both domestic political stability and the EU relationship created a positive climate that led to non-stop growth of output in 23 consecutive quarters between 2001 and 2008. Many observers assume the EU relationship as either an anchor or a commitment and credibility device for Turkey's restructuring and development [72]. Throughout the last three decades, Turkey has managed to promote its financial system, which has also contributed to its economic sectors, including industry, FDI, and trade. Therefore, it would be interesting to examine the role of financial development in environmental performances in countries such as Turkey. Although numerous recent studies examine conventional EKC under both panel and time series settings, the debate provides mixed results since

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