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## Relationship between Industrial Production, Financial Development and Carbon Emissions: The Case of Turkey

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### Abstract

It is widely accepted that industrialization causes air pollution due to increased fossil fuel consumption. On the other hand, recent literature related with the impacts of financial development on air pollution has produced some mixed results. It is argued that not having proper energy policies has become a more severe problem for Turkey as the industrial activities have been accelerated in the country. The present study investigates the long run relationship between industrialization, financial development and carbon emissions by using Granger causality test in Turkey. Findings of the present study reveal a unidirectional relationship from financial development to carbon emissions.

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### 1. Introduction

Energy is an indispensable part of the modern world. Almost all our activities depend on the usage of energy. Considerable amount of the energy is consumed by four major sectors; namely commercial sector, industrial sector, residential sector, and transportation and it is reported that industrial energy consumption constitutes 51% of total global energy usage (Sieminski, 2013). Development of these sectors leads to increase in energy consumption, especially fossil fuels those have detrimental environmental effects, and the situation causes growing concerns about negative outcomes of the industrial production on climate.

Using more fossil fuel in industrial production could be a significant factor behind high level of carbon emissions but it may not be the only reason. Financial development can be an important source as well. The impact of financial

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development on carbon emissions has been investigated by many scholars. Among them, Frankel and Romer (1999), Dasgupta et al. (2001), Sadorsky (2010) and Zhang (2011) argue that financial development is a factor which causes carbon emissions to increase. There are number of factors those can explain the impact of financial development on air pollution. First, improvement of stock market aids listed companies to decrease their financing costs, increase credit channels and spread operational risk, which in turn make firms able to invest more, install new facilities and increase their production capacities hence increase the level of carbon emissions produced. Second, development of financial sector may lead to attract foreign direct investments that raise economic activity and ultimately cause more carbon emissions. Also, an effective financial intermediation contributes to ease consumers' loan exercises by making them able to reach more costly items such as automobiles, air conditioners, bigger houses and etc. which in turn causes more carbon dioxide to be emitted (Sadorsky, 2010). An alternative argument states that financial development can contribute environmental protection and help air pollution to be diminished. Financial intermediation channel is the most crucial way of raising funds and an important factor for firms to develop. A firm that grows by the help of financial development might achieve a better performance in terms of effective use of their resources and become more efficient in its energy use. As a result of such a development carbon dioxide emissions is expected to diminish (Tamazian et al., 2009; Claessens and Feijen, 2007). On the other hand; as firms grow and institutionalized, their social responsibility towards environment may enhance which in turn can decrease carbon dioxide emissions.

After 1980s Turkey has experienced structural economic reforms toward liberalization. Since then, Turkish economy has been heavily emphasized on industrialization as well as financial liberalization. Particularly, Turkish financial sector has developed considerably over the last decade mostly due to sound growth of its banking sector. As a rapidly growing economy, Turkey stimulates industrial production which is mostly dependent on fossil fuel consumption. Fossil fuel energy consumption constitutes around 90% of its total energy consumption as of 2012 (World Bank, 2015). Turkey has been criticized for its increasing carbon emissions (CO<sub>2</sub>) over the last years. According to Climate Change Performance Index (Burck et al., 2014) Turkey is ranked as 51<sup>st</sup> in climate protection performance among 61 countries those are responsible for 90% of the total carbon emission in the world. It is pointed that the country suffers from lack of energy policies as its dominance of consuming fossil fuels in energy industry as well as growing inferior energy efficiencies contrast to other countries (Ediger et al., 2006). Given the debate on the relationships between financial development and air pollution together with the Turkey's both industrial and financial sector growth and also criticism for its climate protection performance, makes the study rather interesting.

This study aims to investigate whether financial development is interconnected with Turkey's industrialization and carbon emissions. To this aim, time series data covering 1976-2012 period is used. First, Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) unit root test are applied to check for the integration order of the data. Then, Johansen co-integration test is conducted to investigate any possible long-run relationship between the variables. Granger Causality test is employed to specify direction among each other.

The following section of this study will cover a brief literature review, and then data and methodology used will be explained. Section four contains empirical results and finally conclusion and policy implications will be presented in the final section.

## 2. Literature review

Many studies have found positive and significant relationship between energy consumption and carbon emissions (Soytas et al., 2007; Halicioglu, 2009; Dhakal, 2009; Cho et al., 2009). The IPCC Fourth Assessment Report (2007) states that carbon emission from the fossil fuel consumption is the major reason of Greenhouse Gas intensity. It is also indicated that industrial energy consumption constitutes 51% of the global energy usage. Chang and Lin (1999) investigated the factors that alter carbon emissions in Taiwan by taking 34 different industries into account in order to uncover an integrated perspective of the industrial, environmental, and economic performance. By using Grey Relation Analysis they discovered that industrial production has the closest relationship with carbon emissions which is followed by electricity consumption. Zhao et al. (2010) analyzed the factors those cause carbon emissions

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