



## Does globalization impede environmental quality in India?



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### ABSTRACT

Using annual data for the period 1970–2012, the study explores the relationship between globalization and CO<sub>2</sub> emissions by incorporating energy consumption, financial development and economic growth in CO<sub>2</sub> emission function for India. It applies Lee and Strazicich (2013) unit root test for examining the stationary properties of variables in presence of structural breaks and employs the cointegration method proposed by Bayer and Hanck (2013) to test the long-run relationships in the model. The robustness of cointegration result from the latter model was further verified with the application of the ARDL bounds testing approach to cointegration proposed by Pesaran et al. (2001). After confirming the existence of cointegration, the overall long run estimates of the estimation of carbon emission model points out that acceleration in the process of globalization (measured in its three dimensions – economic, social and political globalizations) and energy consumption result in increasing CO<sub>2</sub> emissions, along with the contribution of economic development and financial development toward the deterioration of the environmental quality by raising CO<sub>2</sub> emissions over the long-run. This finding validates the holding of environmental Kuznets curve (EKC) hypothesis for the Indian context.

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### 1. Introduction

Globalization being a worldwide phenomenon has been affecting each human being in every part of the world in their socio-economic-political aspects of life. Globalization mostly links all the economies through trade in goods and services and foreign direct investment (FDI) and its consequences are numerous. This has got implications for the degree of openness, financial development, growth of real per capita income and environmental quality across the economies. While each economy desires to achieve higher rate of per capita income growth through trade and investment, the process of achieving growth through industrialization and urbanization fortuitously gives rise to undesirable or unintended externalities such as pollution and thereby degradation of environmental quality, owing to intensification in the consumption of conventional forms of energy in major economic activities including industrial production activity. While energy

consumption serves as a vital input into the production and economic growth, it has its side effects, by causing environmental pollutions in terms of release of carbon dioxide (CO<sub>2</sub>) and sulfur dioxide (SO<sub>2</sub>). The emissions of these pollutions have implications for global climate change and ecological imbalances and thereby can cause enormous economic damages and direct and indirect welfare losses for the civilizations on the earth. The effects of these emissions may result in dragging economic growth through their welfare retarding effects. Hence, the effects of intensification in the use of energy for consumption and production activities, depend on its net impact on an economy whether its good outcomes dominate over the bad outcomes or vice versa.

Higher the degree of openness (a measure of globalization) of an economy means increased external competitiveness and strong linkage of an economy in trade and investment (domestic and foreign) with rest of the world, which indirectly implies for higher economic growth. But while engaging in trade and investment activities, this also requires consumption of huge quantum of energy which releases more carbon dioxide. An effort toward reduction of carbon dioxide without exploration of substitutive clean energy implies the economy has to sustain with lesser degree of industrialization, lesser openness and lesser economic growth. Thus, the effect of globalization depends on the net effects of

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openness on economic growth as there could be a net effect of energy consumption on economic growth and also the effect of openness on energy consumption. This is because of their inherent dynamic relationships with each other. Since economic growth is associated with higher energy consumption and its qualitative impact on environment, unless one controls the openness variable in energy demand model, it is difficult to disentangle the effects of energy consumption on economic growth and similarly unless one controls for energy consumption, along with openness and financial development, one cannot disentangle the effect of economic growth on carbon emissions in carbon estimating model. There is more likelihood of obtaining biased prediction about their dynamic relationships between these variables. Further, the degree of openness itself also depends on liberalization measures adopted by the concerned economies with regard to their trade and investments and ultimately also their degree of financial development.

Considerable studies have attempted to address how increased trade is directly or indirectly responsible for the environmental degradation and how all the dimensions of globalization affect the natural environments. Globalization contributes to economic growth through expansion of trade and investment flows between the countries and thereby affects the environmental quality in many ways that can adversely affect the economies when they persistently rely on export led growth strategies. Globalization accelerates the structural change by altering the industrial structure of countries as industries orient toward satisfying foreign demand for their products and this gives rise to increased resource use and atmospheric pollution levels. This in turn intensifies the market failures and policy distortions that may spread and exacerbate environmental damage. Globalization intensifies trade liberalization and trade related activities and those in turn affect the environment when all goods and services produced in the economy are directly and indirectly associated with uses of power and energy (oil products, natural gas), which are common to all the countries. According to the types of fuels utilized, correspondingly emissions levels are obvious.

The environmental degradation also further depends on the types of technology used in production. With technological sophistications, nations are putting efforts to extract energy from various renewable sources such as solar and wind powers and through cost effective ways. There remains to establish the link between technological innovations on the one hand and environmental quality and resource use on the other. A significant attention has been paid to the economic benefits of globalization but reasonable attention has not been paid to the social and environmental implications. Therefore, the paper attempts to address a crucial issue for a developing economy context – whether globalization as a result of international trade and investments has been always bettering for economies' growth and environment. We find that the energy consumption is a major contributing factor of CO<sub>2</sub> emissions. The economic growth along with financial development degrades the environmental quality. Globalization (especially the measure of political globalization and social globalization) impedes environmental quality. While economic growth Granger causes CO<sub>2</sub> emissions, the opposite also holds true. Energy consumption and CO<sub>2</sub> emissions are interdependent and same relationship holds true for economic growth and energy consumption. The relationship between globalization and CO<sub>2</sub> emissions is bidirectional. Financial development Granger causes economic growth, energy consumption, globalization and CO<sub>2</sub> emissions.

### 1.1. Indian experience

India has undergone significant transformations during its phase of the post – liberalization period, 1990–1991. The economy initiated a number of liberalization policies mainly owing

to imbalances in its fiscal performance and current account performances of the BOP faced during the period of 1990s. India since independence has been importing oil and natural gas massively from the oil producing rich countries in the gulf to fulfill its huge increasing demand mainly on account of rising population, urbanization and industrialization. The sharp international demand pressures and frequent oil crises in the world economy mainly owing to international embargoes among the oil rich countries in the past, it has resulted in the increasing price of oil and its volatility which have economically dragged the economy to produce deficits in its current account performances of BOP.

India being a poor developing economy is believed to mostly compromise with its environmental standards in an effort to maintain its international competitiveness position at a high level and thus might have induced the economy to relatively engage in exporting more of pollution-intensive goods, or might have inwardly attracted more pollution-intensive foreign capital investments from other countries. There are theories which also widely believe that the developing economies might have developed comparative advantage in pollution-intensive industries and become 'havens' for the world's polluting industries (Siebert, 1977; McGuire, 1982; Copeland and Taylor, 1995). However, the empirical evidences are not so strong in support of the 'pollution haven hypothesis'. This may be because India is one of the lowest greenhouse gas emitters in the world on a per-capita basis. It was emitting to the tune of 1.13 tons of carbon equivalents per capita in 2000 which is roughly one-fourth of the corresponding global average and now it has marginally gone up to 1.67 tons in 2010 on per capita basis. On the other hand, given the large size of the Indian economy, there has been faster growth of carbon emissions over the last decade from 69% from 2000 to 2010, while its gross domestic output has grown at the rate of 110% over the same time period. India is highly vulnerable to climate change, as large population are dependent on agriculture and natural resources and any adverse impact on these and related sectors due to environmental degradation and climate change will negate government's efforts to eradicate poverty and ensure sustainable livelihood for the population (Boutabba, 2014).

One possible theoretical explanation in support of low carbon emitting developing economy is based on the factor endowments hypothesis. This asserts that factor endowment (or technology) determines a countries' comparative advantage and the polluting industries are typically capital intensive. Therefore, the polluting industries are more likely to be concentrated in capital abundant developed economies regardless of their differences in the environmental policy (Copeland and Taylor, 2004). Nevertheless, the empirical evidence relating to this is also very scant. The previous empirical literature on this issue provides interesting and conflicting evidences; and the consensus is yet to reemerge. This motivates us to relate the energy consumption, openness, economic growth and carbon emissions for an emerging developing economy, India. This is one of the populous countries with lower per capita incomes, is currently pursuing to promote industrialization simultaneously along with the presence of flourishing service sector. The economy is highly relying on all the traditional sources of energy along with engaging rapidly with the world in trade, finance and foreign investments.

Given the above background, the main objective of this paper is to investigate a country specific dynamic relationship between globalization, CO<sub>2</sub> emissions, energy consumption, financial development and economic growth. This is mainly because of the empirical analysis at the aggregate level using multiple countries is unable to capture the complexities of the economic environment of each individual country. Therefore, we recommend that a country specific analysis will provide many inferences on the issue we are investigating. Furthermore, our choice of India as an empirical

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