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The Impact of Trade and FDI on the Emission of Pollution in Developing Countries

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Extended Abstract

The impact of trade openness and foreign direct investment (FDI) on environment is a subject of intense debate among economists and environmentalists. Trade openness and FDI have been the important factors in economic growth in developing countries in recent years. In fact, despite the positive impact of these factors on economic growth in these countries, their environmental effects are considered as the main issue. Thus, the main objective of this paper is to assess how trade openness and FDI affects the environmental pollution in developing countries during the period 1980-2013.

Theoretical Framework

Trade theory suggests that the impact of a marginal change in trade on the emission level in a given economy can be decomposed into three major channels: scale effect, composition effect, and technique effect (Grossman & Kruger, 1993). The net change in aggregate emissions in this particular economy are determined through the interaction of these effects.

The *scale effect* refers to an increase in emissions due to the increasing level of economic activity, holding all other factors constant. In a simple case without any other structural change in the economy, trade openness would increase the level of production, transportation, and also the consumption of goods. This would, in turn, drive up the level of pollution through greater emissions during these processes. Therefore, the sign of the scale effect is generally positive when isolated, because higher trade level is usually associated with higher levels of economic activity. Analogously, a reduction in trade between countries due to a hike in trade barriers would cause a contraction in economic activities and decrease the level of emission through the scale effect (Hubler & Keller, 2010).

The *composition effect*, on the other hand, refers to a change in the emission level

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because of a change in the relative shares of different goods in the aggregate production of a country. Other things being equal, a marginal change in trade barriers would alter the relative prices of the goods produced in an economy. This would, in turn, change the quantities of production in equilibrium. When goods have different degrees of carbon intensity, a change in the composition of production would affect the overall emission level (Stern, 2004). The sign of the composition effect is determined by the comparative advantage of the economy. A reduction in trade barriers would increase the domestic price of the exported goods; therefore, most of the national resources would be devoted to the production of the exported goods.

Finally, the *technique effect* refers to the impact of an increase in trade on the emission level due to a change in production methods. Other things being equal, this effect represents the variation in the derived demand for the polluting input per unit of the final goods or services. There are, in fact, two major channels through which trade reduces the emission per unit of output. First, trade facilitates technology transfer; therefore, cleaner technologies become available for adoption by domestic producers. Developing countries might benefit significantly from the increasing access to modern technology embodied in imports. Second, trade can reduce the emission per unit of output through the consumer's preferences and political processes. As environmental quality is considered to be a normal item, the demand for it increases when trade raises income. If politicians are responsive to public demand, then necessary fiscal and regulatory measures would be implemented to induce the producers to reduce the GHG intensity per unit of output in the production process (Antweiler et al., 2001).

Methodology

The goal of this study is to examine the relationship between CO2 emissions, FDI and trade openness in the 56 developing countries which are studied in four distinct groups. The study groups include Latin American countries (19 countries), sub-Saharan Africa (14 countries), Middle Eastern and North African countries (14 countries), and South-East Asia (9 countries). A balanced panel data from 1980 to 2013 is used in this study. The data for all variables are collected from the *World Development Indicators (WDI)*. The model of this study is specified as follows (Al-mulali & Tang, 2013):

$$(CO2_{it}) = f(GDPg_{it}, Trade_{it}, FDI_{it}, Energy_{it})$$

Where $CO2_{it}$ is the natural log of per capita carbon dioxide (CO2) emissions, $GDPg_{it}$ is the gross domestic production growth, $Trade_{it}$ is the trade openness (exports plus imports as a share of GDP), FDI_{it} is the foreign direct investment, net inflows (% of GDP) and $Energy_{it}$ is the log of the per capita energy consumption. The specified model is also estimated using Panel Vector Auto-Regression (Panel VAR) method.

Results and Discussion

The results of the impulse response functions show that a positive shock of FDI increases the CO2 emissions in Latin America and sub-Saharan Africa, while such a shock in the MENA and South East Asian countries have a negative response.

The effect of trade shocks on CO2 emissions has been debated although in most

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cases the increase in volume of trade causes negative responses in the studied groups. The analysis of variance decomposition shows that the share of trade in explaining changes in CO2 emissions in South-East Asia countries has been far more than other groups.

Conclusions and Suggestions

To provide suggestions for further research, it should be noted that the findings of the present study are just generally able to look at how FDI and trade affect (without considering the details of the trade and the FDI flow) the CO2 emission in different groups of developing countries. Hence, more detailed data and models can be used to complete and strengthen the research. For example, the trade volume data and the FDI flow between the major trading partners of a given country (e.g., Iran) and the gravity model can be used to study how FDI and bilateral trade affect the pollution emission. Also, the use of data on the composition and volume of trade in different product groups between countries helps to distinguish between the scale, combination and technique effects. In fact, this approach helps to identify the business-friendly policies to improve the production structure of a country in terms of emission reduction.

Keywords: Trade, FDI, Environmental pollution index; Panel VAR Models
JEL Classification: Q53, F21, R11

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