Effect of Environmental Stringency on Polluting Industry Exports: A Study Related to the Exports of Bilateral Refined Petroleum Products

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Abstract

The purpose of this study was to investigate how environmental stringency affects the pollution intensive manufacturing industry exports in the world. The study further evaluated as to how exports of these polluting industries take place when the exporting country belongs to a certain trading group. An augmented gravity model was estimated for the exports of refined petroleum products using panel data of 100 countries, during the period 2000-2004. The estimated gravity model showed that the environmental stringency influenced negatively for the refined petroleum product exports, during the period and also showed that these exports are high for the countries belonging to some of the trading groups considered.

Key words: Environmental stringency, Gravity model, Pollution haven Hypothesis, Refined petroleum

Introduction

During the last decade the world economy has been characterized by trade liberalization, with questionable consequences on the world environment. At present, trade and the environment have become one of the most debatable issues. It is considered that differences between countries in terms of environmental standards lead to a relocation of polluting industries from those with strict environmental regulations to those with less strict regulations, sometimes called the Pollution Haven Hypothesis (Caporale *et al.*, 2010).

It is argued that the environmental concerns of the developed economies caused them to enact strict environmental regulations to reduce the pollution that occurs from the manufacturing process from some dirty industries, which have increased the cost of production in the home country. On the other hand, developing countries with their low wages and lax environmental regulations have been attractive alternative producers in these sectors. At the same time this migration is also beneficial for developing countries that are in need of financial resources for industrial development. Thus, countries with weak environmental policies (generally developing countries) become a pollution haven for those with strong environmental stringency, exporting the "dirty" goods and importing the "clean" ones. In contrast, developed countries improve the quality of their environment by developing a comparative advantage in the clean goods. A wide variety of findings exists related to trade and the environment. Early empirical studies suggested that the stringency of environmental regulations had little or no impact on trade patterns (Tobey, 1990). But in the case where exporting countries are Central and Eastern European, a negative effect of environmental stringency is seen, explaining that more stringent environmental regulations reduce polluting exports (Jug and Mirza, 2005).

The aim of this paper was to investigate the effect of environmental stringency on bilateral exports of 100 countries, taking the refined petroleum product exports in these countries in to consideration. In addition, the study discovered how these exports take place when the exporting country belongs to a certain trading group.

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Materials and Methods

To empirically analyze the effect of environmental stringency on bilateral trade flows, the gravity model of trade is often used as the theoretical framework. This basic model has been further expanded by adding variables for population, language, common border etc. (Yue *et al.*, 2010).

Consistent with this approach and in order to investigate the above mentioned effects, the traditional gravity model was augmented with proxies for environmental regulations on dirty exports represented by Environmental Performance Index (EPI) and other traditional gravity variables such as country's GDP, population and distance between trading partners. In addition, dummy variables for common border, exporting country's income level and trading groups were included in the model (equation 1).Usually the model is estimated in log-linear form.

$$Q_{ijt} = \beta_0 + \beta_x \ln X' \quad (1)$$

Where, β terms are coefficients, *i* is the exporting country *j* is the importing country *k* is the industry. Q_{ij}which is the dependent variable denotes the export quantity from the exporting country *i* to the importing country *j*.X is a matrix of independent variables described in Table 1.

According to the data availability, 100 countries were selected for this analysis. Trade, Production and Protection data base provided the refined petroleum product export values (kilograms per year), the GDP data of the countries, shared border and bilateral distance (kilometers) by country pair, geographic region by country. The World Bank data provided the country's population in million persons for years 2000-2004. For the environmental stringency variable, the Environmental Performance Index (EPI), prepared by Yale Center for Environmental Law and Policy of the Yale University and the Center for International Earth Science Information Network of the Columbia University was used. The EPI was used based on the assumption that if the EPI is high in a country, their environmental stringency is also high (Emerson *et al.*, 2012). The equation (1) was estimated by using Stata 11.2 statistical package.

Results and Discussion

The outcome of the gravity model reported in Table 2, with respect to the bilateral refined petroleum product exports. Results revealed that the coefficient sign of the target variable (EPI_i), is negative and significant as expected for this refined petroleum product exports indicating that when the value of the EPI_i increased, the exports of these products decreases in all countries. It explained that refined petroleum product exports are lower in countries with high EPI value than the countries with low EPI value. Further when the exports across the countries of each income group were considered results showed that, the exports of these products are significantly low in high income countries with compared to low income countries, giving some evidence for a relocation of these pollution intensive manufacturing industries in countries with lax environmental regulations.

When the exports of the different trading country groups were considered, it showed that the exports of refined petroleum products are high when the exports take place in a COMESA country, and the exports of the countries related to NAFTA trade group were the lowest.

The geographical distance coefficient was negative implying reduced trade due the increase of transportation costs as the distance increases. The coefficient values obtained for the variable distance proved that it has a significant impact on dirty industry exports.

In pollution intensive manufacturing industry exports, country's population plays a vital role.

This was proved by both exporter and importer population being significant. Population of the exporting country showed a positive impact on bilateral trade flows which indicate that, higher the population, higher the production and exports as a result. The coefficient for the importing country's population was positive, implying that higher demand will occur as the population increases, which enhance imports. GDP which reflects the country's export or import demand conditions was positive in both exporter and importer as expected. Results revealed that both exporting and importing country's GDP have a significant impact in polluting industry exports. The common border dummy was positive in all estimations.

The research found that environmental stringency is an important determinant and it shows a negative relationship with the exports of refined petroleum products. Further, it highlighted that high income countries export less with compared to low income countries in above industry. Moreover, the countries related to COMESA trading group showed significantly high exports of this industry during this period. Therefore it is proved that developed countries concern more about the environmental pollution by reducing pollution intensive manufacturing exports than the developing countries.

Explanatory Variable Description	Explanatory Variable	ISIC 353
Environmental Performance Index of the exporting country	EPI_i	-1.11*
Gross Domestic Product of the country *i*	GDP_i	0.62*
Gross Domestic Product of the country *j*	GDP_j	0.92*
Population of the country *i*	POP_i	0.87*
Population of the country *j*	POP_j	0.60*
Geographical distance between country *i* and *j*	DIS_{ij}	-1.56*
1 if country *i* and *j* shares a common border	BOR_{ij}	1.30*
1 when the i^{th} exporter is a high income OECD country	$INC1_i$(HOECD)	-0.60
1 when the i^{th} exporter is a high income other country	$INC2_i$(HOTHR)	-1.21*
1 when the i^{th} exporter is a lower mid income country	$INC4_i$(MID LOW)	-0.31
1 when the i^{th} exporter is an upper mid income country	$INC5_i$(MID UP)	-0.37
1 when the i^{th} exporter belongs to AFTA trade group	$AFTA_i$	0.99
1 when the i^{th} exporter belongs to APTA trade group	$APTA_i$	-0.50*
1 when the i^{th} exporter belongs to SICA trade group	$SICA_i$	0.15
1 when the i^{th} exporter belongs to CEFTA trade group	$CEFTA_i$	0.24
1 when the i^{th} exporter belongs to COMESA trade group	$COMESA_i$	0.92*
1 when the i^{th} exporter belongs to NAFTA trade group	$NAFTA_i$	-1.29*
1 when the i^{th} exporter belongs to SAFTA trade group	$SAFTA_i$	-3.20
1 when the i^{th} exporter belongs to EU trade group	EU_i	-0.12*
1 when the i^{th} exporter belongs to GAFTA trade group	$GAFTA_i$	-0.78*
	Cons	-7.96*
	R^2	0.28
	No of Observations	14896

Note: AFTA = Asean Free Trade Agreement, APTA = Asia-Pacific Trade Agreement, SICA = Central American Integration System, CEFTA = Central European Free Trade Agreement, COMESA = Common Market for Eastern and Southern Africa, NAFTA = North American Free Trade Agreement, SAFTA = South Asian Free Trade Agreement, EU = European Union, GAFTA = Greater Arab Free Trade Area, OECD = Organization for Economic Development and Corporation

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