TRADE OPENNESS AND ENVIRONMENTAL QUALITY: A LITERATURE REVIEW

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ABSTRACT:

The environmental effect of trade liberalization has been one of the most crucial questions concerning trade policy over the last two decades. However, the theoretical literature on trade openness and the environment is largely inconclusive relating to the overall influence of international trade on the environmental quality including displacement hypothesis, pollution haven hypothesis, foreign direct investment, "race to bottom", diffusion of technology, and globalization. Previous studies demonstrate that trade openness have both positive and negative influence on the environmental quality.

Keywords: trade openness, international trade, environmental quality.

1. Introduction

Trade openness could be one of the most crucial factors explaining EKC. Trade increases in size of the economy leading to an increase in pollution, hence trade, ceteris paribus, is the principal cause of environmental degradation. However, Birdsall and Wheeler (1993), Jones and Manuelli (1995), and Lee and Roland-Holst (1997) suggested that environmental damage linked to trade is not caused by trade. However, international trade has the contradictory influences on environmental quality, both positive and negative affect. Due to the scale effect (through an increase of the size of economy originating from an increase of trade volume), environmental quality could decline, hence increases pollution. However, trade could enhance the environmental quality via technique effect and/or composition effect (i.e., as trade increases income leading to environmental regulation and supervision is tightened). The environmental

pollution was caused by the production of pollution-intensive goods reduces in one nation while it increases in other nation though international trade. This composition effect is attributed to two related hypotheses: displacement hypothesis and pollution haven hypothesis are two hypotheses associated with the contribution of composition effect. Fundamentally, there is no difference between these two hypotheses regarding comparative advantage in free trade. Due to trade relates one economy with international communities; a poor economy could rely on foreign technology transfer via foreign direct investment (FDI), which may reduce environmental pollution.

2. Trade openness and environmental quality: Theory and empirical evidence

(i) Displacement hypothesis

According to Arrow et al. (1995), Stern, Common, and Barbier (1996), Ekins (1997) and Rothman (1998), it is accepted that consumption

and international trade are linked under the structural change in production. More specially, the changes in the structural change in production is not accompanied by equivalent structure change in consumption in developed countries, thus EKC states that the migration or displacement of dirty industries from developed countries to less developed countries. The pollution-intensive industries migrate to less developed countries with weaker regulations from developed countries with stringent environmental regulations under certain circumstances (Copeland & Taylor, 1995). Nevertheless, the commodity composition of free trade in manufactures reflects the energy consumption in a country or a region (Agras & Chapman, 1999). Energy consumption and exports of manufactured goods have a positive relationship in countries (Suri & Chapman, 1998). Rich economies tend to become net importers of pollution-intensive goods while poor economies are likely to be net exporters following Saint-Paul (1994). The extracted inverted-U curve could be the consequence of changes in international specialization. It implies that richer economies are concentrated in "clean" and service-intensive goods industries while poor countries are focused on "dirty" and material-intensive goods industries, without altering the consumption (Cole, Elliot, & Azhar, 2001; Jänicke, Binder, & Mönch, 1997; Stern et al., 1996). Environmental impacts are being displaced from one economy to another due to the composition effect, rather than reduced (Rothman, 1998). These findings are consistent with the displacement hypothesis. In addition, the displacement hypothesis anticipates that openness or trade liberalization may lead to more fast growth of pollution-intensive goods industries in poor countries as rich countries enforce stringent environmental regulation and supervision (Harrison, 1995; Rock, 1996; Tobey, 1990).

(ii) Pollution haven hypothesis

Trade liberalization can be beneficial for environment quality (Antweiler et al., 2001a; Liddle, 2001). Free trade raises real income in poor countries, thereby leading to increased demands in stricter environmental protection as higher income individuals desire for a cleaner environment. On the other hand, if heavy polluting countries move to countries with weaker environmental regulation and supervision, lower trade barriers may damage environment. This called the pollution haven hypothesis. The pollution haven hypothesis implies the possibility that multinational enterprises with highly polluting activities migrate to countries with weaker environmental standards. The pollution haven hypothesis suggests that weaken environmental standards as a source of comparative advantage, thus shifting trade patterns. The pollution haven hypothesis is fundamentally a theory that argues that rich countries with stringent regulation and supervision may lose the dirty industries while poor countries would get them all.

(iii) Foreign direct investment

If developing countries reduce their environmental standards below efficiency levels for attracting foreign direct investment, they would provide pollution havens for dirty industries. Most developing countries base on technology transfer via foreign direct investment as a main means of technology acquisition. Thus, enterprises will reduce pollution damage by efficient and clean energy technologies. However, the rapid recent growth of global eco-consciousness and linking between trade, investment and environmental issues have the potential for disruption in these capital flows.

(iv) Race to bottom

The "race to bottom" scenario refers to relatively strict environmental standards in developed countries impose significant costs on polluters. Thus, polluting activities in developed economies suffer higher regulatory and supervision costs than their counterparts in less developed economies following Jaffe, Peterson, Portney, and Stavins (1995) and Mani and Wheeler (1998). This creates a strong incentive for some seriously polluting industries to displace and thereby the reallocation of international capital takes place. The rise of capital outflows may force developed country governments to relax environmental standards. As the ensuing race to bottom accelerates, the EKC flattens and rises toward highest existing level of pollution (Dasgupta, Laplante, Wang, & Wheeler, 2002).

(v) Diffusion of technology

With free trade, technological innovation becomes more important than in the closed market

economy. Thus, developed economies must continually innovate not only to maintain their economic growth but even to keep their real incomes. Economic latecomers from requiring the same levels of energy and materials inputs per unit of gross domestic product are prevented by diffusion of technology, rather than older industrialized countries needed in past. Free trade enhances clean technology diffusion (Reppelin-Hill, 1999; Wheeler & Martin, 1992). Some studies have argued that this might allow less developed economies to dive through the EKC (Magnani, 2000).

(vi) Globalization

According to Wheeler (2001), globalization may trigger the environmental race to bottom by an increase in competition for investment and jobs. Actually, "the bottom" rises with economic growth. Less developed countries enhance their environmental quality and standard as investment increases employment and income. Thus, globalization has been generally compatible with pollution reduction (Dessus & Bussolo, 1998; Grether & De Melo, 2003; Robison, 1988). Driving force of global economic growth is economic globalization; however, the benefits of this process is controversial (Tisdell, 2001). Globalization, liberalization and economic openness raise the issue of potential conflicts in two powerful current trends: the market-oriented economic reform process now extensively accepted worldwide, and environmental protection.

Table 1 shows a systematic review of empirical evidence on impact of trade openness on environment. The environmental effects of trade openness has received considerably much attention in the last two decades. However, the empirical evidence for the link between openness and environment quality is controversy and inconsistent in general (Antweiler et al., 2001a; Baek et al., 2009; Cole and Elliott, 2003; Frankel and Rose, 2005; Kearsley and Riddel, 2010).

Table 1. Openness and environmental quality

No.	Author(s)	Countries	Time periods	Methodologies	Dependent variables	Independent variables	Findings
1	Antweiler et al. (2001a)	43 developed and developing countries	1971-1996	FE, RE	Sulfur dioxide (SO2)	Real GDP per capita, total trade/GDP	TradeOpen → EQ (+)
2	Atici (2009)	Bulgaria, Hungary, Romania and Turkey	1980 - 2002	FE, RE	Carbon dioxide (CO2) emission per capita	The trade openness index (ratio of goods traded/GDP)	TradeOpen → EQ (+)
3	Baek et al. (2009)	50 countries	1960–2000	CVAR	Per capita SO2 emissions	Per capita real GDP, the value of total trade/real GDP	TradeOpen → EQ (-) [developed countries] TradeOpen → EQ (+) [developing countries]
4	Jalil and Mahmud (2009)	China	1975–2005	ARDL	Per capita CO2 emissions	Commercial energy use per capita, per capita real GDP, total trade/nominal GDP	TradeOpen ≠ EQ

No.	Author(s)	Countries	Time periods	Methodologies	Dependent variables	Independent variables	Findings
5	Ang (2009)	China	1953–1999	ARDL	Per capita CO2 emissions	Per capita real GDP, total trade/GDP, distance to the frontier, research and development input, research and development expenditure	TradeOpen → EQ (-)
6	Cole and Elliott (2003)	26 developed and developing countries	1975–90	FE, RE	Air pollutants (sulfur dioxide (SO2), nitrogen oxides (NOx) and carbon dioxide (CO2)); Water pollution (biochemical oxygen demand – BOD)	The capital–labor ratio, per capita income, total trade/GDP, time trend	TradeOpen ≠ EQ
7	Nasir and Rehman (2011)	Pakistan	1972–2008	JCM, OLS, VECM, VAR	Per capita CO2 emissions	Per capita GDP, per capita energy consumption, the trade openness ratio used as proxy for foreign trade	TradeOpen → EQ (-)
8	Frankel and Rose (2005)	Across countries in 1990		OLS, IV	Mean sulfur dioxide, mean nitrogen dioxide, mean total suspended particulate matter	Real GDP per capita, the ratio of nominal exports and imports to GDP, the structure of the government, per capita land area	TradeOpen → EQ (+)
9	Kearsley and Riddel (2010)	27 OECD member countries	1980-2004	IV, GLS	Emissions per capita (GHGs, NOx, and CO2, CO, SOx, VOCs, and SPM)	GDP per capita, manufacturing output by total economic output, total trade/GDP, the ratio of dirty exports/total exports	TradeOpen ≠ EQ

No.	Author(s)	Countries	Time periods	Methodologies	Dependent variables	Independent variables	Findings
10	Frankel (2009)	Cross-country data	1990-2004	OLS, IV	CO_2, SO_2 and PM emissions	Total trade/GDP, real GDP per capita, polity (democracy), area per capita	TradeOpen $\neq$ EQ
11	Choi et al. (2010)	China, Korea and Japan	1971-2006	OLS, VAR, VECM	CO_2 emissions per capita	Real GDP per capita, total trade/GDP	TradeOpen $\to$ EQ (+/#)
12	Atici (2012)	ASEAN	1970–2006	FE, RE	CO_2 per capita	GDP per capita, the current exports/the current gross domestic product in reporting countries, current GDPs, FDI, population, regulatory quality	TradeOpen $\to$ EQ (+)
13	Managi (2004)	63 developed and developing countries	1960-1999	OLS, IV	CO_2 emissions	GDP per capita, income, total trade/GDP, polity, dummy variables	TradeOpen $\to$ EQ (-)
14	Chebbi et al. (2011)	Tunisia	1961–2004	VAR, VECM, GIRF	CO_2 emissions per capita	Real GDP per capita, total trade/GDP	TradeOpen $\to$ EQ (-)
15	Le et al. (2016)	98 countries	1990 - 2013	RE, GMM	CO_2 emissions per capita, micrograms per cubic meter	Total trade/GDP, total trade/GDP, per capita real GDP	TradeOpen $\to$ EQ (−)
16	Managi et al. (2008)	88 countries from 1973 to 2000 (SO_2 and CO_2), 83 countries from 1980 to 2000 (BOD emissions)	1973-2000	GMM	Emissions (SO_2, CO_2, and BOD) per capita	GDP per capita, total trade/GDP, a country's capital–labor ratio, a country's relative capital–labor ratio, relative GDP per capita	TradeOpen $\to$ EQ (+/#)
17	Managi et al. (2009)	88 countries from 1973 to 2000 (SO_2 and CO_2), 83 countries from 1980 to 2000 (BOD emissions)	1973-2000	GMM	Emissions (SO_2, CO_2, and BOD) per capita	GDP per capita, total trade/GDP, a country's capital–labor ratio, a country's relative capital–labor ratio, the relative GDP per capita	TradeOpen $\to$ EQ (+/#)

No.	Author(s)	Countries	Time periods	Methodologies	Dependent variables	Independent variables	Findings
18	Mutascu (2018)	France	1960–2013	Wavelet tool	CO2 emissions per capita	The cumulated volume of imports and exports	TradeOpen → EQ (+/#)
19	Shahbaz, Nasreen, et al. (2016)			The Pedroni (1999) and Westerlund (2007) panel cointegration tests	CO2 emissions per capita	The real export per capita plus the real import per capita, real GDP per capita	TradeOpen → EQ (+) [low income countries]

Notes: TradeOpen – Trade openness; EQ – environmental quality; (+) positive effects; (#) negative effects; RE - Random effects estimator; CVAR - The cointegrated vector autoregression; ARDL - Auto regressive distributed lag; JCM - Johansen cointegration method; OLS - Ordinary least squares; VECM - Vector Error Correction Method ; VAR - The vector autoregressive; IV - Instrumental variables techniques; GLS - Feasible generalized least squares estimation; VECM - The vector error correction model; GIRF - Generalized impulse-response functions; GMM - The generalized methods of moments estimator.

3. Conclusions

There are several aspects differ from Antweiler, Copeland, and Taylor (2001a); therefore, future works aim at filling these research gaps. Firstly, research on the impact of trade openness on environmental quality under considering financial openness has received less attention, especially for developing economies. Hence, this paper aims to close the aforementioned gap in the literature, by examining whether and how environmental quality is influenced by trade openness in developing economies. Secondly, one of the major research gaps is the adoption of the regression model based on the Bayesian model averaging proposed by Fernandez, Ley, and Steel (2001b) to take into account model uncertainty in this relationship. Thirdly, this paper provides a systematic review of relevant empirical studies that has not been documented before. Fourthly, energy consumption is considered as a major cause of greenhouse gases emissions, which influence environmental quality through a variety of unfavorable ways. Hence, the inclusion of energy consumption as a key determinant of environmental quality. Last but not least, there is a persistent scarcity of empirical studies on the impacts of trade openness on environmental quality for developing economies using legal origins variable as a key determinant of CO2 emissions via the shaping of governance mechanisms, leading to overall institutional logics that govern human behavior ∎

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ĐỘ MỞ THƯƠNG MẠI
VÀ CHẤT LƯỢNG MÔI TRƯỜNG:
TỔNG QUAN LÝ THUYẾT

● NCS. **PHẠM THỊ THÚY DIỄM**
Trường Đại học Ngân hàng Thành phố Hồ Chí Minh
Tạp chí Kinh tế và Ngân hàng châu Á
● GS.TS. **NGUYỄN TRỌNG HOÀI**
Phó Hiệu trưởng Trường Đại học Kinh tế Thành phố Hồ Chí Minh

TÓM TẮT:

Tác động môi trường của tự do hóa thương mại là một trong những câu hỏi quan trọng trong chính sách thương mại hơn 2 thập kỷ gần đây. Tuy nhiên, tổng quan lý thuyết về độ mở thương mại và môi trường vẫn chưa thống nhất liên quan đến ảnh hưởng tổng thể của thương mại quốc tế lên chất lượng môi trường, bao gồm: giả thuyết chuyển dời, giả thuyết nơi ẩn giấu ô nhiễm, đầu tư trực tiếp nước ngoài, "cuộc đua xuống đáy", khuếch tán công nghệ và toàn cầu hóa. Các nghiên cứu trước cho thấy rằng, độ mở thương mại có cả tác động tích cực lẫn tiêu cực lên chất lượng môi trường.

Từ khóa: độ mở thương mại, thương mại quốc tế, chất lượng môi trường.