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TESTING THE VALIDITY OF THE POLLUTION HAVEN HYPOTHESIS FOR REGIONALLY LEADING EMERGING ECONOMIES*

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Abstract

This study tests the validity of the Pollution Haven Hypothesis (PHH) for the case of six emerging industrial economies with a relatively higher competitive industrial performance compared to the other developing countries in their region. The sampled countries are China (East Asia), Poland (Europe), Mexico (Latin America), India (South Asia), South Africa (Africa), and Turkey (Europe and the Middle East). The study adopts a Revealed Comparative Advantage (RCA) approach to the Pollution-Intensive Industrial Products (PIIPs) and differs from many relevant studies by grouping PIIPs and distinguishing a wide range set of factors between those that directly affect the RCA in PIIPs and those that have indirect effects through attracting Foreign Direct Investment (FDI). Estimations of random-effects models over the period 1995-2018 provide weak support for the validity of PHH: Despite inward FDI stocks are positively associated with the RCA indices of higher polluting industries, the environmental policy elasticity of inward FDI stocks is slight and insignificant. The study argues that the evidence of the PHH may change over proxies, measurements, model construction, and (more importantly) the classification of PIIPs that should be considered by future studies while analyzing the PHH.

Keywords : *Pollution-intensive industrial product, Pollution haven hypothesis, Foreign direct investment, Revealed comparative advantage, Emerging industrial economies.*

JEL Classification : *F18, L52, O14, Q50.*

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BÖLGESEL ÖNDE GELEN YÜKSELEN EKONOMİLER İÇİN KİRLİLİK SIĞINAĞI HİPOTEZİNİN GEÇERLİLİĞİNİN TESTİ

Öz

Bu çalışma, Kirlilik Sığınağı Hipotezi (KSH)'nin geçerliliğini, bölgelerindeki diğer gelişmekte olan ülkelere kıyasla daha yüksek rekabetçi sanayi performansına sahip altı yükselen sanayi ekonomisi için test etmektedir. Çalışmanın örneklemini Çin (Doğu Asya), Polonya (Avrupa), Meksika (Latin Amerika), Hindistan (Güney Asya), Güney Afrika (Afrika) ve Türkiye (Avrupa ve Orta Doğu) oluşturmaktadır. Kirlilik-Yoğun Sanayi Ürünlerindeki (KYSÜ) rekabetçilik performansını açıklanmış karşılaştırmalı üstünlük yaklaşımıyla belirleyen çalışma, KYSÜ'leri kirlilik yoğunlukları bakımından gruplayarak çok sayıda faktörü KYSÜ'lerdeki karşılaştırmalı üstünlükleri doğrudan ve dolaylı (Doğrudan Yabancı Sermaye Yatırımları (DYY)'nı çekerek) etkileyen faktörler olarak ayırması bakımından daha önceki çalışmaların çoğundan farklılaşmaktadır. 1995-2018 dönemi için tesadüfi-etkiler model tahminleri, KSH'nin geçerliliğini zayıf bir biçimde desteklemektedir: Her ne kadar yurtiçine gelen DYY stokları yüksek kirliliğe sahip sanayiler için hesaplanan açıklanmış karşılaştırmalı üstünlük endeksleri ile pozitif ilişkide olsa da DYY stoklarının çevre politikaları esnekliği düşük ve istatistiki olarak anlamsız bulunmuştur. Çalışma, KSH bulgularının gösterge değişkenlere, bu değişkenlerin ölçümlerine, model kurgularına ve (daha önemlisi) KYSÜ'lerin kirlilik yoğunlukları bakımından sınıflandırılmasına bağlı olarak değişebileceğini, bu nedenle KSH'yi test edecek ileriki çalışmaların bu hususları dikkate almaları gerektiğini ortaya koymaktadır.

Anahtar kelimeler : *Kirlilik-yoğun sanayi ürünü, Kirlilik sığınağı hipotezi, Doğrudan yabancı yatırım, Açıklanmış karşılaştırmalı üstünlük, Yükselen sanayi ekonomileri.*

Jel Sınıflandırması : *F18, L52, O14, Q50.*

INTRODUCTION

A strong body of the vast literature has documented that openness to international trade and investment is one of the key drivers of economic development through such varied channels as productivity gain, income growth, technological diffusion, physical and human capital accumulation, and employment benefits in many countries with a specific reference to open developing economies (Edwards, 1993; Matusz, 1996; Barro & Sala-i-Martin, 1997; Frankel & Romer, 1999; Choudhri & Hakura, 2000; Feldstein, 2000; Hausmann & Fernández-Arias, 2000; OECD, 2002; Alcalá & Ciccone, 2004; Thirlwall, 2006; Razin & Sadka, 2007; Were, 2015; Cerdeiro & Komaromi, 2020). Besides these well-documented benefits, the sequent export-led growth success triggered by substantial Foreign Direct Investment (FDI) attraction in some East Asian countries which is described as the 'East Asian miracle' (WB, 1993) motivated many developing countries to redesign their trade and investment policies towards openness to the global economy in the early 1980s.

The shift of many developing countries from import substitution to export orientation has brought about a new international trade and investment pattern in which developed and developing countries have been participating in different sectors based on their comparative advantage in terms of productivity and production cost. In this process, trade volumes within developing countries and between developed and developing countries have increased more than those within developed countries. The earlier explanation for the increased trade and investment flows between developed and developing countries underlines the comparative advantages of developing countries in terms of natural resource abundance and low labor cost. This premise builds on the developing countries' production and export structures concentrated in the resource-intensive, low/medium-tech, and labor-intensive industries. Another discussion emphasizes the global trade and investment pattern in which the deindustrialization of developed countries and the fast-industrialization of some developing countries are coinciding (Rowthorn & Ramaswamy, 1997; Boulhol & Fontagné, 2005).

On the other hand, rising environmental awareness of the international community since the 1990s has also led to a rapid tightening of pollution regulation in many developed countries. Consistently, a relatively new research strand has been immensely examining the roles of comparative advantages of being a pollution haven and attracting polluting industries. Relying on the observation that many firms in developed countries have been forced to adopt and obey higher environmental standards, this interest has been attempting to find out whether the leniency of developing countries' environmental regulations attract polluting industries from the developed countries where the environmental regulations are relatively more stringent. This flourishing multi-disciplinary interest in the literature has tested the validity of the Pollution Haven Hypothesis (PHH) using data of more rapid growth of dirty industries and FDI attraction in environmentally unregulated economies (Neumayer, 2001; Akbostancı et al., 2007; Grether et al., 2012; Millimet & Roy, 2016; Guha, 2018).

Within the PHH, some developing countries from different regions have a relatively higher industrial performance compared to other developing countries and emerging economies. The United Nations Industrial Development Organization (UNIDO) groups these countries as Emerging Industrial Economies (EIEs) for their considerable improvement in competitive industrialization path measured by manufacturing value-added indicators (UNIDO, 2019). Despite having some characteristics similar to those of both developed and developing countries, EIEs differ from many other developing/emerging countries by performing faster industrialization and from developed countries by involving more in labor- and pollution-intensive industrial activities. These observations have left a research gap in examining the PHH for EIEs.

Addressing the research gap, this study tests the validity of the PHH for regionally leading six EIEs over the period 1995-2018. The study's key contribution to the literature is twofold: Firstly, it classifies the Pollution-Intensive Industrial Products (PIIPs) into four sub-groups by efficiency level based on pollution intensity. Second, it covers a wide-range set of control variables that are distinguished between those that affect inward FDI stocks and those that are directly associated with the Revealed Comparative Advantage (RCA) indices in PIIPs. The remainder of the study is structured as follows: Section 2 shows the trends in international trade and investment. Section 3 explains the PHH and gives an overview of directions in the relevant literature. Section 4 is devoted to the empirical framework which covers the definitions of PIIPs, representation of country sample and variables, explanations of data characteristics, model construction, and analysis, respectively. The study concludes with a brief discussion of findings in the final section.

I. TRENDS IN INTERNATIONAL TRADE AND INVESTMENT

Many developing countries have opened up to the world economy since the 1980s by reducing trade barriers and adopting export-oriented liberal policies. Increasing integration of developing countries in global trade has enabled them to participate in global value chains which are often considered a feature of the current wave of globalization and characterized by fragmentation and internationalization of production processes (Kowalski et al., 2015). Consequently, in terms of both exports and imports of merchandise, the world share of developing countries has increased while the share of developed countries[3] has reduced since the mid-1980s as seen in Figure 1. In this convergence process, the increasing share of EIEs[4] (especially China) seems to be decisive.

[3] In the UNCTAD's (2020a) database, developed economies are *27 European Union (EU) countries,* and *Iceland, United Kingdom, Norway, Switzerland, Australia, New Zealand, Canada, Greenland, United States, Israel,* and *Japan* while developing countries are the others.

[4] In the UNIDO's (2019) classification, EIEs include *Argentina, Brazil, Brunei Darussalam, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Egypt, Greece, India, Indonesia, Iran, Kazakhstan, Latvia, Mauritius, Mexico, North Macedonia, Oman, Peru, Poland, Romania, Saudi Arabia, Serbia, Serbia, Montenegro, South Africa, Suriname, Thailand, Tunisia, Turkey, Ukraine, Uruguay,* and *Venezuela*.

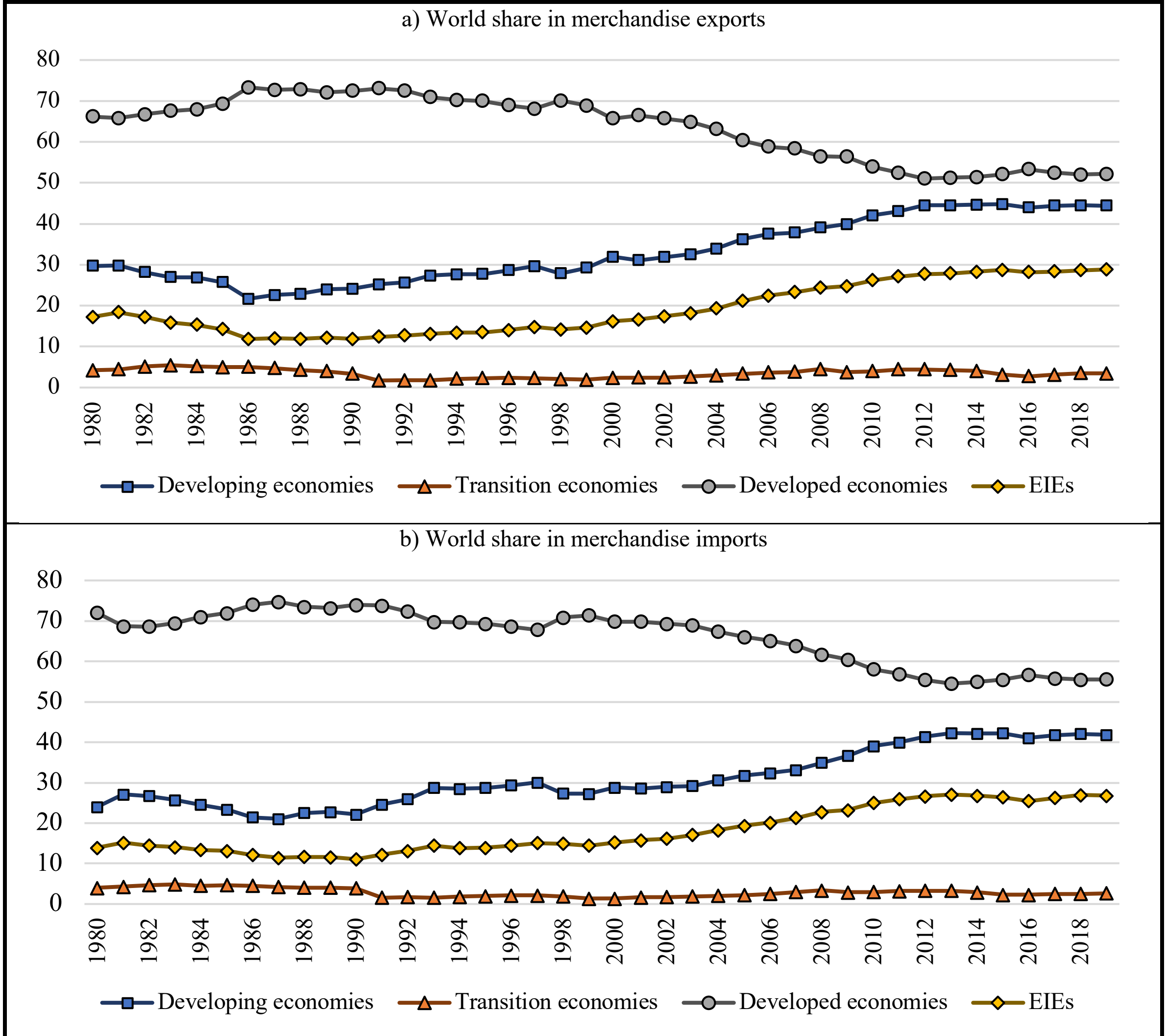

Figure 1. World Share of Selected Country Groups in Merchandise Trade (%, 1980-2019)

Source: Authors' compilation based on UNCTAD (2020a) data.

This increasing share of developing countries in international trade has stemmed from the rapid growth in the trade that occurred both amongst developing counties (*i.e.* South-South trade) and between developed and developing countries (North-South trade). As shown in Table 1, the share of exports between developing countries was about 42% in 1995 which increased to about 58% in 2018 while import share arose to about 60% in 2018 from about 38% in 1995. However, the intra-group trade in developed countries (*i.e.*, North-North trade) and transition economies[5] reduced from 1995 to 2018 while there was an important rise for EIEs. Therefore, it can be inferred from the trends in Table 1 that trade within developing countries outweighed the trade between developed and developing countries and within developed countries from 1995 to 2018.

[5] *Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, North Macedonia, Russia, Serbia, Tajikistan, Turkmenistan, Ukraine,* and *Uzbekistan*.

Table 1. Intra-Group Trade in Different Country Groups (%, 1995, 2018)

	Intra-group	Rest of the world	Intra-group	Rest of the world	Intra-group	Rest of the world	Intra-group	Rest of the world
	1995		2018		1995		2018	
	Export				Import			
Developing economies	41.59	58.41	57.59	42.41	37.64	62.36	59.62	40.38
Transition economies	27.42	72.58	16.46	83.54	32.98	67.02	22.97	77.03
Developed economies	70.25	29.75	68.32	31.68	70.18	29.82	60.10	39.90
EIEs	13.11	86.89	22.19	77.81	13.40	86.60	27.48	72.52

Source: Authors' compilation based on UNCTAD (2020a) data.

The shrunk in trade amongst developed countries can be explained by the relocation of the FDI operations of multinational enterprises. Many businesses have carried some of their production plants to developing countries and later become an importer of these relocated productions. Moreover, this relocation pattern also explains the increased trade within developing countries since the host developing countries export to both developing and developed countries. In this regard, developing economies and more specifically EIEs are the main beneficiaries of the global rise in FDI. Figure 2 shows that albeit wide volatilities, developing countries' average world share of international FDI inflows has increased gradually as a linear trend. Again, in the rise of developing countries, EIEs' (more prominently China's) FDI attraction has an important role.

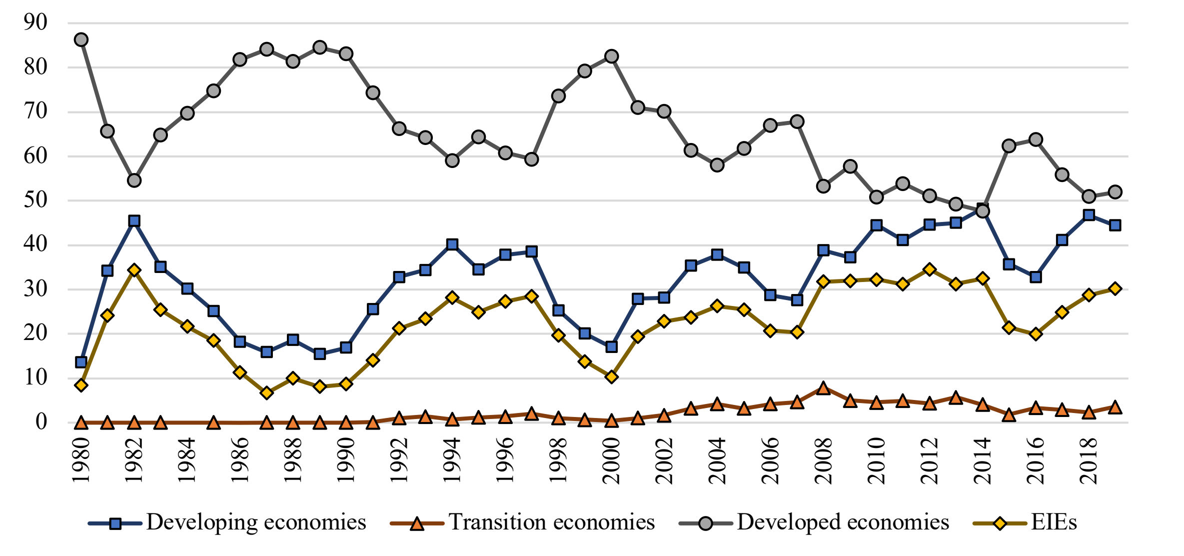

Figure 2. World Share of Selected Country Groups in Inward FDI Flows (%, 1980-2019)
Source: Authors' compilation based on UNCTAD (2020a) data.

II. POLLUTION HAVEN HYPOTHESIS: AN OVERVIEW OF THE PREVIOUS EVIDENCE

In a consideration of 'home' developed country with stricter environmental policies and 'host' developing country with laxer environmental standards, inward FDI operations have three effects in developing countries: i) FDI may bring in clean technology and mitigate environmental pollution (the polluting halo effect), ii) Polluting firms can get benefit from environmental policies through green innovations (the Porter effect), and iii) multinationals may carry their pollution-intensive activities to environmentally-unregulated developing countries (the pollution haven effect). Our study deals with the last effect based on the PHH which has three sequent underpinning premises: First, some developed countries, in particular those with high income, adopt and implement more stringent environmental policies and specializes in relatively clean products. Second, global free trade encourages polluting industries to move to developing countries with weaker environmental policies. Finally, developing countries with no or lenient environmental regulations have a comparative advantage in production and exports in PIIPs. Regarding these premises, in the global literature, what make a country a pollution haven is increasingly attempted to be answered by the central predictors such as the availability and stringency of different environmental policies (e.g., Brunnermeier & Levinson, 2004; Lu, 2010; Dong et al., 2012; Zheng & Shi, 2017), multinationals and their FDI operations (e.g., List & Co, 2000; Eskeland & Harrison, 2003), industrial development and economic structure (e.g., Kate, 1993; D'Souza & Peretiatko, 2002; Boulhol & Fontagné, 2005; Cherniwchan, 2012; Ullah et al., 2020), trade and FDI openness (e.g., Birdsall & Wheeler, 1993; Dean, 2002; Garsous & Kozluk, 2017) together with other control variables.

Some of the former studies are cross-country panel studies while others have focused on individual countries. Many of these studies adopt a pollution effect of some pollutants such as carbon dioxide (CO_2) (as a proxy for pollution) mostly within the environmental Kuznets curve framework (e.g., Cole, 2004; Haisheng et al., 2005; Abdouli et al., 2018; Jun et al., 2018; Da Silva et al., 2019; Rana & Sharma, 2019). These studies focus on the consequences of becoming a pollution haven and consider the relocation of pollution by analyzing the emissions level in (developing) countries that attract FDI operations seeking for the low-cost advantage of pollution from other (developed) countries. Our study, however, focuses on the relocation of the pollution-intensive industries (rather than the relocation of pollution itself) by dealing with the causes of having a comparative advantage in PIIPs since many other demand-side and supply-side factors may affect the overall emissions of pollutants.

We can group the relevant empirical studies into those which found the validity of the PHH and those which did not. Some of these studies also cover our-sampled countries. A multi-country and multi-sectoral study of Grether et al. (2012) found a significant pollution haven effect globally stemmed from the economic activities spilled over from advanced countries (the North) with stricter environmental regulations into developing countries (the South) where the environmental policies are not that stringent. Their results indicated that, on the other hand, the pollution haven effects were reduced by the increased regional trade. Adopting the comparative advantage approach and using a combination of country-level environmental policy data and industry-level pollution intensity data, Broner et al. (2016) found that countries with laxer environmental regulation had a comparative advantage in polluting industries for a large sample of countries. Garsous & Kozluk (2017) analyzed a dataset of selected firms in 23 OECD (The Organisation for Economic Co-operation and Development) countries including Poland and Turkey found that higher domestic energy prices caused by the stringent upward environmental policies tended to motivate the firms to carry their polluting production stages into other locations (in developing world) where energy prices and the costs of environmental pollution were relatively lower. To et al. (2019) examined the impact of FDI on environment degradation for Asian emerging and developing countries including China and India as well and found the validity of the PHH in the region.

Birdsall & Wheeler (1993) argued that trade liberalization and increased FDI were not associated with pollution-intensive industrial development based on their findings indicating that protected economies tended to favor pollution-intensive industries while openness actually encouraged cleaner industries through the spread of higher pollution standards. Busse (2004) performed an empirical investigation for 119 countries' five pollution-intensive industries and did not find general evidence to support the PHH with an exception in high-polluting iron and steel products for which the increased commitment to international environmental treaties and stringent regulations tended to reduce net exports. Martínez-Zarzoso et al. (2017) investigated the relationship between environmental stringency and trade flows within the European Union (EU) countries including Poland, found results with weak support for the PHH for some dirty industries. Instead, stronger support for the 'Porter hypothesis' was found for trade in clean products. Findings of Destek & Okumus (2019) gave a U-shaped relationship between FDI and ecological footprint meaning the invalidity of the PHH for a sample of 10 newly industrialized countries including our EIEs sample except for Poland. Da Silva et al. (2019) investigated the PHH for Brazil, India, China, and South Africa and found support for the PHH only in the China case. For the BRICS (i.e., Brazil, Russia, India, China, and South Africa) and the MINT (i.e., Mexico, Indonesia, Nigeria, and Turkey) countries Shao et al. (2019) found no support for the validity of the PHH since their results demonstrated a bidirectional and negative causality from FDI inflows to per capita energy consumption (for BRICS countries) and per capita carbon emissions (for MINT countries).

The review of the relevant studies provides ambiguous and sometimes controversial evidence, even for the same country. Regarding our sampled countries, a study of Zhang & Fu (2008) found that environmental stringency had a significant and negative effect on FDI in China which supported the PHH. Dean et al. (2009) found results supporting the PHH in China where the highly-polluting industries were attracted by weak environmental standards whereas this was not true for the investments migrating from high-income countries. Zhang & Zhou (2016) analyzed China's national and provincial panel dataset and found FDI reducing CO_2 emissions which supports the pollution halo hypothesis rather than the PHH. Zheng & Shi (2017) investigated the PHH at provincial-level regions in China and found that the types and legal frameworks of environment-related economic policy instruments as well as industrial characteristics mattered for the relocation of polluting industries.

Mani et al. (1997) found that new plant establishments in different states of India were not adversely associated with more stringent environmental enforcement. They underlined other factors such as reliable infrastructure and factors of production affecting the location decisions of businesses. Conducting an input-output analysis, Dietzenbacher & Mukhopadhyay (2007) found that India had moved further away from being a pollution haven in the 1990s. Dasgupta & Mukhopadhyay (2018) measured the shares of pollution content of India's inter-industry trade and its impact on the environment by using an input-output framework and found that export in intra-industry trade was highly pollution-intensive and the results of pollution terms of trade provided stronger evidence on the PHH. Rana & Sharma (2019) examined the causality relationships between FDI and CO_2 emissions as well as Gross Domestic Product (GDP) and trade in India and found evidence supporting the existence of the PHH. Their findings revealed that imports were causing CO_2 emissions while CO_2 emissions and GDP were causing each other.

In the Mexico case, Grossman & Krueger (1991), suggested that Mexico had not necessarily become a pollution haven following the regional free trade agreements. Their suggestion was based on the findings that the difference between the environmental policies of Mexico and the United States (US) attracted minor components of polluting industries to Mexico whilst Mexico tended to receive the benefit of attraction of human capital and physical capital sectors in which reduction in pollution might be regarded a side-benefit of increased Mexican-US trade. Waldkirch & Gopinath (2004) found a positive correlation between FDI and pollution that was both statistically and economically significant in the case of the highly controlled/regulated emissions of pollutants. They also confirmed that environmental considerations as well as comparative advantage in labor-intensive production processes mattered for businesses' location decisions. Using state-level data, Nolen et al. (2010) found, in general, a positive relationship between trade liberalization and pollution caused by industrial activities in manufacturing sectors. Consistently, Cherniwchan (2017) found evidence that Mexico tended to become a pollution haven as dirty US production relocated to Mexico to take advantage of differences in environmental regulations between the two countries.

Javorcik & Wei (2004) found no systematic evidence supporting the PHH in the transition countries including Poland. Similarly, Martínez-Zarzoso et al. (2017) investigated the relationship between environmental stringency and trade flows within the EU countries including Poland and found results with weak support for the PHH for some dirty industries. Their results more significantly supported the 'Porter hypothesis' for trade in clean goods. For South Africa, a study of Kivyiro & Arminen (2014) confirmed a negative relationship between FDI inflows and emissions level which contradicts the prediction of the PHH. Abdouli et al. (2018) examined the impacts of FDI inflows along with economic growth and population density on CO_2 emissions in BRICTS countries and their regression results provided no significant relationship between FDI and CO_2 emissions-driven pollution for South Africa as well as Brazil whereas the PHH pattern was somewhat supported for China and Russia. Their findings also showed that FDI improved the environmental quality in Turkey which is consistent with the pollution halo effect, contrary to the PHH.

About Turkey-specific studies, Akbostancı et al. (2007) examined a sectoral disaggregated manufacturing data and found that exports increased as the dirtiness of the industries increased, which the authors interpreted as evidence for the validity of the PHH. Within an emissions-based pollution approach, Mutafoglu's (2012) results showed a positive causality between FDI inflows and CO_2 emissions indicating the validity of PHH. Mert & Caglar (2020) analyzed the asymmetric short- and long-run causal links between FDI and emissions in Turkey and found a negative relationship between the variables which contradicts the prediction of the PHH. Again, adopting an emissions approach in the Turkey case, Terzi & Pata (2020) found a one-direction positive causality from CO_2 emissions to FDI inflows which the authors interpreted as support for the PHH. In their conclusions, Mert & Caglar's (2020) study regarded emissions as a consequence and FDI as a cause while Terzi & Pata (2020) treated emissions as a promoter of FDI inflows.

After all, the estimated effects in the reviewed studies above tend to vary over the characteristics of data, samples, approaches, and methods. This is well showed by Doytch & Uctum's (2016) study which has a large sample of countries and industries and reveals that FDI flows into manufacturing support the PHH pattern while those flowing into services support the pollution halo effect, and FDIs flowing into low- and middle-income countries depict a pollution haven pattern, while flows to high-income countries benefit the environment and support a pollution halo effect. These heterogeneity-based variations are also confirmed by the study of Li et al. (2019). Many studies on developing and emerging economies have been using an indirect proxy of emissions of the key pollutants, mostly CO_2 emissions, for the level of countries' involvement in PIIPs relying on the close relationship between them. In our empirical setting, however, we consider a direct proxy of RCA in PIIPs to comparatively measure the engagement of countries in the so-called dirty industries.

III. EMPIRICAL FRAMEWORK

III.I. Definition of Pollution-Intensive Industrial Products (PIIPs)

Environmental pollution caused by industrial activities of human-being has many aspects that air, water, forestry, noise, visual, light, garbage, and soil pollution are among others. Table 2 displays Mani & Wheeler's (1998) classification and ranking of manufacturing industries by environmental pollution which is broadly distinguished between air, water, and metal pollution that are closely related to other aspects of environmental pollution. It should be noticed that almost every production activity has a pollution effect but the products listed in Table 2 are those that pollute the environment heavily.

Table 2. Ranking of Manufacturing Industries by Environmental Pollution

Rank	Air pollution	Water pollution	Metal pollution	Overall pollution
1	*Iron and steel*	*Iron and steel*	*Non-ferrous metals*	*Iron and steel*
2	*Non-ferrous metals*	*Non-ferrous metals*	*Iron and steel*	*Non-ferrous metals*
3	*Non-metallic mineral products*	*Pulp and Paper*	*Industrial chemicals*	*Industrial chemicals*
4	*Petroleum and coal products*	*Miscellaneous manufacturing*	*Leather products*	*Petroleum refineries*
5	*Pulp and paper*	*Industrial chemicals*	*Pottery*	*Non-metallic mineral products*
6	*Petroleum refineries*	*Other chemicals*	*Metal products*	*Pulp and paper*
7	*Industrial chemicals*	*Beverages*	*Rubber products*	*Other chemicals*
8	*Other chemicals*	*Food products*	*Electrical products*	*Rubber products*
9	*Wood products*	*Rubber products*	*Machinery*	*Leather products*
10	*Glass products*	*Petroleum refineries*	*Non-metallic mineral products*	*Metal products*

Source: Mani & Wheeler,1998

Considering both direct and indirect pollution impacts of manufacturing industries in terms of overall environmental pollution as well as the coverage by environmental policies, we have a new list of PIIPs shown in Table 3. This classification is similar to those of Mani & Wheeler (1998), Busse (2004), and Lu (2008). Products that are directly related to petroleum have been excluded because the sampled countries (except South Africa) are not actually involved in oil production. Agricultural products are also omitted from the study since we focus on the industrialization based on manufacturing activities. We include 'machinery and transport equipment (MTE)' for controlling the transformation from low-tech and high-pollution to mid-tech greener path in EIEs. In fact, the MTE industry is seen as a transition sector as it provides efficiency-driven opportunities for many EIEs that are actively progressing in the export-quality ladder. Therefore, we expect a sign of MTE products different from especially CRP and MNM sectors since EIEs are to some degree in a transition process from resource-dependent and labor-intensive to efficiency-driven economic structure.

Table 3. The Study's Classification of PIIPs (SITC 3rd revision)

Main industry category	SITC codes	Product definition
I. Chemicals and related products (CRP)	511-516	Organic chemicals
	522-525	Inorganic chemicals
	562	Manufactured fertilizers (except crude fertilizers
	591-598	Chemical materials and products
II. Pulp and waste paper (PWP)	251	Pulp and waste paper
	641-642	Paper and paper manufacture
III. Manufactured metallic and nonmetallic goods (MNM)	661-667	Nonmetallic mineral manufactures
	671-679	Iron and steel
	681-689	Non-ferrous metals
IV. Machinery and transport equipment (MTE)	711-718	Power generating machinery and equipment
	721-728	Specialized machinery
	731-737	Metalworking machinery
	741-749	Other industrial machinery and parts

Note: Detailed explanations for products can be found at UNCTAD (2020b).

III.II. Country Sample

As previously stated, our study covers six EIEs which have relatively higher industrial performance compared to other developing and/or emerging countries in their regions. While choosing these countries and defining them as regionally 'leading EIEs' we considered their Competitive Industrial Performance (CIP) based on the UNIDO's CIP index (UNIDO, 2020). The CIP index is compositely constructed based on eight core indicators of industrial performance including i) share in world manufacturing exports, ii) share of world manufacturing value-added, iii) share of medium and high-tech activities in total manufacturing value-added, iv) share of medium and high-tech activities in manufacturing export, v) manufacturing value-added per capita, vi) share of manufacturing value-added in GDP, vii) manufactured exports per capita, and viii) share of manufactured exports in total exports (UNIDO, 2020). EIEs have relatively higher performance in CIP compared to other developing countries. Moreover, our sampled countries have relatively higher performance compared to other EIEs in their regions. Table 4 comparatively shows the changes in CIP performance and rank (in 152 countries) of sampled countries from 1995 to 2018. Despite its CIP index slightly reduced, Mexico climbed to the upper rank and remained the best performer in Latin America. Again, even South Africa's positions deteriorated in terms of both the CIP index and rank, it still had relatively higher performance in the Africa region given the average performance in the 1995-2018 period.

Table 4. Competitive Industrial Performance (CIP) of Sampled EIEs (1995, 2018)

Country	1995		2018		Rank amongst EIEs in the region (1995-2018 mean-performance)
	CIP index	World rank (in 152)	CIP index	World rank (in 152)	
China	0.136	24	0.372	2	1/East Asia
Poland	0.073	41	0.159	22	1/Central Europe
Mexico	0.168	21	0.164	20	1/Latin America
India	0.045	53	0.078	42	1/South Asia
South Africa	0.071	41	0.057	52	1/Africa
Turkey	0.087	37	0.121	29	1/Southeast Europe, Middle East

Source: Authors' compilation based on UNIDO (2020) data.

III.III. Variables and Data

Our dependent variable is the comparative advantage in PIIPs. The comparative advantage is proxied by the RCA index which posits that patterns of trade among countries are shaped by their relative differences in productivity. The rationale behind the RCA index is that such productivity differences can be captured by countries' specialization structure (UNCTAD, 2020a) in a globalized world. In our case, for country *c*, the RCA metric (as an index) for a PIIP (*p*) in all product space (*P*) can be calculated as in Equation 1.

$$RCA_{c,p} = \frac{X_{c,p} / \sum_{j,P} X_{c,j}}{X_{w,p} / \sum_{j,P} X_{w,j}} \qquad (1)$$

where, *P* is the set of all products including *p* as well, and $X_{c,p}$ is the country *c*'s exports of product *p* while $X_{w,p}$ is the world's exports of product *p*. The terms $\Sigma_{j,P} X_{c,j}$ and $\Sigma_{j,P} X_{w,j}$ are respectively the country *c*'s and the world's total exports of all other products *j* (except *p*) in *P*. When the RCA index is greater than 1 it is inferred that the corresponding country has a comparative advantage in the relevant PIIPs shown in Table 3. The higher the value of a country's RCA index, the higher its export strength (UNCTAD, 2020a). Using the trade indicators database of UNCTAD (2020a), we calculated each country's RCA index for PIIPs (classified into four groups) at 3-digits based SITC (3rd revision) and took the average to have a mean RCA index for each of the PIIP groups.

Table 5. RCA Indices of Examined Countries in PIIPs (Mean-values of 1995-2018)

PIIP groups→ Countries↓	Chemicals and related products (RCA-CRP)	Pulp and waste paper (RCA-PWP)	Manufactured metallic and nonmetallic goods (RCA-MNM)	Machinery and transport equipment (RCA-MTE)
China	1.046*	0.434	1.296*	0.707
India	1.218*	0.199	1.612*	0.537
Mexico	0.390	0.416	0.667	0.664
Poland	0.728	1.661*	1.615*	1.021*
South Africa	1.772*	1.732*	4.025*	0.572
Turkey	0.293	0.679	1.710*	0.669

Source: Authors' computation based on UNCTAD (2020a) data.
Note: * denotes a confirmed revealed comparative advantage (RCA index>1).

By definition, two central predictors, i.e. FDI and environmental policy, are decisive for testing the PHH. We take inward FDI as a stock term for capturing the agglomeration and external spillover effects of FDI which are commonly ignored by the studies that use only FDI inflows. The PHH is based on the role of environmental policies in terms of both availability and stringency. In the PHH, the direct positive association between FDI inflows and the advantage of pollution haven actually depends indirectly on the push and pull effects of environmental policies. Nevertheless, cross-country studies in the PHH literature seem to be failing to capture the effect of environmental policies due to data limitations. Concerning international trade, the World Trade Organization's (WTO) environmental database (WTO, 2020) provides a systematic assessment of member countries in terms of notifications, measures, and trade policy reviews (TPR) that are related to the environment regarding energy conservation, water, and waste management, nature protection, alternative/renewable energy use, climate change mitigation, sustainable agriculture, environmental protection, changing activity, energy/non-energy efficiency, renewables, alternative energy use, etc. For the 2009-2018 period, WTO environmental database covers roughly 5,500 environment-related notifications, 11,500 environment-related measures, and 7,900 environment-related TPR entries. The OECD's environmental policy stringency index is a country-specific and internationally-comparable measure of the stringency of environmental policies. Stringency is assessed based on the degree to which environmental policies put an explicit or implicit cost on environmental pollution. The index ranges from 0 (not stringent) to 6 (most stringent) (Botta & Kozluk, 2014; OECD 2020). Given the miscellaneous aspects and different measures as well as varied assessments of environmental policies, it is hard to have stable estimations of the effects of environmental policies. Since our study aims to capture the pull-effect of the environmental policy body, we take the overall pollution-mitigating attempts of countries into consideration based on both punitive/ compelling policies and encouraging inducements. Within a set of good practice policy, we use the annual number of any kind of environmental regulations and policies which aims to mitigate any kind of environmental pollution in all industries. The data was taken from the climate policy database of the New Climate Institute (2020).

Table 6 provides an inventory of countries' involvement in environmental policies, As seen from Table 6, China submitted the highest number of environment-related notifications, measures, and TPR entries to WTO followed by Mexico and India. However, the information provided by these notifications has shortcomings since they can be used as an excuse for protectionism. In terms of environmental policy stringency metric, Poland has the highest score followed by Turkey. Regarding environmentally related tax revenue as a share in GDP, China and Mexico have relatively lower share compared to other countries. Poland, China, and India seem to be engaging in the implementation of climate policies more than the other three countries.

Table 6. Indicators of Environmental Policy Involvement of Sampled EIEs

	China	India	Mexico	Poland	South Africa	Turkey
Number of environment-related notifications (2009-2018)[(a)]	257	51	136	6	39	57
Number of environment-related measures (2009-2018)[(a)]	461	73	197	16	82	82
Number of environment-related TPR entries (2009-2018)[(a)]	335	70	11	0	65	70
Environmental policy stringency index (1990-2015)[(b)]	0.89	0.73	Not available	1.50	0.64	1.03
Environmentally related tax revenue, % GDP (1994-2018)[(b)]	0.84	1.15	0.62	2.29	2.09	2.93
Total (cumulative) number of climate policies currently implemented inside the country (1995-2018)[(c)]	156	150	69	177	67	58

Sources: [(a)]: WTO (2020); [(b)]: OECD (2020); [(c)]: New Climate Institute (2020).
Note: Periods are general and not equal for all countries.

We have a varied set of control variables which affect pollution havens directly and/or indirectly (through FDI). These variables include market size proxied by population growth; trade (export and imports) openness; technological progress measured as the capacity of exporting medium and high-tech products[6]; industrialization as the development of industry sector[7]; labor and capital stocks; labor cost, and productivity. The variables together with their definitions and data sources are summarized in Table 7. Population (*PopGr*) and environmental policies (*EnPol*) variables are not converted into the natural logarithmic form due to some non-positive values in their series. Other variables are expressed in the logarithmic form which enables us to interpret the estimated coefficients as elasticities.

Table 7. Definitions of Variables, Notations, and Data Sources

Variable	Symbol	Definition of variables	Data source
Dependent variables			
RCA in 'chemicals and related products (CRP)'	RCA_CRP	Annual RCA indices calculated at 3-digit level based on SITC (3rd revision)	UNCTAD (2020a)
RCA in 'pulp and waste paper (PWP)'	RCA_PWP		
RCA in 'manufactured metallic and nonmetallic products (MNM)'	RCA_MNM		
RCA in 'machinery and transport equipment (MTE)'	RCA_MTE		
Explanatory variables			
Openness to inward FDI	InwFDIst	Inward FDI stocks. Percentage of GDP.	UNCTAD (2020a)
Environmental policy	EnvPol	Annual number of climate policies currently implemented inside the countries[(b)]	New Climate Institute (2020)

[6] In the World Bank's database (WB WDI, 2020), SITC (3rd revision, 3-digit) codes of the medium-technology products are 266-267, 512-513, 533, 553-554, 562, 571-575, 579, 581-583, 591, 593, 597-598, 653, 671-672, 678, 711-714, 721-728, 731, 733, 735, 737, 741-749, 761-763, 772-773, 775, 778, 781-786, 791, 793, 811-813, 872-873, 882, 884, and 885 while high-technology codes include 525, 541-542, 716, 718, 751-752, 759, 764, 771, 774, 776, 792, 871, 874, 881, 891. Explanations for products can be found at UNCTAD (2020b).

[7] We broadly define industry by also including mining and quarrying, recycling, electricity-gas-water supply, and construction as well as manufacturing. Industry corresponds to ISIC divisions 10-45. For industrialization, we adopted the value-added approach to eliminate reexport and intermediate inputs within the global supply chains and international outsourcing networks.

Control variables			
Population-based market size	PopGr	Annual percentage change in the total population.	WB WDI (2020)
Trade openness in terms of export	TrOpenEx	Total exports of goods and services as a percentage of GDP	
Trade openness in terms of import	TrOpenIm	Total imports of goods and services as a percentage of GDP	
Technological capacity in the export sector	TechEx	Medium and high-tech exports (% manufactured exports)[(a)]	
Industrialization	Indust	Value-added of overall industrial sectors including construction. Percentage of GDP. Value-added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.	
Human capital stock	HCst	Human capital index, based on years of schooling and returns to education	Penn World Table-9.1 (GGDC, (2020)
Labor cost	LabC	Share of labor compensation in GDP at current national prices	
Physical capital intensity	PCst	Physical capital stock per employee at current PPPs (in 2011 USD)	
Overall productivity	TFP	Total factor productivity (TFP) at constant national prices (2011=1)	
Notes: [(a)] The missing data for the year 2018 was estimated by extrapolating based on the moving average for each country. [(b)] For Poland, many regulations are signed and implemented under the EU initiatives, thus, the EU counties are mostly considered as a single country in the database.			

III.IV. Model Construction

In the PHH literature, the effects of some variables are widely considered 'a priory' and the PHH is commonly tested based on a linear regression between inward FDI and trade performance of PIIPs. However, we first examine the determinants of inward FDI stocks and then test the validity of the PHH based on the relationship between the RCA performance in PIIPs and FDI stocks. Thus, we have models as shown in Equation (2a) and (3a). The first equation associates a direct relationship between inward FDI stocks (*InwFDIst*) and environmental policy (*EnvPol*) while the second equation considers the impacts of inward FDI stocks on RCA in PIIPs distinguished between four groups. Therefore, we have five linear models to estimate where *EnvPol* and *InwFDIst* are presumed as the central predictors for the FDI model and PIIP models, respectively.

$$\text{FDI model:} \quad \ln(InwFDIst_{c,t}) = \alpha_0 + \alpha_1 EnvPol_{c,t} + \alpha_i X_{c,t} + u_{c,t} \qquad (2a)$$

$$\text{PIIP models:} \quad \left.\begin{matrix} \ln(RCA\_CRP_{c,t}) \\ \ln(RCA\_PWP_{c,t}) \\ \ln(RCA\_MNM_{c,t}) \\ \ln(RCA\_MTE_{c,t}) \end{matrix}\right\rangle = \beta_0 + \beta_1 \ln(InwFDIst_{c,t}) + \beta_i Z_{c,t} + e_{c,t} \qquad (3a)$$

In these equations, all variables are as previously described in Table 7. The subscripts *c* (c=1,…,6) and *t* (t=1995,…, 2018) stand for the countries and years, respectively, while α_0 and β_0 are the regression intercepts and *u* and *e* are the regression error terms. Finally, α_i and β_i (i>0) parameters are the coefficients (elasticities for logarithmic variables) to be estimated. We respectively estimate these models using the selected six countries' balanced panel dataset covering the period 1995-2018. In equation (2a) *X* is is a matrix of control variables we include according to the statistical significance of their coefficients for inward FDI stocks. Similarly, in equation (3a) Z is a matrix of control variables we include according to the statistical significance of their coefficients for PIIP models. By doing so, we can group the widely used variables of the PHH into those affecting directly and those that have indirect (through FDI operations) effect. Table 8 shows our final models that are constructed based on the following three criteria: When a control variable is significantly associated with inward FDI stock *(InwFDIst)* the variable remains in the FDI model, regardless it also has a significant effect on RCA indices. When a control variable does not have a significant effect on *InwFDIst* but is significantly associated with at least one of RCA indices in PIIPs, the variable is included in all four PIIP models. Finally, if a control variable is not significantly associated with any model, the variable is excluded from both models. Since the trade openness in terms of imports (*TrOpenIm*) has a significant impact on neither the FDI model nor the PIIP models, it is omitted from the analysis.

Table 8. Model Construction based on Bilateral Regressions

Dependent variables→ / Predictors↓	*ln(InwFDIst)*	*ln(RCA-CRP)*	*ln(RCA-PWP)*	*ln(RCA-MNM)*	*ln(RCA-MTE)*	Inference
	Estimated coefficients (Period-weighed Random-Effects Model)					
PopGr	0.385[(a)]	0.733[(a)]	0.124[(c)]	0.231[(a)]	-0.277[(a)]	Included in FDI model
ln(TrOpenEx)	0.946[(b)]	1.179[(a)]	0.994[(a)]	0.937[(a)]	-0.373[(b)]	
ln(TrOpenIm)	Insig.	Insig.	Insig.	Insig.	Insig.	Excluded from both models
ln(TechEx)	1.312[(a)]	0.471[(b)]	0.307[(c)]	Insig.	Insig.	Included in FDI model
ln(Indust)	-1.535[(a)]	Insig.	-0.680[(a)]	-0.90[(a)]	Insig.	
ln(HCst)	Insig.	Insig.	Insig.	-2.378[(a)]	Insig.	Included in PIIP models
ln(LabC)	0.912[(b)]	4.090[(b)]	3.420[(a)]	2.950[(a)]	Insig.	Included in FDI model
ln(PCst)	Insig.	-0.315[(a)]	0.954[(a)]	0.570[(a)]	0.156[(a)]	Included in PIIP models
ln(TFP)	-1.424[(a)]	0.927[(a)]	-0.980[(a)]	-1.53[(a)]	0.426[(b)]	Included in FDI model

Notes: [(a)], [(b)], and [(c)] superscripts indicate statistical significance at %1, 5%, and 10% levels, respectively. Inference is based on the magnitudes (in absolute values) of the coefficients.

According to the initial bilateral regressions in Table 8, the multivariate models are reconstructed as seen in Equation (2b) and Equation (3b). In these models, human capital *(HCst)* and physical capital (*ln(PCst)* stocks as well as inward FDI stock *(InwFDIst)* are directly related to PHH while the other variables are indirectly (through affecting the location preferences FDI stocks) associated with the PHH.

$$\text{FDI model: } \ln(InwFDIst_{c,t}) = \begin{matrix} \alpha_0 + \alpha_1 EnvPol_{c,t} + \alpha_2 \ln(TrOpenEx_{c,t}) + \alpha_3 \ln(TechEx_{c,t}) \\ + \alpha_4 \ln(Indust_{c,t}) + \alpha_5 PopGr_{c,t} + \alpha_6 ln\left(LabC_{c,t}\right) + \alpha_7 ln\left(TFP_{c,t}\right) + u_{c,t} \end{matrix} \quad (2b)$$

$$\text{PIIP models: } \left.\begin{matrix} \ln(RCA\_CRP_{c,t}) \\ \ln(RCA\_PWP_{c,t}) \\ \ln(RCA\_MNM_{c,t}) \\ \ln(RCA\_MTE_{c,t}) \end{matrix}\right\rangle = \beta_0 + \beta_1 \ln(InwFDIst_{c,t}) + \beta_2 ln\left(HCst_{c,t}\right) + \beta_3 ln\left(PCst_{c,t}\right) + e_{c,t} \quad (3b)$$

III.V. Analysis and Results

We estimate each equation based on period-weighed random-effects models. Table 9 and Table 10 show the estimation results of FDI and PIIP models, respectively.

Table 9. Estimated Coefficients of the Determinants of Inward FDI Stocks (Equation 2b)

EnvPol	*ln(TrOpenEx)*	*ln(TechEx)*	*ln(Indust)*	*PopGr*	*ln(LabC)*	*ln(TFP)*	*Constant*
α_1	α_2	α_3	α_4	α_5	α_6	α_7	α_0
0.007 [0.007] (0.302)	1.288[a] [0.163] (0.000)	1.296[a] [0.159] (0.000)	-1.703[a] [0.230] (0.000)	0.354[a] [0.089] (0.000)	0.785[a] [0.296] (0.010)	-1.407[a] [0.356] (0.000)	-0.346 [0.912] (0.705)
N:144; R^2: 0.786; Adjusted R^2: 0.775; F-statistic: 71.345[a] (0.000)							
Notes: The superscript [a] indicates the statistical significance at 1% levels. Robust (panel-corrected) standard errors are shown in [brackets] and probabilities appear in (parentheses).							

Results in Table 9 show that *EnvPol* does not have a significant effect on *InwFDIst* which means that one of the important conditions of the PHH is not met in our case. Additionally, *Indust* and *TFP* are significantly and negatively associated with *InwFDIst* while the other variables have significant positive impacts on *InwFDIst.* Finally, for testing the validity of the PHH, we estimate the PIIP models in Equation (3b) and represent the results in Table 10.

Table 10: Estimated Coefficients of the Determinants of RCA in PIIPs (Equation 3b) (N:144)

Dependent variables→ Predictors↓	ln(RCA_CRP)	ln(RCA_PWP)	ln(RCA_MNM)	ln(RCA_MTE)
ln(InwFDIst) (β_1)	*0.434*[a] [0.100] (0.00)	*0.243*[b] [0.094] (0.011)	*0.208*[b] [0.096] (0.031)	*-0.075*[c] [0.042] (0.078)
ln(HCst) (β_2)	-0.533 [0.381] (0.164)	1.849[a] [0.358] (0.000)	-1.299[a] [0.370] (0.000)	1.579[a] [0.155] (0.000)
ln(PCst) (β_3)	-0.658[a] [0.081] (0.000)	0.385[a] [0.076] (0.000)	0.041 [0.077] (0.598)	0.079[b] [0.032] (0.014)
Constant (β_0)	6.431[a] [0.810] (0.000)	-7.137 [0.758] (0.000)	0.511 [0.776] (0.511)	-2.466[a] [0.315] (0.000)
R^2	0.363	0.637	0.083	0.609
Adjusted R^2	0.350	0.629	0.063	0.601
F-statistic	26.639[a] (0.000)	81.732[a] (0.000)	4.231[a] (0.007)	72.807[a] (0.000)
Notes: [a], [b], and [c] superscripts indicate statistical significance at %1, 5%, and 10% levels, respectively. Robust (panel-corrected) standard errors are shown in [brackets] and probabilities appear in (parentheses).				

Statistically significant ($p<0.10$) results principally show that examined variables tend to affect RCA performances in PIIPs differently. In our case, an increase in *InwFDIst* leads to increased RCA indices of three groups of PIIPs (CRP, PWP, and MNM). This evidence supports the validity of the PHH. Moreover, the negative relationship between *InwFDIst* and *RCA_MTE* does not distort the evidenced pollution haven effect since MTE products are recognized as pollution-intensive but efficiency-driven products which also have medium- and high-tech components produced in both developed and developing countries. This is also consistent with the positive relationships between human capital stock (*HCst*) and RCA_MTE. The estimated effects of physical capital stocks (*PCst*) do not provide stable evidence to infer a general conclusion for all PIIPs. Yet, we can assert that pollution-intensive industries are highly sensitive to human capital and physical capital but with different directions.

DISCUSSION OF FINDINGS AND CONCLUSION

The sources of comparative advantage in PIIPs that are widely referred to as 'dirty' products have been vastly investigated by business and economics scholars in a variety of environmental fields. Intuitively, it can be premised that countries with weak environmental regulation will, ceteris paribus, have a comparative advantage in PIIPs through attracting FDI operations seeking for the low-cost advantage in the pollution-intensive industrial activities. This result is attributed to the PHH which suggests that developed countries with stringent pollution-mitigation policies force their local enterprises to developing countries with no or lenient environmental regulations. We test this hypothesized pollution haven effects for six EIEs that have been recording more significant achievement in both FDI attraction and competitive industrial performance compared to other developing and/or emerging countries in their regions. Our study adopted an RCA approach to the PHH and provided some noteworthy findings as follows: i) Initial condition of the PHH was not met since we found environmental policy variable with an insignificant effect on inward FDI stocks. This can be explained by the high efficiency level of multinational enterprises in these countries where the returns of businesses may be still remaining higher than the cost of pollution since the environmental policies in these countries are not that stringent and punitive. Therefore, future studies examining the PHH for emerging economies that are in a transition from pollution-intensive to efficiency driven economic structure need to comparatively consider the environmental policies in the home (developed) countries sending FDI to these emerging economies. ii) Exports-based trade openness, technological capacity in the export sector, population growth as a proxy for market size, and labor cost were found positively associated with inward FDI stocks which can be concluded that inward FDI activities are motivated mostly by the efficiency and low labor cost, rather than pollution advantages. These accompanying effects are widely discussed in the relevant literature. iii) Another important finding is that the negative influences of industrialization and total factor productivity which provides new insights for practical implications. When industrialization and productivity growth are considered together, they mean an increased capacity to produce imported-components and intermediates leading to a reduced need for FDI and increased competition which may demotivate FDIs. Consistently, during the past decade, the outward FDI operations of emerging countries especially of China have increased considerably which demonstrates a dynamic pattern of FDI migration.

After assessing the impacts of the predictors of inward FDI stocks, we estimated the PHH using PIIP models that associate relationships from inward FDI stocks, human capital accumulation, physical capital intensity to RCA indices in PIIPs distinguished between four groups. In this sectoral aggregation, regarding the overall pollution, the pollution-intensity of 'chemicals and related products' and 'manufactured metallic and nonmetallic products' is higher than that of 'pulp and waste paper' and 'machinery and transport equipment' in their production stages. Our results revealed that an increase in the inward FDI stocks improved the comparative advantages in the PIIP groups except 'machinery and transport equipment'. This is consistent with the prediction of the PHH. The negative elasticity of the 'machinery and transport equipment products' is not contradicting the validity of the PHH since this product group also has both clean and polluting components produced in different sectors by different businesses located in even different countries. This sector has been attracting a specific interest of both policy-makers and scholars due to its characteristics similar to those of both clean and dirty industries. Involvement level in this sector is, in fact, recognized as a transition from resource-driven and pollution-intensive to efficiency-driven productive economic structure and thus sometimes excluded from the list of dirty industries. It is consistent with their emerging economy attribution that our sampled countries have generally increased their competitiveness in this sector during the past two decades. Additional results showed that human capital and physical capital stocks variables were positively associated with the RCA index of 'machinery and transport equipment products' and 'pulp and waste paper' which have relatively lesser pollution-intensity. Moreover, for these sectors, the magnitudes of the estimated elasticities of the human capital variables are considerably higher than those of physical capital. For PIIP groups with relatively heavier pollution-intensity, we found significant strong negative relationships between human capital and RCA index in 'manufactured metallic and nonmetallic products' and between physical capital and RCA in the 'chemicals and related products' group. Therefore, our study's overall evidence underlines the importance of disaggregating PIIPs as much as possible and ranking them by pollution intensity and varied pollution aspects while defining dirty industries.

The study has a limitation stemmed from the possible heterogeneity of the sampled countries with different idiosyncrasies which impede the generalization of the findings to all EIEs and other emerging/developing countries. Furthermore, it should be noticed that despite the RCA metric provides general information about a country's overall export competitiveness, it does not capture the impacts of national policy implications such as tariffs, non-tariff measures, subsidies, etc. which may also affect comparative advantages in PIIPs.

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