Volume: 4 Issues: 14 [March, 2019] pp.62-70]
Journal of Tourism, Hospitality and Environment Management
eISSN: 0128-178X
Journal Website: www.jthem.com

THE POLLUTION HAVEN HYPOTHESIS: EVIDENCE FROM ASEAN COUNTRIES

Norazean Rasit [1]
Sarma Imran Aralas [2]

[1] Faculty of Business, Economics, and Accountancy, Universiti Malaysia of Sabah (UMS), Malaysia (E-mail: hurtingme12@yahoo.com)
[2] Faculty of Business, Economics, and Accountancy, Universiti Malaysia of Sabah (UMS), Malaysia (E-mail: miasarma@ums.edu.my)

Accepted date: *09-12-2018*
Published date: *18-04-2019*

To cite this document: Rasit, N., & Aralas, S. I. (2019). The Pollution Haven Hypothesis: Evidence from ASEAN Countries. *Journal of Tourism, Hospitality and Environment Management*, 4(14), 62-70.

Abstract: *The production of goods and services in economy may create pollution that affects our environment. The pollution haven hypothesis described the situation where developed countries relocate their dirty production to countries with less stringent environmental regulations. This paper contributes to the empirical literature on the effects of the volume of exports and imports of dirty goods on environmental regulation. The study focuses on dirty industries in the Association of South East Asian Nations (ASEAN). Panel data from the years 2002 to 2017 is analysed using the Environmental Kuznets Curve (EKC's) framework. Our findings show that there is a negative relationship between environmental regulation and volume of exports, and a positive relationship between environmental regulation and the volume of imports. There is no evidence to suggest that the pollution haven hypothesis is valid for ASEAN countries for the relationship between the volumes of import and environmental regulation, meanwhile a negative relationship between the volumes of exports and environmental regulation is consistent with the existence of the pollution haven hypothesis in ASEAN countries.*

Keywords: *Pollution Haven Hypothesis, Environmental Kuznets Curve, Panel Data Analysis, ASEAN*

Introduction

Today, the Association of South East Asian Nations or ASEAN is considered as one of the successful regional organizations in terms of economic, political and social cooperation. However, the implementation of environmental regulations within ASEAN countries differs between ASEAN countries because of differences in the rate of the expansion of dirty industries in each country. Rapid development of industrialization causes firms to produce more output in order to gain and maximize profits. These activities may induce the increase of pollution. This study investigates whether the pollution haven hypothesis exists for ASEAN. Pollution haven hypothesis refers to the relocation of the pollution intensive (dirty) industries from one country in order to set up factories abroad to take advantage of less strict

environmental regulations in other countries. Impacts from the relocation of developed nations to developing countries induce the level of developing economy increase. This pollution control behaviour generates impacts on investment and trade flows. According to Aller et al., (2015) emphasized that there is a relocation of the industries from developed countries to developing countries since an increasing trend of international trade. The implication of trade liberalization certainly gives implications to developing countries environmental regulation quality. In addition, less developed countries have a negative effect as well as positive effect from the trend.

Although in general, the environment is low on public concerns list, nevertheless policies of natural resources seen have a very significant impact on the economy. It means that the environment needs to protect from contaminant that released by the dirty industries mainly to spur economy performance. Therefore, the implementation of environmental regulation is one of the tools to protect and to conserve our environment in order to dodge environmental pollution. That is why the implementation of environmental regulations or policies is necessary to protect resources under a common property regime. According to Jia and Shen (2017) environmental regulations will affect the economic performance of countries through two transmissions. First is direct transmission which is environmental performance affect economic performance through a corporation's cost and revenue and second is indirect transmission where environmental regulations affect economic performance through leading of corporations. In contrast, Tomasz and Christina (2016) stated that environmental regulations are not a major driver of international trade patterns, but they are linked to a comparative disadvantage in dirty industries and a corresponding advantage in cleaner industries. Even though, the effects are stronger to the export domestic component compared to gross exports. In addition, Sakiru et al., (2017) stated that the pollution haven hypothesis confirmed in Ghana. It's proven when all variables have a positive impact on carbon dioxide (CO^2) except institutional quality. In addition, the outcome revealed that international trade has a long-run relationship with CO^2 emission. Considerable interest has focused on the possible existence of a pollution haven in this study. Kuznets curve model adapted then beautifying with other related variables as in section three in this paper.

This paper investigates the following questions: (i) is there a negative relationship between environmental regulation with the volume of export and volume of import in ASEAN countries? and (ii) does the pollution haven hypothesis describes trade in ASEAN countries?

The organization of this study is as follows. In section 1, the paper presents introduction of research. In section 2, the paper presents reviews of related literature. Section 3 presents the methods and empirical equations. Section 4 provides results of analysis of data, and section 5 presents a discussion of the findings and recommendations.

Previous Literature Reviews

The Environmental Kuznets Curve (EKCs) hypothesis founded by Simon Kuznets (1955) is an inverted-U-shape relationship between pollutants and income (per capita). The EKC shows that in the beginning, environmental pressure increases until to a certain level of income, and then, as income continues to rise, pollutant levels decrease. The EKCs reveals how environmental quality changes with changes in income levels: at the beginning for pre-industrial economy, then to post-industrial, and eventually to service economy. This is shown in diagram 1 below:

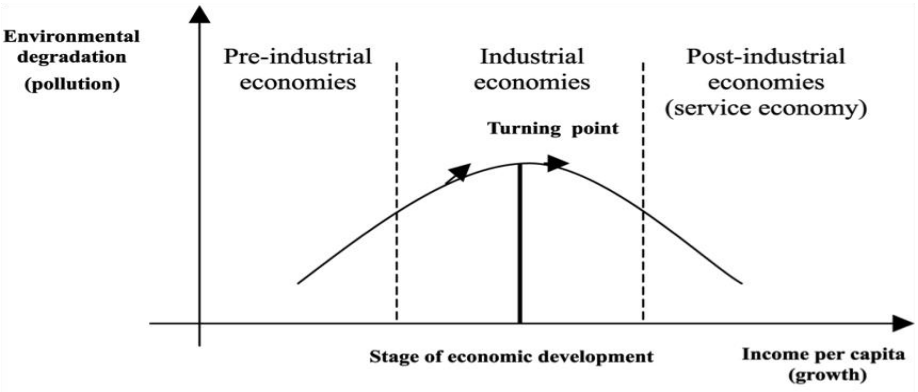

Figure 1: Environmental Kuznets Curve Model

Source: Panayotou (1993)

There are two main points will be discussed in literature which is; first will be discussing on the relationship between environmental regulations with the volume of exports and second, will be discussed on environmental regulations with the volume of imports.

In the relationship between environmental regulation and the volume of exports, according to Wang et al., (2015) the result of the study shows that the strict implementation of environmental regulation might only the chemical industry have a significant loss in international trade, meanwhile other industries are not suffered, and some are benefit from the implementation of environmental regulation. Meanwhile, Holladay (2016) use panel data to estimate a robust relationship between international trade and pollution levels, and found that there was significant heterogeneity across industries and the result shows that there is no evidence of relocation to countries with low levels of environmental regulation, and importing back into the U.S. Helble and Majoe (2017) state that there has an evidence that at the lower prices in environmental products for certain products of environment, the volume of exports equally increased. In addition, Xinzheng and Zhufeng (2018) found that firms' volume of exports, especially for pollution-intensive industries decreases as an effect from stricter of environmental regulation. Besides that, Shapiro and Walker (2018) observed that there is a reduction in pollution emission rather than reallocation across products or changes in real manufacturing output scale and exports equally increased for certain products of environmental.

Whilst, the relationship between environmental regulation and the volume of imports, based on Moinul Islam et al., (2016) by using large balanced panel data found that there has a negative impact on the embodied emissions in imports. Conversely, Thai Ha Le at al., (2016) found that there was a relationship between particulate matter (PM10), trade openness, and economic growth in the long-run. It proven by increased trade openness will lead to environmental degradation yet increasing in trade openness countries gave a harmful effect to middle-income and lower-income countries compared to high-income countries. Helble and Majoe (2017) state that there was evidence at the lower prices in environmental products, those EU Member States implemented the directive to a large extent had substantially higher on the volume of imports. Meanwhile, Antoine and Sato (2017) show that in the short-run, environmental regulation lead to statistically significant adverse impacts on productivity, plant location, and trade employment but the impacts are small relative to production. At the same time, innovation in clean technologies created effects form the implementation of environmental regulation. Lastly, Jung-Ah Hwang and Yeonbae Kim (2017) studied the manufacturing sector under static and dynamic conditions with analyses of environmental tax, tax of energy, and the emissions

trading systems to find that environmental tax and energy limit the volume of imports, mainly for the high-energy consumption groups.

Methods

This section discusses data sources, methods of analysis and econometric models. Methods used in the analysis include descriptive analysis, pooled ordinary least squares, correction analysis, the Hausman test and the Langrage-multiplier (LM) test.

Framework

In this study, environmental regulation (measured in million dollars) as the dependent variable, meanwhile, income per capita (measured in million dollars), volume of export (measured in million dollars) and the volume of import (measured in million dollars) are independent variables. As we knew the pollution haven hypothesis suggesting that developed countries will relocate to developing countries, if the implementation of environmental regulation tightened (see Aller et al., 2015). In this study, the EKC model is used and beautifying from the origin to represent the pollution haven hypothesis, moreover EKC's potentially a reflection of the pollution haven hypothesis. In the model of EKC revealed that there was a relationship between pollution degradation with the income per capita and we believe that there are other factors that influences environmental regulation rather than income per capita which is direct shows the existence of the pollution haven hypothesis as elaborated in section 2. Theoretical of the framework can be illustrated as follows;

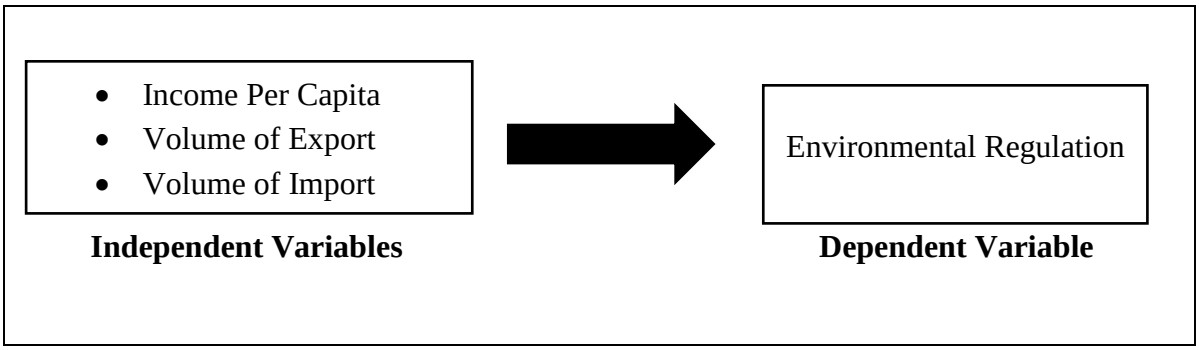

Diagram 2: The Relationship between Environmental Regulation and Determinants

Data

In the current analysis, environmental regulations, measured by the environmental performance index of country, is the dependent variable, while income (per capita), volume of exports, and volume of imports are the independent variables. A short panel data from year 2002 to 2017 (16 years) is used, involving ten of ASEAN countries: Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.

Methods of Analysis

Panel data analysis is used in order to study the following: 1) the negative relationship between environmental regulations with volume of exports and the negative relationship between environmental regulation with volume of imports; and 2) to examine the existence of pollution haven hypothesis in ASEAN countries. The relationship between environmental regulation with export (X), and import (M) is tested using the empirical equation as below:

$$R_{it} = \beta_{0\,it} + \beta_{1\,1it}\,\text{Ink}_{\,1it} + \beta_{2\,2it}\,X_{2it} + \beta_{3\,3it}\,M_{\,3it\,+}\,\varepsilon \qquad (1)$$

Indicator:
R_{it} = Environmental Regulation (measured in Environmental Performance Index- EPI), Ink_{1it} = Income (per capita), X_{2it} = Volume of Export, and M_{3it} = Volume of Import.

Findings

Table 1 (see appendix A) shows the descriptive statistics which consist of the values of the mean of the data, standard deviation, minimum, maximum, and the number of observations for each variable.

Fixed Effect Method

The results from the chow test regression analysis chose the fixed effect method as shown in Table 2 (see appendix B). The coefficient of the independent variables, income (per capita) and import were found to have a positive relationship with environmental regulation, and a negative relationship between environmental regulation and volume of exports. The coefficient of volume of exports is statistically significant at the 5 percent level of significance and indicates that a one percent increase in exports will decrease environmental regulation by -0.2390567 percent. Meanwhile, import was found to have a positive relationship with environmental regulation, statistically significant at the 5 percent level of significance. The result indicates that one percent increase in import increases environmental regulation by 0.2373639 percent.

Hausman-test: Random Effect Method

The Hausman method is used to determine the appropriate method between either the fixed-effect method or the random-effect method is appropriate (see Gujarati, 2003). The result of Hausman-test is shown in Table 3 (see appendix C). It reveals that the value of chi-squared static is 4.8 and the p-value is 0.1869. Therefore, the result indicates that the null hypothesis (H_0: random effects) more appropriate than (H_1: fixed-effects) for this panel data set.

Lagrange Multiplier Statistic

Since the Hausman-test result shows that the random-effects is the appropriate method to use, we use the Lagrange-Multiplier method to determine whether the random-effects method (H_1) is more appropriate than common pooled OLS (H_0). The result shows that p-value is 0.0377, which is the value of (prob > chibar2) < alpha 0.05, as in Table 4 (see appendix D). Therefore, H_1 cannot be rejected, which means that the random-effects method is more appropriate than Pooled OLS.

Discussion and Recommendations

The result of the empirical analysis shows positive relationships between environmental regulation with volume of imports and negative relationship with volume of exports. In this paper, the analysis looks relationship between how the total volume of imports and the total volume of exports influence environmental regulations.

For the volume of imports, we assume that most of imports are from developed countries where countries have stricter environmental regulations. It means an increase in volume of imports of clean products, for example hospitality, tourism, and education that may induce less strict environmental regulation in developing countries. However, the results show a positive relationship between imports and environmental regulation; this means that a volume of imports induces stricter of environmental regulation, which is contrary to our expectations. One explanation could be that our data may suggests that the total volume of import may not be composed of cleans goods of products.

Meanwhile, for the volume of exports, we assumed that since developing countries are mostly engage in agriculture and manufacturing industry which can be described as pollution intensive industries, this may induce less stringent environmental regulations if the exports are mostly dirty goods. Therefore, an increase in the volume of exports may influence environmental regulation in a negative manner. Our results show a negative relationship between exports and environmental regulations; this indicates that the volume of exports affect environmental regulation negatively. Assuming that the production of dirty goods in the domestic country include industries that allows the relocation of dirty production from developed country into developing countries such as ASEAN, then our result of a negative relationship between exports and environmental regulation is consistent with the existence of the pollution haven hypothesis (see Sakiru et al., 2017) who propose that stringent of environmental policy has a negative influence on the production of polluting goods.

Since the results are not shows both in negative relationship as in international trade predictions, we propose that for future research, we use more comprehensive of data that is segregated to reflect imports and exports from pollution intensive industries used in our empirical analysis. We would also propose to test for bi-directional relationships in analysis.

References

Aller, C., Ductor, L., & Herrerias, M. J. (2015). The world trade network and the environment. *Energy Economics: Elsevier*, 52 (2015), 55-68.

Antoine Dechezleprêtre and Misato Sato. (2017). The impact of environmental regulations on competitiveness. *Review of environmental economics and policy*, 11(2), 183-206. doi:10.1093/reep/rex013.

Gujarati, Damodar N. (2003). Basic econometrics (4th ed.). Americas, New York. McGraw-Hill.

Helble, M., and A. Majoe. (2017). How can environmental regulation spur international trade? The case of the EU performance of buildings directive and lessons for Asia. Asian Development Bank Institute. ADBI working Paper Series 769. Tokyo: Asian Development Bank Institute. Retrieved from https://www.adb.org/publications/how-can-environmnetal-regulation-spur-international-trade.

Holladay, J. Scott. (2016). Exporters and the environment. *Canadian Journal of Economics*, 49 (1), 147-172. doi:10.1111/caje.12193.

Jia Nisha and Shen Chen. (2017). A study on the relationship of environmental regulations and economic performance. *Earth and economic science*, 94(2017), 1755-1315. doi: 10.1088/1755-1315/94/1/012035.

Joseph S. Shapiro and Reed Walker. (2018). Why is pollution from U.S. manufacturing declining? The roles of environmental regulation, productivity, and trade. *American Economic Review*, 108 (12), 3814-3854.

Jung-Ah Hwang and Yeonbae Kim. (2017). Effects of environmental regulations on trade flow in manufacturing sectors: Comparison of static and dynamic effects of environmental regulations. *Research article of business strategy and the environment*, 26 (5), 688-706. doi:10.1002/bse.1965.

Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, 45 (1), 1-28. Retrieved from http://links.jstor/sici?sici=0002-8282%28195503%2945%3A1%3C1%3AEGAII%3E2.0.CO%3B2-Y.

Moinul Islam, Keiichiro Kanemoto & Shunsuke Managi. (2016). Impact of trade openness and sector trade on embodied greenhouse gases emissions and air pollutants. *Journal of Judastrial Ecology*, 20(3), 494-545. doi: 19/1111/jiec.12455.

Panayotou, T. (1993). Empirical tests and policy analysia of environmental degradation at different stages of economic development. Working paper WP238, technology and employment programme. Geneva: International labor office. Retrieved from http://www.ilo.org/public/libdoc/ilo/1993/93B09_31_engl.pdf.

Sakiru Adebola Solarin, Usama Al-Mulali, Ibrahim Musah & Ilhan Ozturk. (2017). Investigating the pollution haven hypothesis in Ghana: An empirical investigation, *Journal of energy*, Elsevier, 124, 706-719. doi.org/10.1016/j.energy.2017.02.089.

Thai Ha Le, Youngho Chang & Donghyun Park. (2016). Trade openness and environmental quality: International evidence. *Energy Policy*, Elsevier, 92, 45-55. doi: 10.1016/j.enpol.2016.01.30.

Tomasz Koźluk and Christina Timilotis. (2016). Do environment policies affects global value chains? A new perspective on the pollution haven hypothesis. *Review of environmental economics and policy*, 13(1), 105. doi:101093/reep/rey027.

Xinzheng Shi and Zhufeng Xu. (2018). Environmental regulation and firm exports: Evidence from the eleventh five-year plan in China. *Journal of environmental economics and management*, Elsevier. 89 (2018), 187-200. doi: 10.1016/j.jeem.2018.03.003.

Zhaohua Wang, Bin Zhang and Hualin Zeng. (2015). The effects of environmental regulation on external trade from China economy. *Journal of Cleaner Production*, Elsevier, 114, 55-61. doi: 10.1016/j.jclepro.2015.07.148.

Appendices

Appendix A

Table 1: Summary of Panel Data

$$R_{it} = \beta_{0\,it} + \beta_{1\,1it}\,Ink_{\,1it} + \beta_{2\,2it}\,X_{2it} + \beta_{3\,3it}\,M_{\,3it} + \varepsilon \qquad (1)$$

Variable		mean	std. dev	min	max	observations
Logepi	overall	1.71115	0.135066	1.412629	1.95424	N = 160
	between		0.11877	1.527424	1.91682	n = 10
	within		0.073942	1.596353	1.87525	T = 16
Logink	overall	3.50437	0.669078	2.305351	4.95699	N = 160
	between		0.647707	2.809039	4.59805	n = 10
	within		0.260228	3.00068	4.46323	T = 16
Logx	overall	2.883941	3.600629	-0.737623	15.5916	N = 160
	between		0.839876	0.6388227	3.55508	n = 10
	within		3.510795	1.03283	15.0445	T = 16
Logm	overall	2.834749	3.616047	-0.90346	15.6194	N = 160
	between		0.880298	0.5380224	3.58944	n = 10
	within		3.517666	1.003082	14.9978	T = 16

Appendix B

Table 2: Summary of Pooled OLS

Source	ss	df	Ms
Model	2.2756838	3	0.758561267
Residual	0.62493123	156	0.004005969
Total	2.90061503	159	0.01824286

Number of obs = 160
F(3, 156) = 189.36
Prob > F = 0.0000
R-squared = 0.7846
Adj R-squared = 0.7804
Root MSE = .06329

logepi	coef	Std. err.	t	P>t	[95% Conf. Interval]	
logink	0.2008487	0.0090342	22.23***	0.000	0.1830035	0.21869
logx	-0.2390567	0.0385706	-6.2***	0.000	-0.3152447	-0.1629
logm	0.2373639	0.0381983	6.21***	0.000	0.1619114	0.31282
cons	1.02386	0.0300456	34.08	0.000	0.9645107	1.08321

*** Significant at 1% level of significance where the critical value is 2.609
** Significant at 5% level of significance where the critical value is 1.976
* Significant at 10% level of significance where the critical value is 1.653

Appendix C

Table 3: Summary of Hausman Test

	Coefficients		b-B	sqrt(diag(V_b-V_B))
	b fe	B re	difference	S.E.
logink	0.1657613	0.1929769	-0.0272156	0.0175415
Logx	-0.2010047	-0.2160768	0.0150721	0.0251571
Logm	0.2000569	0.2144156	-0.0143587	0.0253709

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(3) = 4.8
Prob>chi2 = 0.1869

Appendix D

Table 4: Lagrangian Multiplier (LM) Test

Breusch and Pagan Lagrangian multiplier test for random effects

logepi[country,t] = Xb + u[country] + e[country,t]

Estimated results:

	Var	sd = sqrt(Var)
Logepi	0.018243	0.1350661
E	0.003697	0.0608065
U	0.000362	0.0190363

Test: Var(u) = 0
chibar2(01) = 3.16
Prob > chibar2 = 0.0377