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IS TRADE LIBERALIZATION A HAZARD TO SUSTAINABLE ENVIRONMENT? FRESH INSIGHT FROM ASEAN COUNTRIES

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Abstract: The importance of trade liberalization in altering country's ecological condition is a very important topic these days; the current examination seeks to study the empirical association between environmental degradation and trade openness in a panel of ASEAN countries. In doing so, the study seeks to analyze the influence of trade liberalization in impacting carbon dioxide emanations in the countries of Malaysia, Indonesia, Singapore, Thailand and Philippine by utilizing advanced methods of panel Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS). The results confirm that all the variables stationary features at the first differential series. Furthermore, the results of bootstrap cointegration, Pedroni, and Kao cointegration check that all the variables are cointegrated in the long term. Finally, the outcomes suggested that trade liberalization has a significant positive impact on carbon dioxide emission. The outcomes confirm that the more the enhance in the liberalization of trade cause the poor environmental condition. Therefore, the study recommends that the government need to enhance trade based on renewable and green technology. Also, the government can adopt a green transportation system such as hybrid vehicles for the logistics and shipping the good from one place to another place.

Key words: environmental degradation, trade liberalization, bootstrapping cointegration, ASEAN

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Introduction

The increasing trend of adversity in the environment is recognized as a vital threat to sustainability (Woodhouse, 2000). In the modern globalized world, the practices followed by a single country have spillover effects and may influence economies all around the world (Perkins and Neumayer, 2012). Given the rising ecological pressures, there is a growing emphasis for eco-friendly business methods that can ensure environmental stability (Han et al., 2009; Min and Galle, 2001; Florida et al., 2001).

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The role of trade has always considered crucial for economic and environmental stability (Cetin et al., 2015). In this regard, the importance of trade liberalization has been recognized to increase efficiency, innovation, quality, and fairness. It underlies the tendency to enhance growth through improved competitiveness and unobstructed geographical limitations. However, many studies identified trade to enhance environmental degradation by raising the levels of toxic emissions such as carbon dioxide (Shahzad et al., 2017; Ertugrul et al., 2016; Ling et al., 2015; Managi, 2004). On the other hand, few studies also argued the importance of trade in improving environmental stability (Kim et al., 2019; Shahbaz et al., 2017; Ali et al., 2016). The ambiguities in the existing literature regarding the role of trade liberalization in impacting environmental condition augments the significance of studying environment-trade nexus, especially with advanced methodologies as suggested by many researchers (Katircioglu, 2009).

Keeping in mind the importance of trade liberalization (TRL) in altering country's ecological condition, the current examination seeks to study the empirical association between environmental degradation and trade openness in a panel of ASEAN countries. In doing so, the study seeks to analyze the contribution of TRL in influencing carbon dioxide emanations in the countries of Malaysia, Indonesia, Singapore, Thailand and Philippine by utilizing advanced methods of panel Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS). The outcomes of the current study would be useful in highlighting the possible role of trade in encouraging or discouraging severity in the environment, thereby, support the notion of sustainability in future policy building. The rest of the examination is structured as below. Chapter-two of the current study review important literature regarding environment-trade nexus. Chapter-Three would highlight utilized methodology for the study. Chapter-Four will demonstrate the outcomes of empirical results. Lastly, Chapter-five will provide study summary and conclude the findings and future implications.

Literature Review

The association between environmental and monetary variables has been extensively identified in the literature as critical for economic development. There exists a rising trend in the studies that cater to the growing issue of environmental degradation, especially in recent studies. In this regard, the role of bilateral trade in encouraging or discouraging environmental deterioration has been the contentious issue in the literature (Shahbaz et al., 2017; Sebri and Ben-Salha, 2014; Cole and Elliott, 2003; Antweiler et al., 2001). Among such studies, Cetin et al. (2015) analyzed the association among trade and carbon-di-oxide emanations in between 1970 to 2010 focusing on developed economies, the findings of the investigation reported positive relationship among the variables. Furthermore, the results of the causal investigation established the uni-directional causal connection of trade to carbon emission in a group of panel countries. Moreover, Mrabet and Alsamara, (2017) also analyzed the association among trade, carbon emanations, and

ecological footprint between 1980 to 2011 in the Qatari economy. The results of the investigation reported a significant association of trade in enhancing ecological footprint but unsuccessful in establishing the valid relationship between carbon emission and trade.

In another study, Managi (2004) examined the link between trade and carbon emanations between 1980 to 2014 in 60 developing and developed nations. Similar to Cetin et al., the results established a positive association among the variables. Likewise, Shahbaz et al. (2017) studied the link between trade and ecological deterioration for 105 nations based on income levels between 1980 to 2011. The findings of the investigation, unlike Mangai, (2004) reported the presence of negative link among the variables indicating that TRL reduces carbon emanations. Moreover, Kim et al. (2019) also investigated the connection between trade and carbon-di-oxide in 103 emerging and industrialized nations between 1960 to 2013. Reporting the mixed findings, the authors using GMM confirmed that bilateral trade with the North has a positive link with environmental degradation but negative with South.

Similarly, Ertugrul et al. (2016) analyzed the connection between trade and carbon-di-oxide emissions in ten carbon emanating nations between 1971 to 2011. The outcomes of the investigation supported the presence of positive link among the variables, indicating that trade encourages environmental degradation. The outcomes of the investigation, similar to Managi (2004), established a positive link among the variables. In another study, Shahzad et al. (2017) examined the connection of trade with carbon-di-oxide in Pakistan between 1971 to 2011. The findings of the investigation confirmed the positive connection among the variables indicating that TRL openness augmented ecological deterioration in the country. Similarly, Le et al. (2016) analyzed the relationship of trade with carbon emanations in 98 economies between 1990 to 2013. The results of the study found significance link between trade and environmental deterioration indicating that trade enhanced environmental downfall. Similarly, Li et al. (2015) studying 131 merging and industrialized economies between 1961 to 2004 for potential connection between trade and ecological degradation also found that TRL in vital determinants of ecological downfall in sampled nations.

Ling et al. (2015) also analyzed the trade and carbon emission link in Malaysia between 1970 to 2011. The outcomes of the investigation reported a significant positive link between trade openness and carbon emanations in Malaysia. Moreover, Saidi and Mbarek (2017) analyzed trade and ecological degradation in 19 emerging and developed nations between 1990 to 2013. The findings of the study reported that trade is insignificant to drive ecological deterioration. Moreover, Duong and Hultberg (2018) also studied the link between trade and carbon emanations in Asia between 1986 to 2013. The findings of the investigation suggested the positive link among the variables indicating that trade encouraged ecological downfall.

With respect to Nigeria, Ali et al. (2016) analyzed the relationship between trade, power, urbanization, economic development, and ecological deterioration between 1970 to 2011. For environmental degradation, the investigation utilized the proportion of carbon transmissions. Using the methodology of ARDL framework, the discoveries approved the essential relationship of the variables in influencing ecological deterioration in Nigeria. Then again, the discoveries of the examination neglected to locate the noteworthy commitment of urbanization in influencing the environment. The outcomes further showed that trade negatively affects carbon spreads. Likewise, increment in economic development and power usage alters ecological disruptions negatively. Additionally, Bernard and Mandal (2016) inspected the relationship between trade progression and ecological disruption. The investigation used the board information of sixty developing nations from 2002 to 2012. For measuring ecological disruption, the investigation utilized two intermediaries, for example, carbon emanations and ecological footprint (EPI). The statistical discoveries of the investigation were inferred by applying the techniques of GMM Approach. The discoveries of fixed impact demonstrated that exchange progression improved environmental execution through EPI yet additionally upgraded carbon spreads. Revising the endogeneity uncovered the weakly strong job of trade transparency impacting environmental condition through EPI, yet it affirmed the positive affiliation with carbon dioxide.

With respect to Tunisia, Farhani, and Ozturk (2015) inspected the causal relationship between trade progression, power usage, economic development, urbanization, and ecological disruption. They utilized the information from 1971 to 2012. The discoveries of the empirical examination neglected to approve the criticalness of EKC for Tunisia. Moreover, the result of the investigation found that economic development and urbanization are vital to alter ecological debasement in long-run. Opposingly, the discoveries built up the negative and vital association of trade progression and power utilization with carbon radiations in Tunisia. In addition, Al-Mulali, and Ozturk (2015) additionally assessed the connection between power use, political unsteadiness, economic development, urban improvement, trade advancement, and ecological disruption in MENA nations. To break down the association, the study used the data of fourteen MENA nations from 1996 to 2012. The discoveries of the investigations applying the methodology of FMOLS confirmed the vital relationship of power usage, trade progression, urban advancement, development, and political insecurity with ecological disruption (Hussain et al., 2019). Specifically, the discoveries of the empirical examination recommended that trade, power, economic improvement, and urbanization are emphatically connected with ecological deterioration, though, political strength declined to impact the environment. In another investigation, Al-Mulali et al. (2015) likewise examined the relationship of trade advancement with ecological deterioration. Examining ninety-three economies between the times of 1980 to 2008, the empirical examination revealed that trade transparency improved ecological disruption in the tested nations.

Data and Methodology

In the current investigation, we utilize yearly information on trade openness, urbanization, economic growth, financial development, and carbon emission. We used trade openness as a proxy of TRL and considered as main focus variable. However, urbanization, economic growth, and financial developed used as a control variable. On the other hand, we used carbon dioxide emission as the dependent variable. In the current study, liberalization of trade is represented by (TRL) and is calculated by adding exports and imports of goods and services with the ratio of economic growth. Furthermore, urbanization is represented by (URB) and is calculated by counting a number of populations living in the urban region of the country. Economic growth is represented by (GDP) and is calculated by all finished goods and services. Moreover, financial development is shown by (FD) and estimated by domestic credit to the banking sector. Finally, the carbon emission is denoted by (CO₂) and calculated as the emission of different greenhouse gases. The data for the above-mentioned variables are collected from the World Development Indicators (WDI) managed by the World Bank. The data covers the time period from 1980 to 2017 for top five ASEAN countries (including Singapore, Malaysia, Thailand, Indonesia, and the Philippines). Finally, all variables are converted into natural logarithmic form. In this current study, the CO₂ is appeared by the underneath equation:

$$CO2_{it} = f(TRL_{it}, GDP_{it}, FD_{it}, URB_{it}) \quad (1)$$

where, i discuss the number of countries included in the sample, which is used in this study; however, t explains the time period considered for the current investigation. In this study, initially, we apply different unit root test to confirm the stationary features of the variables. After confirming the stationary property, we further apply different cointegration method to confirm the long-run connection between the variables and finally, we apply FMOLS and DOLS estimations to inspect the effect of TRL and other control variables on CO₂ emission in ASEAN countries.

Results and Interpretation

In this unit, we describe the outcomes achieved by information analysis. Table 1 explains the results for the various unit root test. We used Im et al. (2003) and Levin et al. (2002) unit root test, which emphasizes on the philosophy of variable integrations. The results of Table-1 confirm that all variable showed a non-stationary property at level, but the variables showed a stationary property at first different series. The results confirm that all variables are stationary; therefore, we move for the next step, i.e. cointegration.

In the next step, initially, we apply basic cointegration approaches, and the results are shown in Table 2 and 3.

Table 1. Results of Stationary Test

Variables	IM, Pesaran, and Shin				Levin, Lin, and the Chu			
	I(0)		I(1)		I(0)		I(1)	
	C	C&T	C	C&T	C	C&T	C	C&T
CO2	0.285	0.277	-6.328***	-6.144***	0.263	0.255	-6.453***	-6.332***
TRL	0.736	0.711	-5.477***	-5.452***	0.684	0.662	-5.781***	-5.698***
URB	0.327	0.399	-5.039***	-5.009***	0.309	0.322	-5.117***	-5.183***
GDP	0.285	0.264	-4.985***	-4.893***	0.266	0.232	-4.577***	-4.883***
FD	-0.834	-0.880	-4.778***	-4.873***	-0.678	-0.701	-4.678***	-4.625***

Single, double, and triple asterisks indicate significance level, respectively at 1, 5, and 10%.

The results of Pedroni (2001a, 2001b, and 2004) as well as Kao and Chiang (2001) cointegration check that all the variables are cointegrated in the long run period. Furthermore, we applied advanced econometrics of cointegration, i.e., Bootstrapping cointegration proposed by Westerlund (2007). The results of bootstrap cointegration are described in Table 4. The results of bootstrapping cointegration also confirm that all the variables have a long-run connection in the long-run time period.

Table 2. Results of Pedroni (Engle-Granger based) Panel Cointegration

Estimates	Stats.	Prob.
CO2 = f (TRL + URB + GDP + FD)		
Panel v-statistic	-21.467	0.000
Panel rho-statistic	-15.237	0.000
Panel PP statistic	-12.371	0.000
Panel ADF statistic	-14.473	0.000
Alternative Hypothesis: Individual AR Coefficient		
Group rho-statistic	-12.832	0.000
Group PP statistic	-21.589	0.000
Group ADF statistic	-27.479	0.000

Note: The null hypothesis of Pedroni's (1997) panel cointegration procedure is no cointegration

Table 3. Results of Kao (Engle-Granger based) Panel Cointegration

Estimates	Stats.	Prob.
CO2 = f (TRL + URB + GDP + FD)		
Panel ADF-statistics	-30.382	0.000

Note: The null hypothesis of Kao residual co-integration panel co-integration procedure is no co-integration

In a further step, we apply FMOLS and DOLS to investigate the effect of TRL, urbanization, economic growth, and financial development on carbon dioxide emission in ASEAN countries. The outcomes of the long-run coefficient are shown in Table 4. The results of FMOLS and DOLS confirm that all the variables have a positive and significant impact on carbon dioxide emission in ASEAN countries except economic growth which has a negative and significant impact on carbon

dioxide emission in ASEAN countries. The results further suggested that TRL has a significant positive impact on carbon dioxide emission in ASEAN countries. This means that the more liberalization in trade enhances the carbon dioxide emission and harm the environmental condition in these ASEAN countries.

Table 4. Results of Westerlund (2007) Bootstrap Panel Cointegration

Statistic	Value	Z value	p value	Robust p value
Gt	-1.984	-1.004	0.000	0.000
Ga	-18.382	-11.893	0.000	0.000
Pt	-19.382	-8.893	0.000	0.000
Pa	-20.473	-9.383	0.000	0.000

Note: The null hypothesis of Westerlund (2007) panel cointegration procedure is no cointegration

Using the bootstrap approach of Westerlund (2007) to account for cross-sectional dependence, the number of replications is 1000. The p-values are for a one-sided test based on a normal distribution. The robust p-value is for a one-sided test based on 1000 bootstrap replications.

Table 5. Results of long-run estimation through FMOLS and DOLS

Variable	FMOLS			DOLS		
	Coeff.	t-stats	Prob.	Coeff.	t-stats	Prob.
TRL	0.298	5.487	0.000	0.277	5.382	0.000
URB	0.316	4.537	0.000	0.326	4.375	0.000
GDP	-0.368	-5.384	0.000	-0.345	-5.174	0.000
FD	0.194	4.372	0.000	0.175	4.285	0.000

In the final step, we apply a heterogeneous panel causality test to confirm the causal connection between economic growth, TRL, urbanization, and carbon emission in ASEAN countries. The results of causality are shown in Table-6. The outcomes confirm that TRL has a bidirectional causal relationship with carbon emission, which means the causality is running from TRL to CO₂ and the vice versa. Furthermore, the results confirm that urbanization, economic growth, and financial development also have a bidirectional causal connection with carbon dioxide emission. This means that the causality is running from carbon emission to all control variables and also in reverse direction. The outcomes of panel causality confirm that all variables which are urbanization, financial development, and economic growth along with TRL are also very crucial in the relationship of CO₂ emission in ASEAN countries.

Table 6. Results of Heterogeneous Panel Causality test

Null Hypothesis	Zbar-Stat	Prob.
TRL does not homogeneously cause CO2	9.473	0.000
CO2 does not homogeneously cause TRL	12.448	0.000

URB does not homogeneously cause CO2	11.327	0.000
CO2 does not homogeneously cause URB	13.278	0.000
GDP does not homogeneously cause CO2	19.998	0.000
CO2 does not homogeneously cause GDP	16.437	0.000
FD does not homogeneously cause CO2	24.227	0.000
CO2 does not homogeneously cause FD	19.484	0.000

Conclusion

The role of trade has always considered crucial for economic and environmental stability. In this regard, the importance of TRL has been recognized to increase efficiency, innovation, quality, and fairness. It underlies the tendency to enhance growth through improved competitiveness and unobstructed geographical limitations. However, many studies identified trade to enhance environmental degradation by raising the levels of toxic emissions such as carbon dioxide. The ambiguities in the existing literature regarding the role of TRL in influencing environmental condition augments the significance of studying environment-trade nexus, especially with advanced methodologies as suggested by many researchers. Keeping in mind the importance of TRL in altering the country's ecological condition, the current examination seeks to study the empirical association between trade openness and environmental degradation in a panel of ASEAN countries.

In doing so, the study seeks to analyze the contribution of TRL in influencing carbon dioxide emanations in the countries of Malaysia, Indonesia, Singapore, Thailand and Philippine by utilizing advanced methods of panel Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS). The results confirm that all the variables stationary features at the first differential series. Furthermore, the results of bootstrap cointegration, Pedroni, and Kao cointegration confirm that all the variables are cointegrated in the long run. Finally, the results suggested that TRL has a positive and significant impact on carbon dioxide emission. The outcomes confirm that the more the enhance in the liberalization of trade cause the poor environmental condition. The study suggested that TRL is an important factor which needs to focus to reduce environmental degradation in ASEAN countries.

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CZY LIBERALIZACJA HANDLU STANOWI ZAGROŻENIE DLA ZRÓWNOWAŻONEGO ŚRODOWISKA? AKTUALNE SPOJRZENIE Z KRAJÓW ASEAN

Streszczenie: Znaczenie liberalizacji handlu w zmianie stanu ekologicznego kraju jest obecnie bardzo ważnym tematem. Artykuł ma na celu zbadanie empirycznego związku między degradacją środowiska a otwartością handlu w grupie krajów ASEAN. Badanie ma na celu przeanalizowanie wpływu liberalizacji handlu na oddziaływanie emisji dwutlenku węgla w Malezji, Indonezji, Singapurze, Tajlandii i Filipinach dzięki wykorzystaniu zaawansowanych metod Dynamic Ordinary Least Square (DOLS) i Fully Modified Ordinary Least Square (FMOLS). Wyniki potwierdzają, że wszystkie zmienne są usytuowane w pierwszej serii różnicowej. Ponadto wyniki kointegracji bootstrap,

kointegracji Pedroniego i Kao sprawdzają, czy wszystkie zmienne są zintegrowane w dłuższej perspektywie. Wreszcie wyniki sugerują, że liberalizacja handlu ma znaczny wpływ na emisję dwutlenku węgla. Wyniki potwierdzają, że im większa jest liberalizacja handlu, tym gorszy jest stan środowiska. Dlatego w badaniu zaleca się, aby rząd wzmocnił handel oparty na odnawialnych i zielonych technologiach. Ponadto rząd może przyjąć ekologiczny system transportowy, taki jak pojazdy hybrydowe dla logistyki i wysyłki towaru między różnymi destynacjami.

Słowa kluczowe: degradacja środowiska, liberalizacja handlu, kointegracja bootstrapping, ASEAN

贸易自由化是否会对可持续环境造成危害？来自东盟国家的新见解

摘要：贸易自由化在改变国家生态条件中的重要性是当今一个非常重要的课题，目前的研究旨在研究东盟国家中环境退化与贸易开放之间的经验联系。在此过程中，本研究旨在通过采用面板动态普通最小二乘法（DOLS）和完全修正的普通最小二乘法的先进方法，分析贸易自由化对影响马来西亚，印度尼西亚，新加坡，泰国和菲律宾国家二氧化碳排放的影响。方形（FMOLS）。结果证实了第一个微分系列中的所有变量静止特征。此外，bootstrap协整，Pedroni和Kao协整的结果检查所有变量是否在长期内协整。最后，结果表明贸易自由化对二氧化碳排放具有显著的积极影响。结果证实，贸易自由化的增强越多，导致环境条件恶劣。因此，该研究建议政府需要加强基于可再生和绿色技术的贸易。此外，政府可以采用混合动力汽车等绿色运输系统进行物流，并将货物从一个地方运送到另一个地方。

关键词：环境退化，贸易自由化，自组织协整，东盟。