



**DO TRADE, FDI AND GLOBALIZATION HURT ENVIRONMENTAL SUSTAINABILITY IN ASEAN
NATIONAL GOVERNANCE, INDUSTRIALISATION AND ENVIRONMENTAL SUSTAINABILITY IN
A GLOBALIZED BUSINESS ENVIRONMENT: A PANEL DATA ANALYSIS OF TRADE-OFF**

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Abstract. Environmental pollution has become a major issue in different regions of the world due to industrialization and other activities. The environmental sustainability is facing serious damages and it needs to be rectified as soon as possible. In this scenario, the current study has been conducted with the motive to find out and study the impact of trade, FDI and globalization on the environmental sustainability of ASEAN countries. To achieve this objective, the researchers collected data for this purpose from the ASEAN countries of 28 years from reliable resources. After data collection, the researchers applied the most appropriate techniques and approaches to analyze the collected data such as unit root test, diagnostic tests, correlation test, PCSE and GMM estimation tests. The diagnostic tests suggested that the collected data is heteroskedastic, variables are autocorrelated and cross dependent but without multicollinearity. The results indicated that in the case of both PCSE and GMM estimation, all the independent variables i.e. trade; FDI and globalization have a significant and positive impact on environmental sustainability. This study has major practical implication that it will make the conditions of trade, FDI and globalization better in ASEAN and other countries and ultimately have a positive impact on the environment.

Keywords: Trade; FDI; Globalization; Environmental Sustainability; ASEAN Countries; GMM Estimation

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Jel Codes: O1, O2

1 Introduction

With the fact that the global transborder flows have led to the displacement of national economic governance priorities (Weiss, 1999; Zeibote, Volkova, & Todorov, 2019), leading to a new form of inter-governmental connectedness and regulatory framework (Phillimore, 2013), has become eminent. Global governance, management and sustainability need integral and decisive governance of the global system (Burke & Stephens, 2018; Aktan, Turen, Tvaronaviciene, Celik, & Alsadeh, 2018), where all parties are represented in all aspects, including trade, foreign direct investment (FDI), environmental management and sustainability.

Due to the fact, the economy is an important element in globalization, trade, FDIs and the environmental sustainability have become widely studied areas by the academics, researchers and policymakers (Thanh, Phuong, & Ngoc, 2019; Humbatova, Tanriverdiev, Mammadov, & Hajiye, 2020; Grzeszczyk, & Waszkiewicz, 2020). Globalization is regarded as a holistic term for the totality of the industry structure of a country (Chishti, Ullah, Ozturk, & Usman, 2020; Du, C. 2020). With the increasing globalization, the resulting rise in the scope of trade has been considered as beneficial for the economic growth and the GDP of the country (Andrew Adewale Alola, Bekun, & Sarkodie, 2019; Zheng & Walsh, 2019; Iqbal. Z., et al., 2020). However, the benefits of the increase in the income and economic progress come at a cost relative to the non-economic objectives, which includes the environmental quality (Can, Dogan, & Saboori, 2020; Dogan, Madaleno, Tiwari, & Hammoudeh, 2020; FanLv, & Zheng, L. 2020; Farooqi, 2020). A clear cut adverse consequence of globalization and trade is environmental degradation (Frankel & Rose, 2005).

Table 1: Environmental Performance Index (EPI) of ASEAN countries (2020)

Country	EPI (%)
Brunei	63.57
Cambodia	43.23
Indonesia	46.92
Philippines	57.65
Singapore	64.23
Thailand	49.88
Vietnam	46.96
Lao	42.94
Malaysia	59.22
Myanmar	45.23

The ASEAN region has been experiencing faster growth in the trade figures and Foreign Direct Investment (FDI) inflow and outflows consecutively for a number of years (Ling, Ab-Rahim, & Mohd-Kamal, 2020; Mahrinasari, Haseeb, & Ammar, 2019). The above graph shows the increasing trend of the increasing FDI in ASEAN region and it is projected that this trend will continue to rise (Khan & Ozturk, 2020; Nasir, Huynh, & Tram, 2019), owing to the improvement in the business investments and developments in the region (Ginting, 2019; Setboonsarng & Setboonsarng, 2019). But these advancements have played a detrimental role in maintaining the quality of the environment as shown by the following table. The index given in this table shows that these countries are no included among the top nations who are performing well considering the performance indicators of their environments and they need to adopt measures to improve their environmental sustainability. See Figure 1.

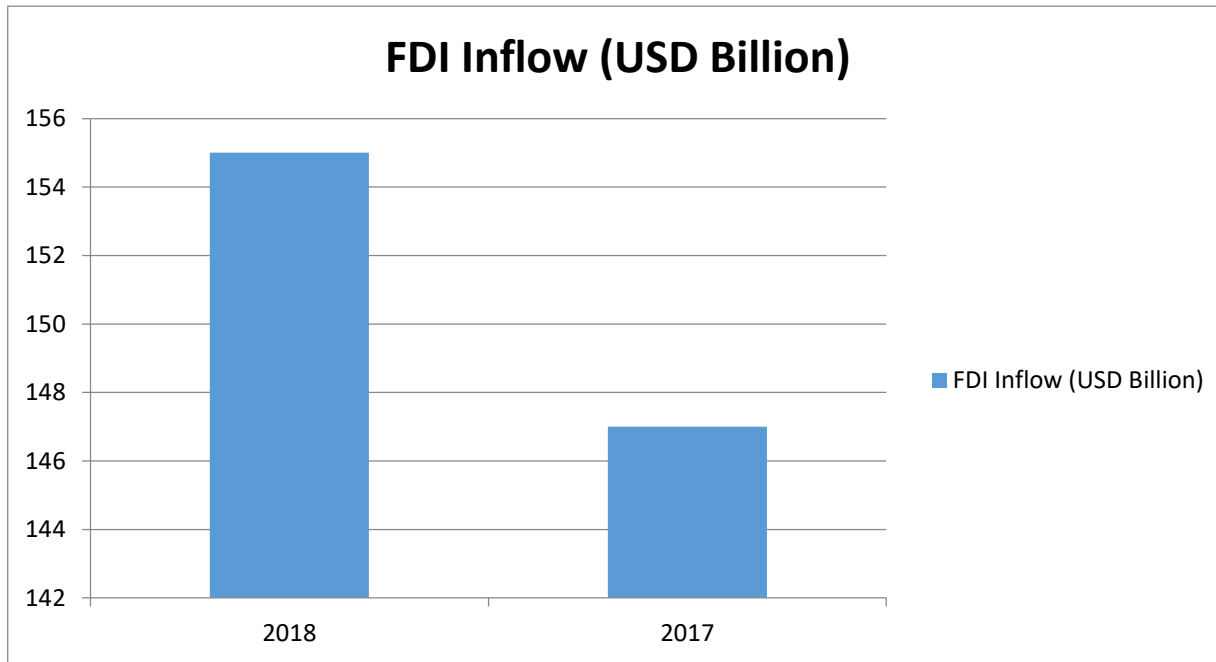


Figure 1: FDI inflow in ASEAN countries (\$ million)

Studies have shown that the interest of the researchers and policymakers is gradually increasing in the factors that tend to have adverse impacts on the degradation of the environment, especially in the ASEAN region where the environmental quality is not very appropriate (Ling et al., 2020; Mahrinasari et al., 2019; Nasir et al., 2019). For this purpose, the factors of trade (Andrew A Alola, 2019), FDI (Joshua & Alola, 2020) and globalization (Bilgili, Ulucak, Koçak, & İlkay, 2020) have been identified using previous studies to delineate their impact on the environmental sustainability. Hence, there is a need to use data from these countries and analyze these factors on saving the environment from further deterioration. Keeping in mind this open area of research, the current study aims to evaluate how trade, FDI and Globalization hurt the environmental sustainability of the ASEAN countries by utilizing the panel data of trade-off from these countries. Moreover, the specific objectives of this research are:

- To examine the effect of trade on environmental sustainability
- To examine the effect of FDI on environmental sustainability
- To examine the effect of Globalization on environmental sustainability

This study has a significant contribution to the existing pool of literature content by examining the effects of trade, FDI and globalization factors on environmental sustainability using the panel data analysis. This study has implications for the researchers and the policymakers as it can help develop effective policies for regulating the trade, FDI and Globalization so that its harmful and detrimental effects on the environmental sustainability of countries can be reduced and addressed.

This paper has the following organization. The first section is the Introduction to the study and the second section details the literature review. The next section shows the complete research methodology, while the fourth section gives the panel data results. The paper ends with discussion, conclusion, limitations and implications of the study.

2 Literature Review

2.1 Trade

The developed countries around the world have been continuously working for saving the environment of the globe as it is one of the largest issues faced by mankind in the 21st century (Sarkis & Zhu, 2018). Countries are

constantly developing and redesigning their policies to save the world from further destruction and control the factors negatively affecting the environment (Baland, Bardhan, & Bowles, 2018). The scholars have been exploring the factors that have been contributing to this wreckage. In a study, the researchers used the dynamic ARDL-bound testing approach and examined the dilemma effect of trade and monetary policy covering a long period from 1990 to 2018 to see its impeccable effect on the atmosphere. The results highlighted that trade and monetary policy have a confounding effect and have drastically raised the level of carbon and other pollutants in the atmosphere, disturbing the natural ecosystem and destroying the environment greatly. Hence, environmental sustainability is at a threat from the trade and other policies made and implemented by the country's government. However, the study showed that in the short run, no significant effect was noted, but in the long-run, this will have a more deteriorating impact.

The study pinpointed that government policies must be matched with the Sustainable Development Goals 2030 (Andrew A Alola, 2019). Another study utilizing panel data for empirical analysis covering ten years covering 114 countries was conducted to assess the impact of increased trade and investment by countries has on their environment for various income levels. The results revealed that trade and investment are negatively linked to the environmental sustainability of countries. Positive relationships among other political and economic factors were also confirmed with environmental sustainability. When the income levels were considered, a positive correlation was found, while for those with lower income levels, the correlation was negative. Hence, a significant causal relationship was confirmed between the trade and investment flows with the environmental sustainability which can help the countries develop their trade and economic policies keeping in mind the conservation of the environment, specifically for the least developed and the developing states (Chakraborty & Mukherjee, 2013).

Other contemporary authors have been researching these variables and proved that controlling the trade with strict policies is the need of the hour if the countries want to conserve their environments (Hamid, Shahid, Hameed, Amin, & Mehmood, 2019; Jung, Kim, Malek, & Lee, 2016; Li, Xing, & Yu, 2018; Sarkodie, Adams, Owusu, Leirvik, & Ozturk, 2020) and it has been mandated prominently as a target in the WTO reforms (Birkbeck, 2019). These findings prove that there exists a negative correlation between trade and environmental sustainability. Hence, a significant relationship can exist among them and the following hypothesis is deduced:

H1: Trade is significantly linked to Environmental Sustainability

2.2 FDI

Both prior and recent studies have shown that increase in FDI considerably rise the degradation of the environment and hence is a threat to its sustainability (Pisani, Kolk, Ocelík, & Wu, 2019). In their research work, (Omri, Euch, Hasaballah, & Al-Tit, 2019) examined the determinants of environmental sustainability in the country of Saudi Arabia by investigating whether the factors of trade and FDI have improved the environment of the country. The results showed that the threshold for both trade and FDI are very sensitive towards environmental sustainability and have significantly led to the degradation of the environment in Saudi Arabia after a specific threshold is surpassed. Hence, the study highlighted the need for augmenting the policy of these indicators to eradicate the pollution and achieve the improvement in the environment as desired. (Bokpin, 2017; Chakraborty & Mukherjee, 2013) have found out in their research that the FDI inflow negatively influences the environmental sustainability, while it is positively related to the FDI outflow, hence raising serious concerns for the investment policies of the country and their role towards the degradation of the environment.

In a similar study by (Lau, Choong, & Eng, 2014), conducted on a panel of 17 MENA (the Middle East and North Africa) states using data from 1974 through 2013 revealed that FDI is negatively related to the environmental sustainability. (Ali, Naveed, ul Hameed, & Rizvi, 2018; Omri, Nguyen, & Rault, 2014) carried out a similar study on the data from three regional sub-panels, constituting Central Asia, Europe, Latin America, North Africa, the Middle East and the Caribbean for 1990 – 2011 also proved these relationships. Other scholars have also suggested similar associations between FDI and the environment regarding the role of FDI in inevitably polluting

the country's environment (Bende-Nabende, 2017; Hakimi & Hamdi, 2016; Rafindadi, Muye, & Kaita, 2018). These results show that FDI has significant relationship with environmental sustainability and countries must formulate rigid environmental laws and regulations to reduce the pollution levels and enhance the sustainability of the environmental stakeholders. So, the following hypothesis is finalized to represent the relationship:

H2: FDI is significantly linked to Environmental Sustainability

2.3 Globalization

In the simplest words, first of all, globalization is a word that is used to explain that the world has become interdependent in all aspects, the economic aspect of all of the countries has become interdependent, the cultural beliefs are settling on the same page and imports and exports both are on their peaks. Globalization has become a very important factor just because it connects people even sitting across the borders and keeps the dealings going on. The world has become interconnected like a web and there is no difference in space and time left when it comes to communication and business. Globalization was recognized as a main leading factor for increasing trade and economic activities and improves the total productivity. Globalization has deemed necessary for the government to enforce the policies on an international level to reduce the trade barriers between the countries and increase the import of the efficient technologies (Shahbaz, Shahzad, Mahalik, & Sadorsky, 2018). While globalization has benefits, yet it also has harms to the environment as it aggravates the pollution levels and shifts the pollutants to the other countries in which the environmental policies are not rigidly implemented (Grabara, Hussain & Szajt, 2020).

This shows that globalization positively linked to the growth, but negatively related to environmental sustainability (Saint Akadiri, Alola, & Akadiri, 2019). Trade and globalization are the two factors that promoted individuals and businesses to cross the borders and today all production and service levels have become internationally known and accepted. The global exchange of commodities and even services has increased to such an extent that businesses are being supported more in foreign countries than they are being supported in their home country. Even after the wars and economic depressions, trade globalization is something that has increased to a great extent, this is something that does link to the sustainability of the environment. A balance between the environment and the operations of the business and trade is important, as far as the industries are pointed out in the sustainability of environment from the perspective of production, at the same time it has also been implied that the right kind of globalization activities can positively impact the environment whereas if the globalization activities going beyond the benefit of the environment can cause dangers to the environmental sustainability. The role of Globalization on the environmental sustainability has been investigated by scholars using the ARDL (Autoregressive Distributed Lag) testing approach and VECM (Vector Error Correction Model) (VECM) causality approach considering the case of Turkey with the periods of 1970-2014.

The finding of their study has shown that globalization has a negative effect on the carbon emission and degrades the environment in the long run only, though globalization itself has a positive and noticeable effect on the overall economic growth (Saint Akadiri, Alkawfi, Uğural, & Akadiri, 2019). In another research by (Shahbaz, Ozturk, Afza, & Ali, 2013), the interaction between globalization, carbon emission and economic growth were examined and it was provided that globalization greatly improves the innovations and technology and enhances the quality of the environment if it is managed properly (Dalle et al. 2020; Gultom et al. 2020). Studies have further confirmed that globalization is significantly linked to the environmental sustainability (Balsalobre-Lorente, Driha, Shahbaz, & Sinha, 2020; Bilgili et al., 2020; Chishti et al., 2020). Thus, this relationship is depicted with the following hypothesis:

H3: Globalization is significantly linked to Environmental Sustainability

3 Methodology

3.1 Data and Sample

As it has been quite clear that the purpose to conduct the current study by the researcher was to find out whether trade, FDI and globalization have any impact on the environmental sustainability of ASEAN countries. The first and important step here is to collect the data that is useful and reliable for the study. In this regard, the researcher has selected a few ASEAN countries and has collected data about them from the databases such as World Bank Development Indicators and Global Economy. These sources ensure the reliability and accuracy of the collected data. The researcher has collected data from these sources about the particular aspects that are to be studied in the current research. The collected data comprises 28 years.

As far as the variables of the study are concerned, there is a single dependent variable i.e. environmental sustainability which has been denoted by ENS in the study and has been measured through the environmental sustainability index. There are three independent variables in the study. The first one is the trade which is the total exports and imports difference and is measured through US dollars. The second one is FDI which stands for foreign direct investment and has been measured in US dollars. The last independent variable is globalization which has been denoted by GLOB and has been measured through a globalization index. In addition to these independent and dependent variables, the researcher also has added a control variable i.e. per capita income which has been denoted by PCI and measured through US dollars. The estimation model that can be used in the current study is given as follows;

$$ENS_{it} = \alpha + \beta_1 TRADE_{it} + \beta_2 FDI_{it} + \beta_3 GLOB_{it} + \beta_4 PCI_{it} + \sum_{j=1}^4 q_j CFE_{dumj} + \varepsilon_{it} \quad (1)$$

In this equation, α is a constant, I represent the country, t is the time of the year, β shows the coefficient of the variable, CFE_{dum} means the dummy of country fixed effect. Moreover, FDI represents a foreign direct investment, GLOB shows globalization, PCI indicates per capita income.

3.2 Empirical Procedure

As we know that time fixed effect dummy has been used in the estimation model of this study, the reason behind its usage is that the time series has an impact on the cross-country results of regression and to lower that impact this fixed effect has been used (Hussain et al., 2020). In this way, the trends of the panel data can be easily controlled that might impact the overall results of the relationships between the variables. Besides, the use of time fixed effect also has the advantage that it identifies and probes the structural breaks which have the possibility of presence in the time series data (Medina, Caceres, & Corbacho, 2010).

In the first step, the researcher has applied panel unit root test to find out the stationary properties and stochastic properties of the variables. Moreover, the order of integration is also supposed to be found out by using this unit root test. There are various unit root tests used generally but the author has selected Levin Lin Chu unit root test for this study. This test is based on the null hypothesis which has the assumption that the data is non-stationary and there is a unit root present in the collected data (Levin, Lin, & Chu, 2002). The rejection of this null hypothesis leads towards the next step of the analysis. After the application of unit root test, the researcher has applied autocorrelation, heteroscedasticity and cross-sectional dependence tests along with multicollinearity test. These tests have been applied in the study so that any correlation, heteroscedastic effects, cross-sectional dependence and multicollinearity among the variables can be found out. If these tests are not applied, there might be inconsistency in the results of the study. For this purpose, the tests that have been applied include modified Wald and Breusch-Pagan/Cook-Weisberg heteroscedasticity test, VIF test of multicollinearity, Wooldridge autocorrelation test and Pesaran correlation test (Pesaran, 2004).

If the data contains any cross-sectional dependence and other such issues, it is necessary to use appropriate and authentic techniques to resolve these issues (Arellano & Bover, 1995; Blundell & Bond, 1998). Therefore, the

researcher in this study has applied Paris-Winsten regression test along with the PCSE estimation of the coefficients through the use of GMM estimation. The reason behind the use of two types of estimation is that the results obtained will have a higher degree of reliability and accuracy. As discussed earlier, the researcher has used both country and time fixed effects in the estimation model so that any heterogeneity issue can be effectively addressed. In GMM estimation, the lagged values are the basic tools that deal with the endogeneity issue. However, there are some prerequisites for it such as large sample size and stationarity of data (Bond, 2002). Another advantage of this estimation is that it reduces the small sample bias issues and thus improves the accuracy of the model and the results as well. The following model can be used for GMM estimation:

$$\vartheta_{it} = \alpha_i + \gamma \vartheta_{i,t-1} + \sum_{p=1}^p \beta_p Z^p_{it} + \sum_{q=1}^q \beta_q Z^q_{it} + \sum_{r=1}^r \beta_r Z^r_{it} + \epsilon_{it} \quad (2)$$

3.3 Results and Analysis

The first test that was applied by the researcher in this study was the LLC unit root test, the results of which have been presented vividly in table 2. The values for both level and first difference have been given in the table along with the significance of rejection and acceptance. As far as the level series is concerned, it is clear from the table that only FDI and globalization have rejected the null hypothesis of a unit root. The remaining three variables i.e. environmental sustainability, trade and per capita have accepted the null hypothesis. To resolve this issue of non-stationary variables, the researcher has applied the first difference on all the variables and the unit root was tested on this series. The first difference series indicate that all the variables have rejected the null hypothesis with 5 and 10 percent significance for different variables. This clears that at the first difference all the variables are stationary and there is no unit root. This result makes the data favourable to enter the next phase of the analysis i.e. diagnostic tests in this case.

Table 2: LLC unit root

Constructs	ENS	Trade	FDI	Glob	PCI
At Level	-0.756	-2.489	-3.293*	-4.483*	-2.219
First difference	-4.399***	-7.394**	-5.309***	-7.459***	-5.388**

After the unit root test, the researcher had applied various diagnostic tests to find out the basic information about the data and the variables. These tests include autocorrelation, heteroscedasticity and cross-sectional dependence tests along with multicollinearity test. The results of all these tests have been reported in table 3. As per the heteroskedasticity results, it has been found out that the collected data has a significant amount of heteroskedasticity in it. Also, the autocorrelation test results have shown that the variables of the study are autocorrelated with each other.

Moreover, the cross-section dependence test results have also proved that the variables of the study are autocorrelated with each other. However, the results of multicollinearity test have shown that there is no multicollinearity among the variables of the study. To put it in a nutshell, the collected data is heteroskedastic, variables are autocorrelated and cross dependent but without multicollinearity. After all these tests, the next step was to perform correlation tests on the variables.

Table 3: Diagnostic checks

heteroscedasticity	Autocorrelation	Cross-section dependence	Multicollinearity
Modified wald	Wooldridge	Pesaran	VIF
Breusch-Pagan/Cook-Weisberg			
χ^2 -value: 10.40**	F-statistic: 7.20*	Test statistic: 8.231**	Mean VIF: 1.67
χ^2 -value: 8.49**			

The information about the correlations among the variables has been obtained by applying correlation tests on the variables. The results of this test have been presented in the correlation matrix of table 4. According to these results, it is quite clear that there is no correlation between the variables of the study. Moreover, the general relationships between the variables have also been estimated through this test.

Table 4: Correlation Matrix

Variables	ENS	Trade	FDI	Glob	PCI
ENS	1				
Trade	.373	1			
FDI	.298	.388	1		
Glob	.498	.643	.466	1	
PCI	.367	.242	.388	.483	1

In the last, the researcher has applied PCSE and GMM estimation tests to find out the impact of independent variables on the dependent variables. The results of both these estimations have been given in table 5. As far as trade is concerned, it has a significant and positive impact on environmental sustainability in case of both PCSE and GMM estimation according to the results. In other words, with one percent increase in trade, environmental sustainability will enhance by 29.7% as per PCSE estimation while this increase will be 28.4% in case of GMM estimation. Similarly, FDI also has found to have a significant and positive impact on environmental sustainability in case of both PCSE and GMM estimation.

In this case, as the FDI is increased by one percent, the environmental sustainability will be enhanced by 19.8% for PCSE estimation while it will enhance by 20.3% for GMM estimation. In the same way, globalization also has found to have a significant and positive impact on environmental sustainability in case of both PCSE and GMM estimation. In this case, as globalization is increased by one percent, the environmental sustainability will be enhanced by 29.8% for PCSE estimation while it will enhance by 28.2% for GMM estimation. However, the impact of per capita income has an insignificant impact on environmental sustainability in both cases. In short, all the independent variables have a significant impact on environmental sustainability.

Table 5: Results from PCSE estimation

Dependent Variable = ENS	PCSE estimation	Sys-GMM estimation
Trade	0.297** (0.398)	0.284** (0.476)
FDI	0.198* (0.674)	0.203** (0.384)
Glob	0.298** (0.387)	0.282** (0.367)
PCI	0.032 (0.571)	0.063 (0.488)
Constant	3.278** (0.943)	0.784** (0.498)
R^2	0.789*** (0.877)	-
<i>Arellano-Bond test for AR (1) (Pr W z)</i>	-	0.673
<i>Arellano-Bond test for AR (2) (Pr W z)</i>	-	0.208
<i>Hansen test of over restrictions</i>	-	1.498

4 Discussion and Conclusion

4.1 Discussion

As the current study was designed and conducted with the core motive to explore and investigate the impact that is caused by trade, FDI and globalization on environmental sustainability in ASEAN countries. In this regard, the researcher has generated three hypotheses. The first hypothesis stated that trade has a significant impact on environmental sustainability. This hypothesis has been accepted as per the results which showed that this impact is significant and positive. When the trade between countries increases; technologies get exchanged, which improve the environmental conditions and ultimately the environmental sustainability. These results are in concordance with the past literature (Wiedmann & Lenzen, 2018). The second hypothesis stated that FDI has a significant impact on environmental sustainability. This hypothesis has also been accepted as the results have indicated that this impact is also significant and positive. When the foreign countries invest in a country in any sector, it increases and improves the technology of that country which is environment friendly and thus enhances environmental sustainability. This result also complies with the studies and researches conducted in the past (Bokpin, 2017). The last hypothesis stated that globalization has a significant impact on environmental sustainability. As per the results of PCSE and GMM estimation, this impact was found as significant and positive which leads to the acceptance of this hypothesis. Globalization leads to the exchange of ideas and technologies between different countries for the improvement in the environmental conditions. This leads to the environmental sustainability of these countries. This result is consistent with and agrees with the studies and literature from the past (Najam, Runnalls, & Halle, 2016). In the last, the control variable per capita income was found to have an insignificant impact on environmental sustainability due to insignificant results. In short, all the independent variables i.e. trade, FDI and globalization have a significant impact on environmental sustainability and thus all the hypotheses of the study have been accepted.

4.2 Conclusion

As the researcher of the current study has conducted the study to find out the impact of trade, FDI and globalization on the environmental sustainability of ASEAN countries, the researcher has collected data for this purpose from the ASEAN countries for 28 years from reliable resources and has applied a number of techniques and approaches for analysis purpose. The results of the analysis indicate that all the independent variables have a significant impact on environmental sustainability. These results lead towards the conclusion that the governments of the countries must give attention towards the enhancement of trade, FDI and globalization in their countries so that the latest technology and environment-friendly practices can be exchanged and ultimately it leads towards the environmental sustainability of the country.

4.3 Implications and Limitations

The major implication of practical context is that this study will guide the governments and companies to improve their practices and operations and adopt environment-friendly technology while performing those operations so that the harm caused by these activities to the environment can be reduced considerably and it will lead towards the environmental sustainability in the country. The policies must be devised that promote the use of environment-friendly practices. Moreover, theoretically, this study will provide literature and information to the researchers to be used by them in their studies and further research. As the sample size of the study is 28 years which is not large enough therefore other researchers are recommended to enhance the sample size so that better results can be obtained. Moreover, the other variables may also be used to enhance the scope of the study. Other countries or region must also be considered while conducting the study to obtain their perspective as well.

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