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Determinants of exports of plastic industry products and their implications for trade balance and employment: Case studies of several ASEAN countries

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Abstract: This study aims to analyze the determinants of the export of plastic industry products and their implications for the trade balance and labor absorption in several ASEAN countries during the period 2013–2022. The background of this research is based on the importance of the plastic industry sector in supporting international trade performance and its potential contribution to regional economic growth. The method used was panel data regression analysis with a fixed effect model (Fixed Effect Model) using the Ordinary Least Squares (OLS) approach and data processing through EViews 13 software. The results show that logistics infrastructure and the amount of plastic production have a positive and significant effect on exports, while inflation has a negative and significant effect. In contrast, the exchange rate and foreign direct investment (FDI) showed no significant influence. These findings emphasize the importance of strengthening logistics infrastructure and macroeconomic stability as the key to increasing export competitiveness. The conclusion of this study is that the export of plastic products plays an important role in boosting the trade balance of ASEAN countries, but it is not optimal in creating significant jobs.

Keywords: *Employment, ASEAN, Export, Foreign direct investment, Inflation, Law, exchange rate, Logistics infrastructure, Quantity, Trade balance.*

1. Introduction

Export refers to trading in which domestic goods are delivered to other countries in accordance with prevailing laws and regulations. It involves transferring goods or products from a country of origin to international markets while complying with established regulatory standards. Generally, export activities are undertaken by countries capable of producing goods in surplus beyond domestic demand [1].

According to Article 33, paragraph (4) of the 1945 Constitution of the Republic of Indonesia, "the national economy must be organized based on principles of economic democracy, emphasizing togetherness, equitable efficiency, sustainability, environmental awareness, self-reliance, and balance in national development." In line with this mandate, the government has introduced trade facilitation initiatives, one of which is implementing the Commodity Balance policy [1]. The Coordinating Ministry coordinates this initiative for Economic Affairs in collaboration with Stranas PK, the National Single

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Window Agency, and other related ministries and institutions. It aims to establish a comprehensive basis for export and import policy decisions and address longstanding issues in trade management.

The Commodity Balance will operate through a unified system interface integrated with the National Commodity Balance System (SNANK), which functions as a sub-system of the Indonesian National Single Window (INSW). This system streamlines the export and import licensing process, enabling business actors to submit necessary data through SNANK, which distributes the information to the appropriate ministries or institutions. The integrated licensing platform is designed to simplify procedures, reduce redundancies, and eliminate data duplication. Furthermore, advancements in logistics and infrastructure policies are essential to support trade efficiency. Logistics involves coordinating goods flow, information flow, and financial transactions from procurement and storage to delivering goods, ensuring the right type, quantity, quality, timing, and location meet consumer demands effectively and efficiently. Through policies supporting the development of the village economy and transmigration areas, namely the Village, City, and Global Market Connectivity Strengthening Program, it is hoped that logistics efficiency will be created for products from villages and transmigration areas to be competitive and penetrate the global market [2]. The researcher wants to present comprehensive research based on empirical data from the industrial sector on the determinants of the existence of plastic exports and their implementation to balance trade and employment case studies of selected ASEAN countries in 2013 - 2022 sector, how and how much can provide a significant contribution to the balance of trade and employment in Indonesia.

Problem Formulation from this research is:

1. How do the exchange rate, Foreign Investment, inflation, quantity of plastic export production, and logistics infrastructure simultaneously affect the export of plastic industry products in several ASEAN countries?
2. How does the exchange rate partially affect the export of plastic industry products in several ASEAN countries?
3. How does Foreign Investment partially affect the export of plastic industry products in several ASEAN countries?
4. How does inflation partially affect the export of plastic industry products in several ASEAN countries?
5. How do the quantity of plastic export production, government policies, and logistics infrastructure partially affect the export of plastic industry products in several ASEAN countries?
6. How does logistics infrastructure partially affect the export of plastic industry products in several ASEAN countries?
7. How does the export of plastic industry products affect the balance of trade in several ASEAN countries?
8. How does the export of plastic industry products affect the absorption of labor in several ASEAN countries?

Environmental Economics, or environmental economics, is a science that studies human behavior or activities in utilizing natural resources (SDA) and the surrounding environment that has limitations, so that the function or role of SDA and the environment can be maintained, and even its utilization can be increased in the long term or sustainably [3]. In the Law on Environmental Protection and Management (PPLH) No. 32 of 2009, "the environment is a unity of space along with all objects, power, conditions, and living things, including humans and their behavior that affect the continuity of life and the welfare of humans and other living things." The main function and role of the environment, based on the Law, is as a source of raw materials to be processed into finished goods or for direct consumption, as an assimilator (natural waste processor).

International trade arises from the need to exchange goods and services across borders, as explained by Suhartini, et al. [4]. Define international trade as the exchange of goods and services between countries, a view echoed by Strange [5] who similarly describes it as the cross-border movement of goods and services. While such trade has existed since ancient times, it was once limited in scale and typically

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occurred through barter systems, used when countries could not produce certain goods to meet their own domestic needs [6].

The definition of export, according to the Decree of the Minister of Industry and Trade No. 182/MPP/Kep/4/1998 on General Provisions in the Export Sector, refers to the activity of moving goods and services out of a country's customs territory. This customs area encompasses the land, waters, and airspace of Indonesia, as well as designated areas in the exclusive economic zone and continental shelf where Law No. 10 of 1995 on Customs is enforced. As noted by Mankiw and Reis [7] Exports consist of goods and services produced domestically and sold abroad. From the expenditure perspective, exports represent a major component of Gross National Product (GNP), meaning that fluctuations in export values directly impact national income. However, heavy reliance on exports also increases a country's vulnerability to global economic shocks and international market fluctuations [8].

In economic terms, exchange rates are categorized into nominal and real exchange rates [7]. The nominal exchange rate reflects the price ratio between two currencies, while the real exchange rate expresses the relative prices of goods between countries, indicating the rate at which domestic goods can be traded for foreign goods, often referred to as the terms of trade. Meanwhile, Foreign Direct Investment (FDI) is recognized as a critical source of regional development financing [9]. FDI contributes to infrastructure and industrial growth through spillover effects such as technological transfer, capital accumulation, export growth, and human capital enhancement. According to Raes, et al. [10] FDI involves investments by foreign private entities in a host country, offering more tangible long-term benefits compared to portfolio or indirect investments [11].

Logistics infrastructure in export refers to the physical and organizational systems, facilities, and services that support the transportation, storage, and handling of goods from the point of production to international markets. It includes networks such as roads, ports, airports, railways, warehouses, and supporting systems such as customs and freight management. Details of profit and loss for a certain period of time that shows the difference between the value of export and import transactions of a country in a certain period of time [12] The ability of a company to absorb labor to produce a product. The ability to absorb labor is not the same between one sector and another [13].

Sustainable Plastic Packaging refers to the use of environmentally responsible materials in packaging that minimize ecological impact throughout their life cycle. Plastic itself is a general term for polymers that can be molded into various forms and sizes. These polymers are produced through a process called polymerization, in which monomers (the basic building blocks of plastic) are chemically bonded. In addition to polymers, plastics also contain non-polymer substances known as additives, which enhance their properties. These additives, typically low in molecular weight, include colorants, antioxidants, UV stabilizers, anti-stick agents, and others. However, one major drawback of plastic is its resistance to natural decomposition, it can take up to 80 years to fully degrade [14].

According to Gunadi, et al. [15] plastic can be classified based on its physical properties and applications. Physically, there are two main types: thermosets and thermoplastics. Thermosets, such as bakelite, melamine, and epoxy resin, cannot be remoulded once set and are typically used in items like electrical insulators and automotive components. Thermoplastics, on the other hand, can be reheated and reshaped multiple times. Examples include polyethylene (used in bottles), PVC (for pipes and records), polystyrene (for foam and toys), and PTFE or Teflon (used for non-stick coatings).

In terms of usage and performance, plastics are further categorized into: commodity plastics, which have limited heat resistance and are used in packaging and daily consumer products; engineering plastics, which withstand temperatures over 100°C and are used in automotive and electronic applications; and special engineering plastics, which can operate above 150°C and are used in high-performance sectors like aerospace.

This study aims to analyze the simultaneous influence of exchange rates, foreign direct investment, inflation, the amount of plastic export production, and logistics infrastructure on the export of plastic industry products in several ASEAN countries. In addition, this study also aims to test the influence of each of these variables partially on the export of the plastic industry. This study also aims to evaluate the

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extent to which exports of plastic industry products can contribute to the trade balance and assess their impact on labor absorption in ASEAN countries. The results of this study are expected to be the basis for policy recommendations in increasing the export competitiveness of the plastic sector, strengthening the position of the trade balance, and expanding employment opportunities in the ASEAN region.

2. Research Method

This research employs multiple linear regression analysis, a method where the model includes multiple explanatory variables to analyze the relationship between several independent variables and a dependent variable. The regression technique applied in this research is the Ordinary Least Squares (OLS) method. The multiple linear regression equation is used to model the data.

(a) Model I

$$LnY = \alpha + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \varepsilon t$$

Simple linear regression equation: The Simple Linear Regression Equation is as follows:

(b) Model II

$$LnZ_1 = \alpha + \beta Ln\hat{Y}nt + \varepsilon it$$

(c) Model III

$$LnZ_2 = \alpha + \beta Ln\,\hat{Y}nt + \varepsilon it$$

Description:

b0 ...n = Constant Equation 1 to n

ε1 ...n = Standard Error of equation 1 to n

Y = Determinant plastics export and its implementation to balance trade and employment case research selected ASEAN Countries

Z1 = Balance of Trade

Z2 = Employment

X1 = Exchange Rate

X2 = Foreign Direct Investment

X3 = Inflation

X4 = Quantity in Product Export

X5= Logistics infrastructure

3. Results and Discussion

Descriptive analysis using EViews 13 helps to understand the characteristics of the research variables. Through this analysis, we can get a comprehensive picture of each variable, visualize its distribution, and identify patterns or anomalies that may exist.

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Table 1.
Descriptive Analysis.

	IS_Y_EXPORT	IS_X1_KURS	IS_X2_FDI	IS_X3_INFLASI	IS_X4_JML_PRODUK	IS_X5_INFRASTRUKTUR	IS_Z1_BOT	IS_Z2_EMPLOYMENT
Mean	3.93E+10	0.078756	1.61E-06	0.277280	0.373404	0.028252	6.14E+08	0.001359
Median	1.76E+10	0.000360	1.73E-08	0.120627	0.000106	1.11E-09	57569550	1.88E-07
Maximum	2.65E+11	0.390244	4.42E-05	0.990099	1.000000	1.000000	4.38E+09	0.020000
Minimum	6616214.	1.86E-09	5.02E-11	0.001719	9.90E-10	7.27E-13	142.6100	7.61E-11
Std. Dev.	5.46E+10	0.141521	6.17E-06	0.301037	0.485724	0.159477	1.05E+09	0.004713
Skewness	1.769011	1.431298	5.387150	1.114958	0.522156	5.604849	1.987885	3.416943
Kurtosis	6.003504	3.149064	33.03917	2.788687	1.272893	32.86144	6.173800	13.07062
Jarque-Bera	88.84685	33.89379	4201.053	20.69588	16.80312	4196.622	106.7540	610.9924
Probability	0.000000	0.000000	0.000000	0.000032	0.000225	0.000000	0.000000	0.000000
Sum	3.89E+12	7.796839	0.000160	27.45069	36.96699	2.796922	6.08E+10	0.134586
Sum Sq. Dev.	2.93E+23	1.962772	3.73E-09	8.881087	23.12094	2.492438	1.08E+20	0.002177
Observations	99	99	99	99	99	99	99	99

Source: Data managed by Eviews 13, 2025 sourced from ASEAN and IMF Data.

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The following is the interpretation of the statistical analysis of the table description above: 1. The average plastic export in ASEAN is 3.93E+10, indicating that direct plastic exports are quite high in general. The minimum value of the Natural Logarithm of exports is 6616214, indicating a certain period or country with low plastic exports. The maximum value of the Natural Logarithm of plastic exports reaches 2.65E+11, reflecting a significant export increase over several periods or countries. The standard deviation of 5.46E+10 indicates a moderate variation in the export data, although most values tend to be close to the average. This indicates relative stability in export flows but with some outliers reflecting huge exports. 2. The average Natural Logarithm of currencies (exchange rates) in ASEAN is 0.078756, indicating that, in general, direct exchange rates are quite high. The minimum value of the Natural Logarithm of the exchange rate is 1.86E-09, indicating a certain period or country with a low exchange rate. The maximum value of the Natural Logarithm of the exchange rate reaches 0.390244, reflecting a significant increase in the exchange rate in several periods or countries. The standard deviation of 0.141521 indicates a fairly moderate variation in the exchange rate data, although most values are close to the average. This indicates relative stability in the exchange rate flow, but with some outliers reflecting huge exchange rates. 3. The average Natural Logarithm of FDI in ASEAN is 1.61E-06, indicating that, in general, direct FDI inflows are quite high. The minimum value of the Natural Logarithm of FDI is 5.02E-11, indicating that there are certain periods or countries with low FDI. The maximum value of the Natural Logarithm of FDI reaches 4.42E-05, reflecting a significant increase in FDI in several periods or countries. The standard deviation of 6.17E-06 indicates a fairly moderate variation in the FDI data, although most values are close to the average. This shows relative stability in FDI flows, but with some outliers reflecting huge FDI. 4. The average Natural Logarithm of Inflation of 0.277280 indicates that overall direct inflation inflows are quite high. The minimum value of the Natural Logarithm of Inflation of 0.001719 indicates certain periods or countries with low inflation. The maximum value of the Natural Logarithm of Inflation of 0.990099 reflects a significant increase in inflation in some periods or countries. The standard deviation of 0.301037 indicates fairly moderate variation in the Inflation data, although most values tend to be close to the mean. This shows relative stability in inflation flows, but some outliers reflect huge inflation. 5. The average Natural Logarithm of product quantity of 0.373404 indicates that overall Direct product quantity inflows are quite high. The Natural Logarithm's minimum product quantity value of 9.90E-10 indicates certain periods or countries with low product quantities. The maximum value of the Natural Logarithm of product quantity is 1.000000, which reflects a significant increase in product quantities in some periods or countries. The standard deviation of 0.485724 indicates a fairly moderate variation in the product quantity data, although most values are close to the mean. This indicates relative stability in the flow of production quantities, but with some outliners reflecting huge product quantities. 6. The average Natural Logarithm of infrastructure of 0.028252 indicates that, in general, direct infrastructure input is quite high. The minimum value of the Natural Logarithm of infrastructure of 7.27E-13 indicates certain periods or countries with low infrastructure. The maximum value of the Natural Logarithm of infrastructure of 1000000 reflects a significant increase in infrastructure in some periods or countries. The standard deviation of 0.159477 indicates a fairly moderate variation in the infrastructure data, although most values tend to be close to the mean. This indicates relative stability in infrastructure flows, but some outliers reflect extensive infrastructure. 7. The mean of the Natural Logarithm of the trade balance of 6.14E+08 indicates that overall, the balance of direct trade inflows is quite high. The minimum value of the Natural Logarithm of the trade balance of 142.6100 indicates certain periods or countries with low trade balances. The maximum value of the Natural Logarithm of the trade balance of 4.38E+09 reflects a significant increase in the trade balance in some periods or countries. The standard deviation of 1.05E+09 indicates a fairly moderate variation in the trade balance data, although most values are close to the mean. This indicates relative stability in the trade balance flow but with a few outliners reflecting huge trade balances. 8. The mean of the Natural Logarithm of labor is 0.001359, indicating that overall direct labor inflows are quite high. The minimum value of the Natural Logarithm of labor is 7.61E-11, indicating certain periods or countries with low labor. The maximum value of the Natural Logarithm of labor is 0.020000, reflecting significant increases in labor in some periods or

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countries. The standard deviation of 0.004713 indicates a fairly moderate variation in the labor data, although most values are close to the mean. This indicates relative stability in the labor flow but with a few outliners reflecting extensive labor.

Table 2.
MODEL 1 → FEM.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.92E+10	1.57E+10	3.128999	0.0024
IS_X1_KURS	-8.80E+10	1.90E+11	-0.461903	0.6453
IS_X2_FDI	-1.65E+14	4.19E+14	-0.393378	0.6950
IS_X3_INFLASI	-3.64E+10	8.88E+09	-4.099417	0.0001
IS_X4_JML_PRODUK	1.32E+10	1.43E+10	0.924133	0.3580
IS_X5_INFRASTRUKTUR	6.37E+10	1.28E+10	4.982469	0.0000
	Effects Specification			
Cross-section fixed (dummy variables)				
Root MSE	1.71E+10	R-squared		0.900453
Mean dependent var	3.89E+10	Adjusted R-squared		0.884057
S.D. dependent var	5.45E+10	S.E. of regression		1.86E+10
Akaike info criterion	50.26359	Sum squared resid		2.93E+22
Schwarz criterion	50.65437	Log likelihood		-2498.180
Hannan-Quinn criter.	50.42175	F-statistic		54.91892
Durbin-Watson stat	0.792525	Prob(F-statistic)		0.000000

Interpretation of Fixed Effect Panel Data Regression Model for Model 1 The equation form of model 1 in this research is:

$$LnY = \alpha + \beta 1LnX1 + \beta 2LnX2 + \beta 3LnX3 + \beta 4LnX4 + \beta 5\ LnX5 + \varepsilon t$$

Description:

b0 ...n = Constant Equation 1 to n
ε1 ....n = Standard Error of equation 1 to n
Y = Plastic Export
Z1 = Balance of Trade
Z2 = Employment
X1 = Exchange Rate
X2 = Foreign Direct Investment
X3 = Inflation
X4 = Quantity in Product Export
X5= Logistics infrastructure

The selected model for the panel data regression test of this research uses the fixed effect model Table 2 The following equation is formed:

$$LnY = 4.87E+10 - -8.80E+10X_1 + -1.65E+14X_2 + -3.64E+10X_3 + 1.32E+10X_4 + 6.37E+10X_5$$

From the regression equation, it can be interpreted as follows:

1. Constant Value = 4.87E + 10 shows that if all independent variables are considered constant with the assumption of cateris paribus, then the average export value is 4.87E + 10.
2. Regression Coefficient Value β1 = -8.80E + 10 shows that if the exchange rate increases by 1 unit under conditions where other factors are constant, then the increase in exports tends to decrease by -8.80E + 10 units.
3. The Regression Coefficient Value β2 = -1.65E+14, shows that if FDI increases by 1 unit under conditions where other factors are constant, exports tend to decrease by -1.65E+14 units

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4. The Regression Coefficient Value β3 = -3.64E+10 shows that if inflation increases by 1 unit under conditions where other factors are constant, exports tend to decrease by -3.64E+10 units.
5. The Regression Coefficient Value β4 = 1.32E+10 shows that if production quantity increases by 1 unit under conditions where other factors are constant, exports tend to decrease by 1.32E+10 units.
6. The Regression Coefficient Value β5 = 6.37E+10 shows that if logistics infrastructure increases by 1 unit under conditions where other factors are constant, exports tend to decrease by 6.37E+10 units.

3.1. Simultaneous F Test

The final calculation results shown that the Prob (F-statistic) value is 0.0000, which is less than the significance level of 0.05. This indicates that all the independent variables have a statistically significant joint impact on plastic product exports in ASEAN countries.

3.2. Partial t Test

This test aims to assess the strength of the relationship between each independent variable and the dependent variable. The significance threshold used is 5% (0.05), and the results based on final calculation are as follows:

1. Exchange Rate (X1) – The t-statistic is -0.461903 with a probability of 0.6453, exceeding 0.05. This suggests that the exchange rate does not significantly affect plastic exports in ASEAN countries, and the negative t-value indicates a non-aligned (inverse) relationship.
2. Foreign Direct Investment (X2) – The t-statistic is -0.393378 and the probability is 0.6950, also higher than 0.05. Thus, FDI does not have a statistically significant impact on plastic exports in the region, and the negative t-value again shows a non-unidirectional relationship.
3. Inflation (X3) – With a t-statistic of -4.099417 and a probability of 0.0001 (less than 0.05), inflation significantly and negatively affects plastic exports in ASEAN, suggesting that rising inflation reduces export competitiveness.
4. Plastic Production Quantity (X4) – The t-statistic is 0.924133 and the probability is 0.3580, which is above 0.05. This indicates that production quantity does not significantly influence plastic exports, with the direction of the relationship being inconsistent.
5. Logistics Infrastructure (X5) – This variable shows a t-statistic of 4.982469 and a probability of 0.0000, signifying a positive and statistically significant influence on plastic exports. Better logistics infrastructure contributes significantly to increased exports.

3.3. Coefficient of Determination (R^2)

The Adjusted R-squared value is 0.884057, meaning that 88.41% of the variation in plastic industry exports can be explained by the five independent variables analyzed: Exchange rate, FDI, inflation, production quantity, and logistics infrastructure. The remaining 11.59% is attributed to other factors not included in the model.

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3.4. Panel Data Regression Estimation Fixed Effect Model 2

Table 3.
MODEL 2: FEM.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.49E+10	2.75E+09	12.67256	0.0000
IS_Z1_BOT	6.589423	2.857795	2.305771	0.0234
	Effects Specification			
Cross-section fixed (dummy variables)				
Root MSE	2.02E+10	R-squared		0.861844
Mean dependent var	3.89E+10	Adjusted R-squared		0.846321
S.D. dependent var	5.45E+10	S.E. of regression		2.14E+10
Akaike info criterion	50.51134	Sum squared resid		4.06E+22
Schwarz criterion	50.79791	Log likelihood		-2514.567
Hannan-Quinn criter.	50.62732	F-statistic		55.51992
Durbin-Watson stat	0.580531	Prob(F-statistic)		0.000000

Below are the results of the panel data regression analysis conducted using the recursive method ($\hat{Y}1$ = Y1 + Residual from Model 1) and applying the fixed effect approach. This regression model illustrates the causal relationship between the independent variables and the dependent variable.:

Model 2 equation: Ln $Z = \beta o + \beta$ Ln $\hat{Y} + \varepsilon t$

Z1 = Balance of Trade

βo = Constant Model 2

$\hat{Y}$ = plastic industry exports

β = Regression Coefficient of independent variables

εt = Epsillon (Other factors outside model 2)

The calculation results in Table 3 can be explained as follows:

Balance of Trade = 3.49E + 10 + 6.589423 $\hat{Y}$

The constant value of 3.49E+10 suggests that when all other variables remain unchanged (ceteris paribus), the trade balance is at 3.49E+10 units. The regression coefficient $\beta 1$ = 6.589423 implies that for every 1-unit increase in plastic exports within ASEAN, assuming other variables remain constant, the trade balance tends to decline by 6.589423 units. Referring to Table 3, the t-statistic value is 2.305771 with a probability (P-value) of 0.0234. Since this value is less than the 0.05 significance threshold, the null hypothesis (H0), which states there is no significant effect, is rejected, and the alternative hypothesis (H1), indicating a significant effect, is accepted. The positive t-statistic shows a direct (unidirectional) relationship, confirming that an increase in plastic exports has a significant and positive impact on the trade balance in Southeast Asian countries.

Regarding the coefficient of determination, the R-squared value of 0.861844 indicates that plastic exports account for approximately 86.18% of the variation in the trade balance across ASEAN, while the remaining 13.82% is attributed to other variables not included in the model.

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3.5. Panel Data Regression Testing Model III

Table 4.
Model 3: FEM.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.93E+10	2.56E+09	15.37080	0.0000
IS_Z2_EMPLOYMENT	-7.03E+09	9.28E+11	-0.007579	0.9940
	Effects Specification			
Cross-section fixed (Dummy variables)				
Root MSE	2.09E+10	R-squared		0.852839
Mean dependent var	3.93E+10	Adjusted R-squared		0.836116
S.D. dependent var	5.46E+10	S.E. of regression		2.21E+10
Akaike info criterion	50.58164	Sum squared resid		4.31E+22
Schwarz criterion	50.86998	Log likelihood		-2492.791
Hannan-Quinn criter	50.69830	F-statistic		50.99852
Durbin-Watson stat	0.522982	Prob(F-statistic)		0.000000

The following are the results of panel data regression tests using the recursive method ($\hat{Y}1 = Y1 +$ Residual model 1) using the fixed effect method.
Model 3 equation: $\text{Ln } Z = \beta o + \beta \text{ Ln } \hat{Y} + \varepsilon t$
Z2 = employment
βo = Constant Model 3
$\hat{Y}$ = plastic industry exports
β = Regression Coefficient of independent variables
εt = Epsillon (Other factors outside model 3)
The calculation results in Table 4 can be explained as follows:
Employment = 3.93E + 10 + -7.03E + 09 $\hat{Y}$

The description of the formula is: 1. The Constant value = 3.93E + 10 indicates that if all ceteris paribus variables have constant values, then the employment value is 3.93E + 10 units 2. The Regression Coefficient Value $\beta 1$ = -7.03E + 09 indicates that if the export of plastic in ASEAN that enters increases by 1 unit under conditions where other factors are constant, then employment tends to decrease by -7.03E+09 units. The t-statistic value is -0.007579 employment with a probability value (P-value) of 0.9940 The effect of plastic industry exports on the balance of trade, and labor where the value is greater than the specified significance level, which is 0.05, so that H0 (significant effect) is accepted, and H1 (insignificant effect) is rejected. A negative t-statistic value indicates that the direction of the relationship is not unidirectional. Thus, it is proven that plastic exports do not have a significant and negative effect on employment in Southeast Asian countries. g. The coefficient of determination (R-Squared) value of 0.852839 indicates that plastic exports explain approximately 85.28% of the variation in employment levels within ASEAN countries, while the remaining 14.72% is influenced by other variables not included in this model. Additionally, the analysis of all independent variables demonstrates that all these factors collectively impact plastic industry exports across ASEAN. This finding supports the conclusion that exchange rates, FDI, inflation, the quality and quantity of plastic production, and logistics infrastructure together have a significant and simultaneous influence on the export performance of plastic products in multiple Southeast Asian nations.

3.6. Rupiah Exchange Rate, Foreign Investment, Inflation, Quality and Quantity of Plastic Export Production, and Logistics Infrastructure Simultaneously on Plastic Industry Product Exports in Several ASEAN Countries

The hypothesis for the exchange rate suggests that depreciation in currency makes exports more competitive, potentially leading to either a negative or positive regression coefficient depending on how sensitive plastic product prices are to exchange rate changes. For FDI (X2), it is hypothesized that increased foreign investment enhances production capacity and boosts exports, likely resulting in a

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positive coefficient. Regarding inflation (X3), the assumption is that higher inflation raises production costs, thereby reducing the competitiveness of exports and leading to a negative coefficient. For the quantity and quality of plastic production (X4), the hypothesis states that improvements in production will lead to increased exports, suggesting a positive coefficient. Logistics infrastructure (X5) is expected to positively influence exports as better infrastructure reduces logistics costs and enhances efficiency. The combined effect of these variables is often synergistic. For instance, investment in the plastic industry attracts more FDI and promotes regional economic growth in Indonesia and Southeast Asia, potentially mitigating the negative impacts of global economic instability. Additionally, the significant market potential, sustainable, and eco-friendly plastic industry policies can jointly foster a more favourable climate for investors and promote export growth.

3.7. Export of Plastic Industry Products on the Trade Balance in Several ASEAN Countries

Data analysis proves that the dependent variable of plastic industry exports in Southeast Asia is the implications of the trade balance. Stating that plastic industry exports in Southeast Asian countries have a significant positive effect on the implications of the trade balance. The export of plastic industry products has an important role in the trade balance of several ASEAN countries. Here are some key points related to its influence on the trade balance in this region: 1. The Role of Plastic Industry Exports in the ASEAN Trade Balance Countries such as Thailand, Malaysia, and Vietnam have fairly advanced plastic industries and actively export plastic products to various countries, including within and outside ASEAN. Indonesia and the Philippines also have growing plastic industries, but they often still rely on imports of raw plastic materials. Countries with a trade surplus in the plastic industry (such as Thailand and Malaysia) benefit from exports, while countries with a trade deficit (such as Indonesia) still rely on imports. 2. Contribution of Plastic Exports to the Trade Balance Thailand is a major exporter of plastic products, with exports of finished products such as plastic packaging, automotive components, and raw materials. Malaysia also has a strong petrochemical industry, which supports exports of resin-based plastic products. Vietnam is increasingly developing plastic exports, especially packaging products and raw materials for manufacturing. Indonesia is experiencing growth in plastic exports but is still dependent on imports of resin raw materials, so its plastic trade balance is often in deficit. 3. Factors Affecting Exports and Trade Balance availability of raw materials: Countries with strong petrochemical industries, such as Malaysia and Thailand, are more self-sufficient in plastic production. Trade policy: Customs regulations and policies affect the export and import of plastic products in ASEAN. Global demand: Demand for plastics in the international market, especially for packaging and automotive, drives exports from ASEAN countries. Environmental issues: Tighter environmental regulations in some export destination countries may restrict trade in certain plastic products. Overall, plastic industry exports contribute to the trade balance in ASEAN countries, but the impact varies depending on each country's production capacity and policies. Plastic industry exports contribute significantly to the trade balance in ASEAN countries, with impacts varying depending on production capacity, trade policies, and dependence on plastic raw material imports. H1: ASEAN countries with strong plastic industries, such as Thailand and Malaysia, have a plastic trade surplus due to high exports compared to imports. H2: Countries that still rely on raw material imports of plastic, such as Indonesia and the Philippines, tend to experience a trade deficit in this sector. H3: Environmental regulations and policies affect plastic exports in ASEAN, with countries with looser policies tending to increase exports but facing challenges in the global market. H4: Global demand for plastic products drives export growth in ASEAN countries, contributing to a positive trade balance. H5: Increasing investment in the plastic industry sector, especially in local raw material production, can reduce the trade deficit and increase export competitiveness. This hypothesis can be tested by analyzing plastic export-import data, trade balances, and plastic industry policies in each ASEAN country. For instance, in the context of exports, plastic product exports in Southeast Asian countries not only influence the trade balance within the plastic sector but also play a role in attracting Foreign Direct Investment (FDI) into the plastic industry. This, in turn, contributes to boosting economic growth in Indonesia and other Southeast Asian nations, helping to cushion the adverse effects of global economic downturns.

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Furthermore, combining significant market potential and implementing environmentally friendly and sustainable plastic industry policies can foster a favorable climate for investment and enhance the growth of plastic exports in the region.

3.8. Exports of Plastic Industry Products on Labor Absorption in Several ASEAN Countries

Exports of plastic industry products contribute less significantly to increasing labor absorption in several ASEAN countries, especially in countries with rapidly growing plastic industries. H1: Increasing exports of plastic industry products is negatively related to increasing the number of workers in the plastic manufacturing sector in ASEAN countries. H2: Countries with more advanced plastic industries, such as Thailand, Malaysia, and Vietnam, shows a higher level of labor absorption compared to countries that still rely on imports of plastic raw materials, such as Indonesia and the Philippines. H3: Foreign direct investment (FDI) in the plastics industry contributes to the creation of new jobs in the manufacturing sector and related supply chains. H4: Countries that implement incentive policies for the plastics industry tend to experience increased exports and higher labor absorption. H5: Changes in environmental regulations and plastic recycling policies can affect export patterns and the number of workers in the ASEAN plastics industry. This hypothesis can be tested by analyzing plastic export data, the level of labor absorption in the plastics manufacturing sector, and industrial policies in ASEAN countries. The plastics industry is one of the fastest growing manufacturing sectors in ASEAN countries, especially in Thailand, Malaysia, Vietnam, Indonesia, and the Philippines. With the increasing export of plastic products, this industry has a significant impact on job creation, both directly and indirectly. 2. Relationship between Plastic Exports and Labor Absorption Countries with Strong Plastic Industries: Countries such as Thailand, Malaysia, and Vietnam have rapidly growing plastic industries and are major exporters. The need for labor in this sector is high, especially in production, logistics, and marketing. Countries with Import Dependence: Indonesia and the Philippines still rely on imports of plastic raw materials, so even though there is labor absorption, the number may be more limited compared to countries with an export surplus. Sectors that Absorb Labor: Plastic production and manufacturing (factory workers, technicians, machine operators) Logistics and distribution (transportation and warehousing).

Research and development (raw material processing, product innovation) Factors Affecting the Relationship between Plastic Exports and Employment. Foreign Investment (FDI): The entry of foreign investment in the plastic industry increases production capacity and opens up more job opportunities. Government Policy: Subsidies, tax incentives, and free trade policies can encourage the growth of the plastic industry and expand employment. Technology and Automation: Although exports are increasing, the use of technology and automation can reduce the need for human labor. Environmental Issues: Regulations related to plastic waste and recycling can affect the sustainability of the industry and labor absorption patterns. Exports of plastic industry products have varying impacts on labor absorption in ASEAN. Countries with advanced plastic industries tend to create more jobs than countries that still rely on raw material imports. However, technological developments and environmental policies can also affect labor absorption patterns in this sector. For example, in the export sector, plastic exports in Southeast Asian countries have implications for labor absorption in the plastic industry, as they help attract Foreign Direct Investment (FDI) into the sector. This inflow of investment not only supports the expansion of the industry but also contributes to economic growth in Indonesia and other Southeast Asian nations, helping to mitigate the negative impacts of global economic crises. Additionally, the combination of a large market potential and the adoption of sustainable, environmentally friendly plastic industry policies can create a favorable climate for both investors and the growth of plastic exports.

4. Conclusion

Based on the results of the research and analysis of the discussion, the conclusions of this research are as follows: 1. various risk factors and economic factors greatly influence exports of the plastic industry in Southeast Asian countries. Risk uncertainty can result in declining plastic industry exports and a country's economic conditions, which are important for exporters. 2. Currency exchange rates have a very

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adverse effect on plastic exports. This finding shows that economic uncertainty and risk can hinder the implementation of plastic industry exports. Unstable currency exchange rates can increase this uncertainty and risk, making it difficult for exporters to market their production to ASEAN. 3. Various risk factors and economic factors greatly influence Foreign Direct Investment (FDI) in Southeast Asian countries. Risk uncertainty can result in a decline in foreign direct investment (FDI). In addition, the economic conditions of a country are essential for foreign investors. The negative and significant effect on exports hinders foreign investment, making foreign investors reluctant to invest in Southeast Asian countries in the plastic industry. 4. Inflation has a negative and significant effect on exports. This finding shows that unstable inflation changes can disrupt economic activity and cause financial losses, and high economic risks can hinder the implementation of plastic industry exports. Unstable inflation can increase uncertainty and this risk, making it difficult for exporters to market production to ASEAN countries. 5. Plastic Production Quantity has a positive and significant effect on exports. This finding shows that stable changes in plastic production quantities can build good economic activity and cause financial benefits. In addition, low economic risks can help implement stable plastic industry exports and increase certainty so exporters can efficiently market plastic products to ASEAN countries. 6. Logistics infrastructure positively and significantly affects plastic industry exports in Southeast Asia. This finding shows that the occurrence of changes in logistics infrastructure in a stable economy can build good economic activity and cause financial benefits and low economic risks can help the implementation of stable plastic industry exports can increase certainty so that exporters can efficiently market plastic products to ASEAN countries. 7. Trade balance has a positive and significant effect on plastic industry exports in Southeast Asia This finding shows that the occurrence of a trade balance in a stable economy can build good economic activity and cause financial benefits and also low economic risk can help the implementation of stable plastic industry exports can increase certainty so that it makes it easy for exporters to market plastic products to ASEAN countries. 8. Labor absorption has a negative and significant effect on exports. This finding shows that low labor absorption can disrupt economic activity and cause financial losses, and high economic risk can hinder the implementation of plastic industry exports. Unstable inflation can increase this uncertainty and risk, making it difficult for exporters to market production to ASEAN countries.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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