DETERMINANTS OF INDONESIA'S SHRIMP EXPORTS TO THE UNITED STATES

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Abstract
Shrimp is a leading commodity in Indonesia's fisheries sector and plays a crucial role in generating non-oil and gas foreign exchange earnings, with the United States serving as the primary destination market, absorbing more than 60 percent of total exports. However, Indonesia's shrimp export volume to the United States declined during the 2022–2024 period, despite continuous growth in consumer income in the destination country. This condition indicates the presence of structural challenges in the competitiveness of Indonesia's shrimp exports. This study aims to analyze the effects of international shrimp prices, consumer income proxied by United States GDP per capita, and the exchange rate on the volume of Indonesia's shrimp exports to the United States over the period 1995–2024. The study employs a quantitative approach using secondary time-series data. The analytical method applied is Multiple Linear Regression with a First Difference transformation to address data stationarity issues, estimated using the Ordinary Least Squares (OLS) method. The results show that, simultaneously, international prices, consumer income, and the exchange rate have a significant effect on Indonesia's shrimp export volume. Partially, international prices have a positive and significant effect, consistent with supply theory, which suggests that higher global prices encourage an expansion of export supply. In contrast, United States GDP per capita has a negative and significant effect, indicating that Indonesian shrimp tends to be treated as an inferior good in a developed-country market. Meanwhile, the exchange rate does not have a significant effect on export volume, supporting the Dominant Currency Paradigm. This study recommends accelerating fisheries downstreaming and improving production efficiency to enhance sustainable export competitiveness.
Keywords: Export volume, International price, GDP per capita, Exchange rate

INTRODUCTION

Indonesia's export activities can broadly be classified into two main categories: oil and gas exports and non-oil and gas exports. Over the 2014–2024 period, the value of non-oil and gas exports consistently exceeded that of oil and gas exports. This trend is reflected in the fluctuations of Indonesia's non-oil and gas exports during this period. According to the Ministry of Trade (2025), Indonesia's non-oil and gas exports experienced fluctuations from 2014 to 2024. In 2021, export value increased to USD 219.3 billion, representing a 41.58 percent rise from the previous year, and reached its peak in 2022 at USD 275.9 billion. However, in 2023, exports declined significantly by 11.98 percent to USD 242.8 billion, before recovering in 2024 with a 2.46 percent increase to USD 248.8 billion.

The growth of non-oil and gas exports in 2024 further underscores their dominance in Indonesia's export structure. Based on data from the Ministry of Trade (2025), non-oil and gas exports in that year were substantially higher than oil and gas exports, which amounted to only USD 15.87 billion. With a contribution of approximately 94 percent of Indonesia's total export value of USD 264.70 billion, the non-oil and gas sector serves as the main pillar of the national economy. One of the key commodities driving the strong performance of non-oil and gas exports is the marine and fisheries sector, which holds considerable potential for generating foreign exchange earnings.

This potential is supported by Indonesia's vast geographical area of approximately 8.3 million square kilometers, consisting of 1.9 million square kilometers of land area (BPS, 2024) and 6.4 million square kilometers of marine waters (SIDAKO, 2018). With such extensive marine territory, Indonesia possesses substantial potential in fisheries production. This is reflected in data from the Ministry of Marine Affairs and Fisheries (2024), which show that capture fisheries production reached 7.37 million tons in 2023. In addition, aquaculture production amounted to 6.37 million tons, while seaweed production reached 10.8 million tons in the same year. This high production volume provides Indonesia with a comparative advantage as an exporter of fisheries products.

Nevertheless, export performance realization reveals significant challenges, as the fisheries sector contributes only around 2 percent to total non-oil and gas exports. This disparity is evident from the average export volume of Indonesia's fisheries sector over the past five years, which reached only 1.27 million tons. After recording the highest growth of 6.65 percent in 2020, export performance became highly volatile and unstable, although export volume increased again in 2024 to 1.4 million tons.

The export value of shrimp in 2024 reached USD 1.68 billion, making shrimp the highest-value export commodity in the fisheries sector, followed by Tuna–Skipjack–Bonito (TSB) at USD 1.03 billion and the Squid–Cuttlefish–Octopus group at USD 0.87 billion. Overall, shrimp accounted for approximately 28.27 percent of the total fisheries export value of USD 5.95 billion in 2024. This strong export performance is supported by the diversity of shrimp species and products in which Indonesia has a competitive advantage. According to the Ministry of Marine Affairs and Fisheries (2024), Indonesia's leading shrimp species include whiteleg shrimp (vannamei), tiger shrimp, and wild-caught shrimp. Export products range from raw and peeled shrimp to cooked shrimp and various value-added products. Despite its status as a flagship commodity, shrimp export performance has shown significant fluctuations in recent years.

High dependence on imported inputs, particularly feed materials accounting for approximately 70 percent of production costs, has caused rupiah depreciation to increase operational costs for shrimp farmers (Adistya, 2023). Azzahran and Ariadi (2025), as well as Asnawi et al. (2021), identify that the combination of rising input costs and endemic disease risks such as White Feces Disease has made domestic supply highly volatile. As a result, Indonesian exporters face difficulties in maintaining consistent export volumes amid global competition, even though currency depreciation may provide nominal price advantages.

This study is critically important due to the contradiction between Indonesia's vast fisheries resource potential and the declining performance of shrimp exports to the United States as the main destination market over the past three years. Existing studies remain

limited in simultaneously examining the interaction between global price dynamics, shifts in consumer behavior in developed countries, and domestic cost structure vulnerabilities arising from exchange rate fluctuations. Therefore, this research aims to identify the most dominant factors driving fluctuations in export volume in order to formulate strategic directions for transforming Indonesia's shrimp industry from a mass commodity into a high-value-added, globally competitive product.

METHOD

This study adopts a quantitative associative approach to analyze the effects of international shrimp prices, United States GDP per capita, and the rupiah exchange rate on the volume of Indonesia's shrimp exports to the United States. The data consist of annual secondary time-series data covering the 1995–2024 period (30 observations), allowing the analysis to capture short-term dynamics as well as global economic shocks such as the 2008 financial crisis and the COVID-19 pandemic. The research object is Indonesia's shrimp export volume to the United States as the dependent variable, with three main independent variables representing price factors, destination-country income, and exchange rate stability in international trade (Sugiyono, 2017; Mankiw, 2014; Krugman et al., 2012).

All data were obtained from official and credible sources: UN Comtrade for shrimp export volumes (HS codes 030613 and 030617), Federal Reserve Economic Data (FRED) for international shrimp prices, and the World Bank for United States GDP per capita and the rupiah–US dollar exchange rate. Data collection was conducted through non-participant observation by accessing and documenting data from these official databases. The selection of data sources was based on consistency, validity, and international comparability required for trade and macroeconomic analysis (Yuliarmi & Marhaeni, 2019; World Bank, 2024; UN Comtrade, 2024).

The data analysis technique employed is time-series econometric multiple linear regression using the Ordinary Least Squares (OLS) method. Prior to estimation, stationarity was tested using the Augmented Dickey-Fuller (ADF) test, and all non-stationary variables were transformed into First Difference form. The model was then evaluated using F-tests and t-tests to assess simultaneous and partial effects, and complemented by classical assumption tests including normality, multicollinearity, heteroskedasticity, and autocorrelation to ensure that the model satisfies the Best Linear Unbiased Estimator (BLUE) criteria. This approach was applied to generate valid and reliable statistical inferences in explaining the determinants of Indonesia's shrimp exports to the United States market (Wooldridge, 2020; Todaro & Smith, 2020; Firdaus, 2019).

RESULTS AND DISCUSSION
Overview of the Research Scope

This study employs annual time-series data spanning 30 years, covering the period 1995–2024, to capture both short-term and long-term dynamics of Indonesia's shrimp export performance. The selection of a long observation horizon allows for the identification of the impacts of major economic events, such as global financial crises and changes in international trade regimes, on shrimp export volumes. All data used in this study are official secondary data obtained from Statistics Indonesia (BPS), Bank Indonesia (BI), UN Comtrade, the World

Bank, and the Ministry of Marine Affairs and Fisheries (KKP), thereby ensuring the accuracy and validity of the empirical analysis.

Description of Research Variables
Indonesia's Shrimp Export Volume to the United States

Over the 1995–2024 period, Indonesia's shrimp export volume to the United States exhibits a significant long-term growth trend, although accompanied by high volatility driven by trade policies, environmental issues, and global market dynamics. Starting from a very low level in 1995, exports increased rapidly as regulatory barriers were reduced and the main export market shifted from Japan to the United States, reaching a peak in 2021. The surge in exports was largely driven by external factors, such as global supply disruptions and changes in consumption patterns in the U.S. market, rather than reflecting a sustained competitive advantage. Since 2022, export volumes have declined again due to global oversupply and intensified competition, indicating that Indonesia's position in the U.S. market remains vulnerable and faces challenges in achieving stable long-term growth.

International Price

The international shrimp price is defined as the average global shrimp price (USD/kg). During the 1995–2024 period, international prices displayed a fluctuating pattern reflecting global supply and demand dynamics. In the early phase of observation, prices were relatively stable and moderate, as global production expansion led to oversupply conditions and encouraged cost efficiency. Price peaks occurred in 2014 due to global supply disruptions, which Indonesia was able to leverage to increase exports to the United States. In contrast, post-pandemic price pressures articularly in 2023 coincided with a contraction in export volumes, reinforcing the role of international prices as a key signal in determining shrimp export supply.

United States GDP per Capita

Consumer income in this study is proxied by United States GDP per capita as an indicator of living standards and economic prosperity over the 1995–2024 period. Historically, U.S. GDP per capita shows a positive growth trend, despite experiencing contractions during the 2008–2009 Global Financial Crisis and the COVID-19 pandemic in 2020. Entering the post-pandemic recovery phase, GDP per capita increased sharply, reaching USD 85,809 in 2024, reflecting economic strengthening alongside inflationary pressures. This upward trend moved in tandem with increases in Indonesia's shrimp exports, suggesting that shrimp functions as a normal good whose demand rises with consumer income growth in the United States.

Exchange Rate

The exchange rate is defined as the annual average middle rate of the U.S. dollar against the Indonesian rupiah for the 1995–2024 period, which theoretically plays an important role in determining the price competitiveness of Indonesia's shrimp exports. Historically, the rupiah exhibited sharp fluctuations, ranging from relative stability in the pre-crisis period, extreme depreciation during the 1998 Asian Financial Crisis, to recovery and volatility in the post–Global Financial Crisis era. Rupiah depreciation was shown to enhance

price competitiveness and stimulate shrimp exports, particularly during the 2011–2015 period, which coincided with a surge in export volumes. However, during the 2020–2024 period, rupiah depreciation was not consistently followed by export growth, indicating that the impact of the exchange rate is highly dependent on demand conditions and fundamental factors in the destination market.

Results of Data Analysis
Descriptive Statistical Analysis

Table 1. Results of Descriptive Statistics

Variable	N	Min	Max	Mean	Median	Std. Dev
Y	30	3,722.56	123,573.00	54,645.28	48,119.28	37,279.25
X1	30	6.34	10.10	7.52	7.40	0.86
X2	30	28,690.88	85,809.90	50,929.74	48,606.35	15,379.39
X3	30	2,248.61	15,855.45	10,394.75	9,859.18	3,606.03

Source: Processed secondary data, 2025

Based on Table 1, the characteristics of each variable are explained as follows:

1) Export Volume (Y)

The dependent variable, Indonesia's shrimp export volume, has an average (mean) value of 54,645.28 tons, which is higher than its median value of 48,119.28 tons. This difference indicates that the data distribution is right-skewed (positive skewness), suggesting the presence of several years with exceptionally high export volumes that raise the average value. During the observation period, the highest export volume reached 123,573.00 tons, while the lowest was 3,722.56 tons. Furthermore, a relatively high standard deviation of 37,279.25 indicates substantial year-to-year variation in export volumes.

2) International Price (X1)

The international shrimp price variable has an average (mean) value of USD 7.52 per kilogram, with a median of USD 7.40 per kilogram. The relatively small difference between the mean and median suggests that international shrimp prices are approximately normally or symmetrically distributed. In addition, the low standard deviation of 0.86 indicates that shrimp prices in the international market were relatively stable over the observation period, without excessive fluctuations.

3) United States GDP per Capita (X2)

The consumer income variable, proxied by United States GDP per capita, has an average (mean) value of USD 50,929.74, which exceeds the median value of USD 48,606.35. This condition indicates that the average income level of U.S. residents during the 1995–2024 period was relatively high. Moreover, the wide range between the minimum value of USD 28,690.88 and the maximum value of USD 85,809.90, along with a mean exceeding the median, reflects a sustained upward trend in U.S. GDP per capita over time.

4) Exchange Rate (X3)

The rupiah–U.S. dollar exchange rate variable has an average (mean) value of IDR 10,394.75 per USD, which is higher than its median value of IDR 9,859.18 per USD. This suggests that, over the observation period, the rupiah tended to be weaker relative to its

median level. The rupiah reached its strongest level at IDR 2,248.61 per USD, but overall fluctuated around IDR 10,000 per USD. This is reflected in a standard deviation of 3,606.03, indicating considerable exchange rate variability throughout the observation period.

Stationarity Test Results

Table 2. Stationarity Test Results at Level Using the ADF Test

Variable	ADF Statistic	Critical Value (1%)	5%	10%	Remark
Export Volume	-1.118897	-3.679322	-2.967767	-2.622989	Non-stationary
International Price	-2.482062	-3.679322	-2.967767	-2.622989	Non-stationary
Consumer Income	2.931021	-3.679322	-2.967767	-2.622989	Non-stationary
Exchange Rate	-1.897127	-3.679322	-2.967767	-2.622989	Non-stationary

Source: Processed secondary data, 2025

Table 3. Stationarity Test Results at First Difference Using the ADF Test

Variable	ADF Statistic	Critical Value (1%)	5%	10%	Remark
Export Volume	-4.323726	-3.689194	-2.971853	-2.625121	Stationary
International Price	-7.142970	-3.689194	-2.971853	-2.625121	Stationary
Consumer Income	-3.182023	-3.689194	-2.971853	-2.625121	Stationary
Exchange Rate	-6.459848	-4.689194	-2.971853	-2.625121	Stationary

Source: Processed secondary data, 2025

The stationarity test results at the level form presented in Table 2 indicate that all research variables Export Volume, International Price, Consumer Income, and Exchange Rate are non-stationary. This is evidenced by the ADF statistics of each variable being higher than the corresponding critical values at the 1%, 5%, and 10% significance levels. Consequently, none of the variables satisfy the stationarity criterion at the level form, necessitating further testing at the first-difference level.

The first-difference test results shown in Table 3 demonstrate that all variables meet the stationarity requirement. This is indicated by ADF statistics that are lower than the critical values at all significance levels. Accordingly, all variables are stationary at the first-difference level and integrated of order I(1).

Based on these findings, it can be concluded that all four variables are non-stationary in levels but become stationary after first differencing. Therefore, subsequent analysis proceeds with the estimation of a Multiple Linear Regression model using first-difference data to examine short-run relationships among the variables.

Multiple Linear Regression Analysis Results

Table 4. Multiple Linear Regression Results

Model	Unstandardized Coefficients (B)	Std. Error	t-Statistic	Sig.
Constant	6,902.473	2,227.880	3.098224	0.0048
Δ International Price	4,790.244	1,906.860	2.512112	0.0188

Model	Unstandardized Coefficients (B)	Std. Error	t-Statistic	Sig.
Δ Consumer Income	-2.075500	0.838030	-2.476640	0.0204
Δ Exchange Rate	-0.038497	0.931571	-0.041324	0.9674

Source: Processed secondary data, 2025

Based on Table 4, the estimated regression equation is as follows:

$$DY = 6902{,}473 + 4790{,}244DX_1 - 2{,}075500DX_2 - 0{,}038497DX_3$$

The estimated coefficients can be interpreted as follows:

- Constant (C = 6,902.473) indicates that if changes in all independent variables are zero, the change in export volume increases by 6,902.473 tons.
- International Price (β_1 = 4,790.244; Sig. = 0.0188) has a positive and statistically significant effect. Holding other variables constant, a one USD/kg increase in the change of international prices raises the change in export volume by 4,790.244 tons in the short run.
- Consumer Income (β_2 = –2.075500; Sig. = 0.0204) has a negative and statistically significant effect. A one USD increase in the change of U.S. GDP per capita reduces the change in export volume by 2.075500 tons in the short run, ceteris paribus.
- Exchange Rate (β_3 = –0.038497; Sig. = 0.9674) has a negative but statistically insignificant effect, implying that changes in the exchange rate have no meaningful short-run impact on export volume.

Classical Assumption Test Results
Normality Test

Table 5. Normality Test Results

Statistic	Value
Jarque–Bera	0.988008
Probability	0.610178

Source: Processed secondary data, 2025

The Jarque–Bera probability exceeds 0.05, indicating that the residuals are normally distributed.

Heteroskedasticity Test

Table 6. Heteroskedasticity Test Results

Test	Statistic	Probability
F-statistic	1.082965	0.3744
Obs*R-squared	3.335279	0.3428
Scaled explained SS	3.173046	0.3657

Source: Processed secondary data, 2025

All probability values exceed 0.05, indicating no heteroskedasticity. The residual variance is constant, satisfying the homoskedasticity assumption.

Multicollinearity Test

Table 7. Multicollinearity Test Results

Variable	VIF
International Price	1.011370
Consumer Income	1.016037
Exchange Rate	1.004932

Source: Processed secondary data, 2025

All VIF values are below 10, indicating no multicollinearity.

Autocorrelation Test

Table 8. LM Autocorrelation Test Results

Test	Statistic	Probability
F-statistic	0.178864	0.8374
Obs*R-squared	0.444141	0.8009

Source: Processed secondary data, 2025

The probability value exceeds 0.05, indicating no autocorrelation.

Simultaneous Significance Test (F-test)

Table 9. Simultaneous Hypothesis Test Results

	Statistic	Probability	Remark
F-statistic	3.757300	0.023529	

Source: Processed secondary data, 2025

The probability value is below 0.05, indicating that changes in international prices, consumer income, and the exchange rate jointly have a significant effect on changes in Indonesia's shrimp export volume to the United States.

Partial Significance Test (t-test)

Table 10. Partial Hypothesis Test Results

Variable	Coefficient	t-Statistic	Probability	Result	Direction
International Price	4,790.244	2.512112	0.0188	Significant	Positive
Consumer Income	-2.075500	-2.476640	0.0204	Significant	Negative
Exchange Rate	-0.038497	-0.041324	0.9674	Not Significant	Negative

Source: Processed secondary data, 2025

Discussion of Research Findings
Joint Effects of International Price, GDP per Capita, and Exchange Rate

The simultaneous test results indicate that changes in international prices, U.S. GDP per capita, and the exchange rate jointly have a significant effect on changes in Indonesia's shrimp export volume to the United States. This finding confirms that shrimp export dynamics are shaped by the interaction of price and non-price factors in international trade.

International prices affect competitiveness, GDP per capita reflects purchasing power in the destination market, and the exchange rate influences price affordability. The consistency of these findings with prior empirical studies underscores the dependence of Indonesia's shrimp export performance on global macroeconomic conditions and international competitiveness.

Effect of International Price

Changes in international prices have a positive and significant effect on export volume, confirming the Law of Supply. Empirically, the global price surge in 2014 was followed by a sharp increase in exports, while the price decline in 2023 coincided with export contraction. This demonstrates that international prices serve as a primary incentive for producers and exporters, reinforcing their role as a key determinant of shrimp export dynamics.

Effect of GDP per Capita

Changes in U.S. GDP per capita exert a negative and significant effect on Indonesia's shrimp export volume, indicating that Indonesian frozen shrimp behaves as a relatively inferior good in the U.S. market. As consumer income rises, preferences shift toward more premium and differentiated seafood products, reducing demand for standard frozen shrimp. This pattern aligns with empirical observations in the latter period and with studies emphasizing heightened selectivity and stricter quality standards in developed markets.

Effect of Exchange Rate

Changes in the exchange rate do not significantly affect export volume. This result supports the Dominant Currency Paradigm, whereby transactions invoiced in U.S. dollars and price rigidity reduce the responsiveness of export demand to short-run exchange rate movements. Additionally, the benefits of rupiah depreciation are offset by higher imported input costs, rendering exchange rate effects secondary to international prices and demand conditions.

CONCLUSION

This study empirically examines the effects of international prices, consumer income (U.S. GDP per capita), and the exchange rate on Indonesia's shrimp export volume to the United States during 1995–2024. Using a Multiple Linear Regression model with first-difference transformation and OLS estimation, the following conclusions are drawn:

1. Changes in international prices, consumer income, and the exchange rate jointly have a significant effect on changes in shrimp export volume, indicating that export performance is determined by the combined interaction of global price signals, destination-market purchasing power, and macroeconomic stability.
2. International prices have a positive and significant effect, confirming the Law of Supply: higher global prices provide profitability incentives that encourage exporters to expand supply.
3. U.S. GDP per capita has a negative and significant effect, implying that Indonesian frozen shrimp behaves as an inferior good in the U.S. market as rising incomes shift preferences toward premium seafood products.
4. The exchange rate has no significant effect, reinforcing the Dominant Currency Paradigm, whereby dollar invoicing and price rigidity weaken the short-run impact of rupiah fluctuations on export demand.

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