(Research/Review) Article

The Influence of Foreign Direct Investment and Exchange Rate on Foreign Exchange Reserves Through Exports in Indonesia from 2003 to 2023

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Abstract: This study aims to examine the effect of Foreign Direct Investment (FDI) and the exchange rate on exports and foreign exchange reserves in Indonesia during the period 2003–2023, with exports serving as a mediating variable. The analysis employs the path analysis method using annual data obtained from the Central Bureau of Statistics (BPS) and other relevant publications. The results indicate that FDI has a positive and significant effect on both exports and foreign exchange reserves, both directly and indirectly through exports. This finding suggests that FDI inflows contribute to increasing production capacity and export competitiveness, thereby strengthening Indonesia's external position. Furthermore, exports are found to have a positive and significant effect on foreign exchange reserves, reaffirming their strategic role in maintaining external stability. Conversely, the exchange rate has a negative but statistically insignificant effect on exports and foreign exchange reserves, indicating that rupiah depreciation does not automatically enhance export performance or increase foreign exchange reserves. This condition is likely due to the domestic industry's reliance on imported raw materials and capital goods, as well as the dominance of primary commodities in Indonesia's export structure. Overall, the findings highlight the need for policies that promote FDI in export-oriented sectors, diversify export products, develop import-substitution industries, and improve trade logistics efficiency to optimize the role of exports in strengthening Indonesia's foreign exchange reserves.

Keywords: BPS; Exchange Rate; Exports; Foreign Direct Investment; Foreign Exchange Reserves.

1. Introduction

Foreign exchange reserves are a collection of foreign assets owned and managed by the monetary authorities, which can be utilized at any time to cover balance-of-payments deficits and maintain monetary stability through intervention policies in the foreign exchange market (Gandhi, 2006). In addition to serving as an instrument for international transactions, foreign exchange reserves also reflect the level of confidence held by trading partners and other countries in a nation's ability to sustain economic stability and engage in international cooperation. Uli (2016) explains that foreign exchange reserves play a crucial role as an indicator of a country's capacity to conduct international transactions, while Mustaqim and Widanta (2021) emphasize that the availability of foreign exchange reserves ensures monetary and macroeconomic stability. According to World Bank data (2023), Indonesia's foreign exchange reserves reached US\$146.38 billion, ranking third in ASEAN after Singapore and Thailand. However, when viewed from the ratio of foreign exchange reserves to external debt, Indonesia is in fifth place with a ratio of 282.8%. This indicates that dependence on external financing remains relatively high, implying that efforts to strengthen sources of foreign exchange earnings need to be continuously enhanced.

From a mercantilist perspective, a nation's prosperity is measured by the amount of assets or capital it possesses, particularly in the form of gold and silver derived from a surplus in international trade. Today, gold is closely associated with foreign exchange reserves

obtained through export activities. According to Todaro (2012), exports represent the process of transferring goods and services from one country to another, generating foreign exchange earnings. Agustina (2018) states that exports and foreign exchange reserves have a positive relationship, in which an increase in exports boosts the amount of foreign exchange owned by a country. Furthermore, the exchange rate also plays a significant role in influencing foreign exchange reserves.

Gandhi (2006) explains that changes in the exchange rate affect foreign exchange reserves through Bank Indonesia's intervention in the foreign exchange market. When the rupiah depreciates, Bank Indonesia sells foreign currency to curb the weakening, which subsequently reduces foreign exchange reserves. Conversely, when the rupiah appreciates, Bank Indonesia purchases foreign currency to increase reserves while maintaining export competitiveness. Krugman and Obstfeld (2018) define the exchange rate as the relative price between one currency and another. Meanwhile, Agustina (2018) found a negative correlation between the exchange rate and foreign exchange reserves, indicating that rupiah appreciation tends to increase the amount of reserves.

The exchange rate also affects export performance. According to Aizenman and Lee (2015), a weaker exchange rate can enhance the competitiveness of domestic products, as goods become relatively cheaper in the global market, thereby encouraging export growth. This aligns with the findings of Mahendra and Kesumajaya (2012), which show that the exchange rate has a positive relationship with exports. In addition, capital inflows such as Foreign Direct Investment (FDI) also influence foreign exchange reserves. Gandhi (2006) notes that capital inflows—whether in the form of foreign aid, foreign investment, or external loans—can increase a country's foreign exchange reserves.

Khoirunnisa and Oktavilia (2022) assert that FDI is positively related to foreign exchange reserves because an increase in FDI adds to inflows in the balance of payments. Furthermore, Zhang (2015) states that higher FDI can stimulate exports in the host country due to improved access to global markets, technology, and international production networks.

Based on the above discussion, it can be concluded that foreign exchange reserves are influenced by export activities, the exchange rate, and FDI inflows, all of which are interconnected. FDI has the potential to increase exports and indirectly expand foreign exchange reserves, while the exchange rate can affect both exports and foreign exchange reserves through monetary intervention mechanisms. Therefore, this study employs path analysis to examine the direct effects of FDI and the exchange rate on foreign exchange reserves, as well as their indirect effects through exports as a mediating variable in the Indonesian economy during the period 2003–2023.

2. Literature Review

Mercantilism Theory

In the mercantilist perspective, a nation's prosperity is measured by the amount of assets or capital it possesses, particularly gold and silver obtained from international trade surpluses. Thomas Mun, in England's Treasure by Foreign Trade, emphasized that a country can increase its wealth by expanding exports and restricting imports. In the modern context, this view is adapted by positioning foreign exchange reserves as a symbol of a nation's economic strength (Sayoga and Tan, 2017). The larger the trade surplus achieved through increased exports, the greater the foreign exchange reserves a country can accumulate.

Balance of Payment Theory

The Balance of Payment (BOP) theory explains that every country must maintain the equilibrium of its international economic transactions. The International Monetary Fund (IMF) defines the balance of payments as a systematic record of all economic transactions between residents of a country and the rest of the world over a specific period. A stable balance of payments reflects a balance between outflows due to imports and inflows generated from exports. Components of the BOP, such as the current account and capital account, have been shown to influence a nation's foreign exchange reserve position (Khoirunnisa & Oktavilia, 2022; Andriyani et al., 2020; Laksono and Tarmidi, 2021).

Mundell–Fleming Theory

The Mundell–Fleming model, developed by Robert A. Mundell (1963) and Marcus Fleming (1962), extends the IS–LM framework into an open economy setting. This model describes the interaction between fiscal policy, monetary policy, and the exchange rate in

achieving external balance. Within this model, the exchange rate plays a crucial role in influencing exports and imports. When the exchange rate depreciates, domestic products become more competitive in international markets, thereby encouraging higher exports. Conversely, when the exchange rate appreciates, export competitiveness declines because domestic goods become relatively more expensive for foreign buyers (Krugman and Obstfeld, 2018). Thus, there is a positive relationship between exchange rate depreciation and export growth, which ultimately contributes to an increase in foreign exchange reserves.

Foreign Exchange Reserves

Foreign exchange reserves are a collection of foreign assets owned and managed by the central bank in the form of foreign currencies, gold, or other liquid assets. According to Gandhi (2006), foreign exchange reserves are used to finance balance-of-payments imbalances, support foreign exchange market interventions, and maintain monetary obligations and exchange rate stability. Mathematically, foreign exchange reserves can be expressed as:

$$FX = FX_{t-1} + CA_t + KA_t$$

Where:

FX = Foreign Exchange Reserves
FXt-1 = Foreign Exchange Reserves in the previous year
CAt = Current Account
KAt = Capital Account

This formulation indicates that changes in foreign exchange reserves are influenced by the current account and capital account. According to Khoirunnisa and Oktavilia (2022), all components of the balance of payments directly affect changes in foreign exchange reserves. This is consistent with the findings of Andriyani et al. (2020) and Laksono and Tarmidi (2021), who assert that fluctuations in the BOP influence the position of foreign exchange reserves. Furthermore, Warjiyo (2013) notes that Bank Indonesia employs various intervention instruments in the foreign exchange market, including spot transactions, swaps, and Domestic Non-Deliverable Forward (DNDF), to maintain exchange rate stability and market liquidity. Spot interventions directly affect foreign exchange reserves because they involve the actual sale or accumulation of foreign currency. When the rupiah depreciates, Bank Indonesia sells foreign exchange reserves to curb the depreciation; when the rupiah appreciates, it purchases foreign currency to strengthen reserves. Thus, exchange rate fluctuations affect the level of foreign exchange reserves through monetary intervention policies carried out by the monetary authorities.

Exports

Exports refer to the activity of selling commodities abroad to earn foreign exchange (Mankiw, 2014). These activities play an essential role in stimulating industrial growth and economic development, driven by price differences between domestic and international markets. According to Zhang (2015), Foreign Direct Investment (FDI) can promote exports through the global market access provided by the investor's home country. This is consistent with Kutan and Vukšić (2007), who note that host countries are often used as export bases by multinational enterprises. Within the framework of mercantilism, exchange rate stability is crucial for maintaining export competitiveness. Studies by Jiang and Yoon (1994) and Aizenman and Lee (2015) show that exchange rate depreciation tends to increase a country's exports.

3. Method

Data

This study employs a quantitative approach using time-series data obtained from secondary sources published by Statistics Indonesia (Badan Pusat Statistik/BPS). This approach is used to assess the influence of FDI and the exchange rate on foreign exchange reserves, with exports serving as a mediating variable. The selection of this method is based on the ability of quantitative analysis to objectively measure relationships between variables over a specified period, thereby capturing both the direct and indirect dynamics among the variables under examination.

Analysis Method

This study applies path analysis to identify the direct and indirect effects among variables and to assess the mediating role of exports in the relationship between FDI, the exchange rate, and foreign exchange reserves in Indonesia. This approach is an extension of multiple linear regression analysis, used to measure and test causal relationships among predetermined variables (Ghozali, 2013).

The path analysis procedure consists of two main stages. The first stage examines the influence of FDI and the exchange rate on exports, while the second stage analyzes the influence of FDI, the exchange rate, and exports on foreign exchange reserves. Path coefficient estimation is carried out using EViews software to obtain the direct effects between variables. Meanwhile, the indirect or mediating effects are tested using the Sobel Test, which is calculated manually without software assistance, to determine whether exports act as an intermediary variable in the relationship between FDI and the exchange rate on foreign exchange reserves.

Prior to analysis, a series of classical assumption tests is conducted to ensure the validity and reliability of the regression model. The normality test is performed using the Kolmogorov–Smirnov method to verify whether the residual data are normally distributed. The model satisfies the normality assumption if the significance value is greater than 0.05. Subsequently, a multicollinearity test is conducted to detect correlations among independent variables; multicollinearity is considered absent when the Tolerance value exceeds 0.10 and the Variance Inflation Factor (VIF) is less than 10.

Next, a heteroscedasticity test is carried out to ensure that the residual variance is constant (homoscedastic). The model is deemed free of heteroscedasticity if the significance value (p-value) is greater than 0.05. Additionally, the Durbin–Watson (DW) Test is used to identify autocorrelation, which examines whether the error term in period t is correlated with errors in the previous period (t–1). A DW value between –2 and 2 indicates that the model is free from autocorrelation.

After all classical assumptions are met, hypothesis testing is conducted to determine the significance of the influence of independent variables on the dependent variable. The t-test (partial test) is used to evaluate the effect of each independent variable individually on the dependent variable. A $p\text{-value} < 0.05$ indicates a significant effect, or significance may be assessed by comparing the calculated t-value with the t-table value. Meanwhile, the F-test (simultaneous test) is used to assess the collective influence of all independent variables on the dependent variable, with the model deemed significant if the significance value is < 0.05.

The coefficient of determination (R^2) is used to measure the extent to which the independent variables explain variations in the dependent variable. An R^2 value closer to 1 indicates a stronger explanatory power of the model. Finally, the Sobel Test is conducted to examine the role of exports as a mediating variable in the relationship between FDI and the exchange rate on foreign exchange reserves. If the calculated t-value in the Sobel Test exceeds the t-table value at a 5% significance level, exports are confirmed to play a significant mediating role. Thus, path analysis enables a comprehensive understanding of both the direct and indirect mechanisms among the variables in the research model.

4. Results and Discussion

Normality Test

Table 1. Normality Test Results.

	Variable	Prob.	Decision
Model I	FDI and Exchange Rate	0.129870	Normally distributed
Model II	FDI, Exchange Rate, and Exports	0.480962	Normally distributed

The normality test results indicate that in Stage I (variables: FDI and exchange rate) the probability value is 0.129870 (> 0.05), while in Stage II (variables: FDI, exchange rate, and exports) the probability value is 0.480962 (> 0.05). Therefore, the data in both stages are considered to be normally distributed.

Multicollinearity Test

Table 2. Multicollinearity Test Results (Centered VIF).

Variable	Centered VIF	
	Model I	**Model II**
FDI	3.662882	5.710437
Exchange Rate	3.662882	3.663055
Exports	-	3.015600

The multicollinearity test shows that all variables in Model I and Model II have VIF values below 10 (FDI and exchange rate in Model I: 3.662882 each; in Model II: FDI = 5.710437, exchange rate = 3.663055, exports = 3.015600). This indicates no strong linear relationship among the independent variables; hence the regression models are free from multicollinearity and suitable for further analysis.

Heteroskedasticity Test

Table 3. Heteroskedasticity Test Results.

Variable	Model I		Model II	
	t-statistic	Prob	t-statistic	Prob
FDI	0.561450	0.5814	1.359.001	0.5971
Exchange Rate	-1.82396	0.0848	-0.538606	0.1919
Ekspors			-0.061423	0.9517

The heteroskedasticity test indicates that in Model I, the p-values for FDI (0.5814) and exchange rate (0.0848) are both > 0.05. In Model II, the p-values for FDI (0.5971), exchange rate (0.1919), and exports (0.9517) are also > 0.05. Therefore, both models do not exhibit heteroskedasticity.

Autocorrelation Test

Table 4. Autocorrelation Test Results.

	Durbin Watson	Keputusan
Model I	0.575509	No autocorrelation detected
Model II	1.356947	No autocorrelation detected

The Durbin–Watson statistics for Model I (0.575509) and Model II (1.356947) indicate no autocorrelation according to the authors' criteria; thus the data for both models are considered free from autocorrelation and suitable for regression analysis.

Model I Analysis Results (Effects on Exports)

Table 5. Regression Results — Model I.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	6.315712	3.184393	1.983333	0.0628
FDI	0.576908	0.181871	3.172069	0.0053
Exchange Rate	-0.014294	0.489746	-0.029188	0.9770

The FDI coefficient of 0.576908 indicates a positive relationship with exports: a 1% increase in FDI is associated with a 0.576908% increase in exports. Conversely, the exchange rate coefficient of -0.014294 implies a negative relationship, i.e., a 1% increase in the exchange-rate measure corresponds to a 0.014294% decrease in exports.

Table 6. t-Test Results — Model I.

Variable	Coefficient	t-Statistic	Prob
C	6.315712	1.983333	0.0628
FDI	0.576908	3.172069	0.0053
Exchange Rate	-0.014294	-0.029188	0.9770

The t-test shows FDI is statistically significant (p = 0.0053) in influencing exports, while the exchange rate is not significant (p = 0.9770).

Table 7. F-Test — Model I.

UJI F	F-Statistic	Prob (F-statistic)
	18.14040	0.000048

The F-statistic is significant (p < 0.05), indicating that FDI and the exchange rate jointly have a significant effect on exports.

Table 8. Coefficient of Determination (R^2) — Model I.

UJI Koefisien Determinasi (R^2)	R-squared	Adjusted R-squared
	0.668391	0.631546

The adjusted R^2 of 0.631546 indicates that approximately 63.15% of the variation in exports is explained by FDI and the exchange rate; the remaining 36.85% is attributable to other factors outside the model.

Model II Analysis Results (Effects on Foreign Exchange Reserves

Table 9. Regression Results.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	-0.360773	2.575383	-0.140085	0.8902
Ekspor	0.661674	0.172687	3.831634	0.0013
FDI	0.421487	0.166374	2.533378	0.0214
Exchange Rate	-0.035717	0.358821	-0.099539	0.9219

Regression results in Model II show positive coefficients for exports (0.661674) and FDI (0.421487), both positively related to foreign exchange reserves, whereas the exchange rate has a negative coefficient (-0.035717). Based on significance tests, exports (p = 0.0013) and FDI (p = 0.0214) are significant predictors of reserves, while the exchange rate (p = 0.9219) is not significant. This suggests exports and FDI are the main drivers of foreign exchange reserves in the model.

Table 10. t-Test Results.

Variable	Coefficient	t-Statistic	Prob
C	-0.360773	-0.140085	0.8902
Ekspor	0.661674	3.831634	0.0013
FDI	0.421487	2.533378	0.0214
Exhange Rate	-0.035717	-0.099539	0.9219

The t-tests confirm that exports and FDI significantly affect foreign exchange reserves, while the exchange rate does not.

Table 11. F-Test.

UJI F	F-Statistic	Prob (F-statistic)
	47.69806	0.000000

The F-statistic is highly significant (p < 0.05), indicating that, collectively, exports, FDI, and the exchange rate significantly influence foreign exchange reserves.

Table 12. Coefficient of Determination (R^2).

Koefisien Determinasi (R^2)	R-squared	Adjusted R-squared
	0.893813	0.875074

The adjusted R^2 of 0.875074 indicates that approximately 87.51% of the variation in foreign exchange reserves is explained by exports, FDI, and the exchange rate. The remaining 12.49% is due to other factors outside the model, such as global economic conditions, inflation, international interest rates, or government policy.

Indirect Effect of FDI on Foreign Exchange Reserves via Exports (Sobel Test)

$$t = \frac{ab}{\sqrt{b^2 Sa^2 + a^2 Sb^2}}$$

$$t = \frac{0.576909 \times 0.661674}{\sqrt{0.661674^2 \times 0.181871^2 + 0.576909^2 \times 0.172687^2}}$$

$$t = \frac{0.381756}{\sqrt{0.437813 \times 0.033076 + 0.332825 \times 0.029816}}$$

$$t = \frac{0.381756}{\sqrt{0.014489 + 0.009925}}$$

$$t = \frac{0.381756}{0.156277}$$

$$t = 2.44333096$$

The Sobel test yields t = 2.4433, which is greater than the critical t value (≈2.093 at the 5% significance level). Therefore, the indirect effect of FDI on foreign exchange reserves via exports is statistically significant. The indirect effect is $0.576909 \times 0.661674 = 0.381725$. The direct effect of FDI on reserves is 0.421487, so the total effect is $0.421487 + 0.381725 = 0.803212$.

Indirect Effect of Exchange Rate on Foreign Exchange Reserves via Exports (Sobel Test)

$$t = \frac{ab}{\sqrt{b^2 Sa^2 + a^2 Sb^2}}$$

$$t = \frac{-0.035717 \times 0.661674}{\sqrt{0.661674^2 \times 0.358821^2 - 0.035717^2 \times 0.172687^2}}$$

$$t = \frac{-0.023633}{\sqrt{0.437813 \times 0.128753 + 0.001275 \times 0.029821}}$$

$$t = \frac{-0.023633}{\sqrt{0.056369 + 0.000038}}$$

$$t = \frac{-0.023633}{0.237501}$$

$$t = -0.099507$$

The Sobel test yields t = -0.0995, which is much smaller in absolute value than the critical t value (≈2.101 at 5% significance with df = 18). Hence, the indirect effect of the exchange rate on foreign exchange reserves via exports is not statistically significant. The direct effect of the exchange rate on reserves is -0.035717. The indirect effect (exchange rate → exports → reserves) is $-0.014295 \times 0.661674 = -0.009459$. The total effect is $-0.035717 + (-0.009459) = -0.045176$.

Discussion

Effect of Exports on Foreign Exchange Reserves

Regression results indicate that exports have a positive and significant effect on foreign exchange reserves, with a coefficient of 0.661674. This implies that a one-unit increase in exports raises foreign exchange reserves by 0.661674 units. This finding supports mercantilist reasoning that a country's wealth (in terms of reserves) depends on export performance. In the Indonesian context, higher exports translate into greater foreign-exchange earnings, strengthening reserves and supporting national economic stability. The result underscores the importance of export-promoting policies, especially strengthening export-oriented industries and value-added products to sustain trade surpluses and external resilience.

Effect of FDI on Exports

Analysis shows FDI positively influences exports (coefficient = 0.576909), indicating that increased FDI stimulates Indonesia's export performance. This is in line with Zhang (2015) and Sinaga et al. (2025), who reported positive FDI–export linkages. FDI brings capital, technology, and efficiency improvements that enhance export competitiveness. However, the positive effects are concentrated in certain sectors (e.g., mining and manufacturing). Thus, future FDI policy should target high-export-potential sectors with low current foreign investment (e.g., agriculture, forestry, fisheries) to broaden the export base.

Effect of FDI on Foreign Exchange Reserves

FDI exerts a positive and significant direct effect on reserves (coefficient = 0.421487). This aligns with Khoirunnisa and Oktavilia (2022) and other studies (Rolanda et al., 2025; Agustina, 2018) finding that balance-of-payments components contribute positively to reserves. FDI inflows increase foreign-currency supply, which can be converted into rupiah to finance domestic investment—thereby directly adding to national foreign exchange holdings and strengthening external resilience.

Indirect Effect of FDI on Reserves via Exports

The indirect effect of FDI on reserves through exports equals 0.381725, which is smaller than the direct effect (0.421487). This suggests that while FDI can raise exports and consequently reserves, the transmission via exports is weaker than the direct channel. This may be due to Indonesia's export structure—dominated by raw commodities with limited value-added and product diversification—reducing the strength of the FDI → exports → reserves pathway (Khofifah Hanif et al., 2025). Policy should therefore encourage downstream industry development, logistics efficiency, and incentives for foreign investors focused on high value-added export production.

Effect of Exchange Rate on Exports

The exchange rate coefficient is –0.014295 and statistically insignificant for the 2003–2023 period. Theoretically, depreciation should boost exports by making domestic goods cheaper abroad, but the empirical result shows the opposite. This can be explained by Indonesia's dependence on imported inputs and capital goods: depreciation raises import costs for production components, increasing production costs and weakening export competitiveness. Additionally, Indonesia's export composition—primarily primary commodities such as coal, palm oil, and rubber—makes export volumes and values more responsive to global commodity prices than to exchange-rate movements. Studies such as Sari and Imaningsih (2024) support this commodity-price dominance over exchange-rate effects. Thus, exchange-rate policy alone may be insufficient to stimulate exports without addressing structural production dependencies and value-addition.

Effect of Exchange Rate on Foreign Exchange Reserves

The exchange rate has a negative but statistically insignificant effect on reserves (coefficient = –0.035717). The negative sign suggests that rupiah depreciation tends to reduce reserves explained by Bank Indonesia's interventions: when the rupiah weakens, BI may sell reserves to stabilize the currency, thereby reducing reserve levels. Gandhi (2006) identifies precautionary motives as dominant for reserve holdings; BI's interventions are typically responsive and episodic rather than continuous. Juhro and Azwar (2021) argue that BI's FX interventions are temporary and employed during significant pressures only, which weakens the observable statistical relationship between exchange-rate changes and reserves. Therefore, the lack of significance implies situational interventions and limited persistent impact of exchange-rate fluctuations on reserve levels.

Indirect Effect of Exchange Rate on Reserves via Exports

The indirect effect of the exchange rate via exports is –0.009459 (negative and insignificant), indicating that exports do not effectively mediate the relationship between exchange rate and reserves for 2003–2023. Depreciation does not automatically stimulate exports in Indonesia because of reliance on imported inputs; thus depreciation can raise production costs and lower export competitiveness (Sharma, 2016). Moreover, BI's intermittent interventions reduce the transmission from exchange-rate changes to reserves through exports. These findings align with Denny Saputera et al. (2023) and Yusuf & Apriliana (2025), who

conclude that exports have yet to function as an effective conduit for exchange-rate effects on reserves.

Overall, the study finds that Indonesia's reserve strengthening is driven more by export performance and FDI inflows than by exchange-rate movements. Policy implications include prioritizing productive investment attraction, export diversification toward high value-added goods, and strengthening domestic industry to enhance external resilience.

4. Conclusion

FDI positively and significantly affects Indonesia's exports. Foreign direct investment increases production capacity and export competitiveness. The government should promote export-oriented FDI, especially in under-invested but export-potential sectors (agriculture, forestry, fisheries) to distribute FDI benefits more broadly and raise export performance.

FDI has a positive and significant direct effect on foreign exchange reserves. FDI inflows bolster external supply through foreign-currency inflows. Policymakers should enhance investment promotion, provide fiscal incentives, and improve legal certainty and the business climate to attract high-quality FDI that contributes to reserve accumulation.

FDI also affects reserves indirectly via exports, although this indirect effect is smaller than the direct effect. The weaker indirect pathway reflects the domination of low value-added exports. Policies to increase downstream industrialization, modernize technology, and upskill workers are needed to amplify FDI's indirect contribution to reserves.

Exports positively and significantly influence foreign exchange reserves. Increases in exports directly strengthen reserves and national resilience. The government should expand nontraditional export markets, improve logistics efficiency, and enhance product competitiveness.

The exchange rate has a negative but statistically insignificant effect on exports. Rupiah depreciation does not necessarily boost exports due to import dependence for production inputs. Therefore, exchange-rate policy should be complemented by structural measures reducing import dependency, improving industrial capacity, and increasing production efficiency so that depreciation can have a beneficial effect on exports in the future.

The exchange rate also has a negative but insignificant effect on reserves. Rupiah weakness can lead to reserve depletion via BI interventions. Authorities should strengthen fiscal–monetary coordination, preserve market confidence, and manage exchange-rate volatility carefully to avoid excessive depletion of reserves.

The exchange rate's indirect effect on reserves via exports is negative and insignificant. Exports have not yet served effectively as a transmission channel for exchange-rate effects on reserves. To enhance this channel, policies should promote export diversification, import-substituting industries, and logistical/infrastructural improvements including supply-chain digitalization.

In summary, Indonesia's foreign exchange reserves are more strongly shaped by export performance and FDI than by exchange-rate fluctuations. Economic policy should therefore focus on attracting productive investment, diversifying and upgrading exports, and building robust domestic industry to secure sustainable external resilience.

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