Vol. 3, No. 2, 2026
DOI: 10.61975/gjbes.v3i2.120

ORIGINAL ARTICLE

The Impact of Economic Freedom on the Economic Complexity of Trade in Indonesia

Cut Syazalisma, Suriani Suriani* and M. Shabri Abd. Majid

Department of Economics, Faculty of Economics and Business, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia

* Correspondence: suriani@usk.ac.id

Article History

Received
16 March 2026

Accepted
1 June 2026

Available Online
9 June 2026

Keywords

Economic freedom
Economic complexity of trade
Robust Least Squares
Indonesia

Abstract

This study investigates the impact of economic freedom on the economic complexity of trade in Indonesia, an issue that is increasingly relevant for understanding structural transformation in resource-dependent economies. While the existing literature has separately examined the role of economic freedom in promoting growth and the importance of economic complexity for development, limited attention has been given to how economic freedom influences the sophistication and diversification of exports, particularly in the Indonesian context. Using annual data from 1998 to 2024, this study employs the Economic Complexity Index as the dependent variable and the Economic Freedom Index as the main independent variable, with GDP per capita, FDI inflows, and trade openness included as control variables. The analysis applies Robust Least Squares method, incorporating M-estimation, S-estimation, and MM-estimation techniques to ensure the robustness of the results. The findings reveal that economic freedom has a negative and statistically significant effect on economic complexity, suggesting that liberalization may reinforce specialization in low-complexity, resource-based sectors rather than promote export diversification. In contrast, GDP per capita positively influences economic complexity, while FDI inflows and trade openness do not exhibit significant effects. These results indicate that external integration and market liberalization alone are insufficient to enhance export sophistication without supportive domestic structural conditions. This study highlights the need for policymakers to complement market-oriented reforms with targeted industrial and institutional policies that promote economic diversification, capability accumulation, and technological upgrading to enhance export sophistication.

Introduction

Economic development in the contemporary global economy is increasingly characterized not only by the scale of production but by the sophistication and diversity of a country's export structure [1]. In this context, economic complexity has emerged as a critical indicator of a nation's productive capabilities, reflecting its ability to produce and export a wide range of knowledge-intensive goods [2,3]. At the same time, institutional quality, particularly economic freedom, has been widely recognized as a fundamental determinant of economic performance, influencing investment decisions, resource allocation, and market efficiency [4]. While a substantial body of literature has examined the role of economic freedom in promoting economic growth, relatively little attention has been devoted to its influence on the structural transformation of economies, particularly in enhancing export sophistication and diversification.

A critical real-world challenge lies in the apparent tension between market-oriented reforms and strategic industrial policies. While policies such as export bans and domestic processing requirements are designed to foster industrial upgrading, they may simultaneously constrain elements of economic freedom, such as trade openness and investment flexibility [5]. This creates a policy dilemma regarding whether restricting certain economic freedoms can, in the long run, enhance economic complexity. Alternatively, such restrictions may undermine the development of productive capabilities by distorting market signals and limiting innovation [6].

The lack of clear empirical evidence on this issue complicates policy formulation and underscores the need for systematic investigation.

The case of Indonesia is particularly relevant for examining this relationship. As a resource-rich, developing economy, Indonesia has historically relied on the export of primary commodities, especially in the mining and natural resources sectors. In recent years, the government has implemented various policy reforms to promote downstream industrialization and increase value-added production [7]. However, these efforts have occurred alongside fluctuations in institutional quality and varying degrees of economic freedom, including regulatory restrictions, trade barriers, and state intervention in key sectors [8]. Consequently, Indonesia's progress toward a more complex and diversified export structure remains uneven, raising important questions about the role of institutional factors in shaping this trajectory. Data from the Economic Complexity Index [9] indicate a gradual improvement in Indonesia's export sophistication, with the index increasing from -0.846 in 1998 to positive territory in 2021. Nevertheless, the index remained relatively low and experienced fluctuations in recent years, suggesting that the country's structural transformation is still incomplete. This pattern highlights the importance of identifying the factors that influence economic complexity in Indonesia.

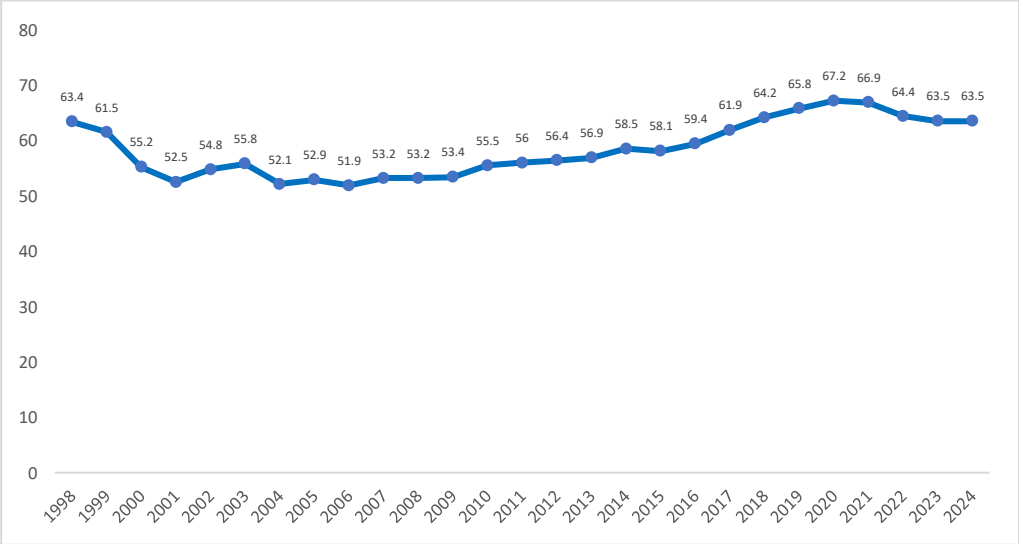

Figure 1. Index of Economic Freedom in Indonesia, 1998-2024 [10].

Figure 1 indicates that Indonesia's Economic Freedom Index declined markedly in the early period, falling from the high-60s in 1998 to its lowest point in the early 2000s, reflecting institutional instability and adjustment following the Asian Financial Crisis. Subsequently, the index shows a gradual and relatively consistent upward trend from the mid-2000s onward, suggesting progressive improvements in market-oriented reforms, regulatory quality, and openness. This upward trajectory peaks around 2020-2021, then slightly moderates in recent years, indicating some stabilization but also potential constraints on further liberalization. Overall, the pattern reflects a transition from post-crisis institutional weakness toward a more stable, though still evolving, economic freedom environment in Indonesia, raising an important empirical question: whether these institutional improvements have translated into greater export sophistication and, consequently, higher economic complexity of trade.

From a theoretical perspective, the relationship between economic freedom and economic complexity can be understood through the lens of institutional economics and the capability-based theory of development [11]. Economic freedom, through secure property rights, efficient regulatory frameworks, and open markets, facilitates entrepreneurship, knowledge diffusion, and efficient resource allocation, all of which are essential for the accumulation of productive

capabilities [12]. These capabilities, in turn, enable economies to diversify into more sophisticated products, thereby increasing their economic complexity. However, this relationship may not be monotonic, particularly in resource-dependent economies such as Indonesia, where structural constraints and policy interventions play a significant role.

Empirical evidence demonstrates a substantive link between these two variables. [13] examine the relationship between economic freedom and economic complexity in 22 transitional economies using a Bootstrap Granger causality approach. Their results reveal that, despite heterogeneous, country-specific linkages, there is an overall robust association between economic freedom and economic complexity. Similarly, [14] investigates the impact of economic freedom on international trade in 22 Asian countries over the period 1995-2020 using a System GMM approach. The findings indicate that economic freedom significantly promotes trade activities, thereby supporting its role in enhancing trade performance and complexity. In addition, [2] analyze the determinants of economic complexity across 89 countries using panel data from 2002 to 2016. Their results show that institutional quality significantly enhances economic complexity, reinforcing the importance of institutional factors, including economic freedom, in shaping productive capabilities and trade sophistication.

Despite the growing importance of economic freedom and economic complexity in development discourse, a significant gap remains in the Indonesian literature. Existing studies in Indonesia primarily examine the role of economic freedom in financial sector performance and macroeconomic outcomes, such as the efficiency of Islamic rural banks (Masrizal et al. (2023), economic growth [16], and bank risk-taking behavior [17]. However, these studies do not explore how economic freedom influences structural transformation through export sophistication and diversification, as reflected in economic complexity. In addition, previous studies generally focus on macroeconomic performance rather than the institutional determinants of trade sophistication. Therefore, empirical evidence linking economic freedom and economic complexity in the Indonesian context remains limited.

This study offers novelty in three main aspects. First, it specifically investigates the effect of economic freedom on economic complexity in Indonesia, a relationship that has received limited empirical attention in previous Indonesian studies. Second, the study employs an annual dataset covering the period 1998-2024, allowing a more comprehensive analysis of structural transformation dynamics. Third, this study applies Robust Least Squares estimation, including M-estimation, S-estimation, and MM-estimation techniques, to obtain more reliable estimates than standard Ordinary Least Squares (OLS) in the presence of potential outliers and non-normality in macroeconomic time-series data.

Therefore, this study empirically examines the impact of economic freedom on economic complexity in Indonesia during the period 1998-2024 using Robust Least Squares estimation. Trade-based economic complexity is examined because export data provide a direct measure of a country's productive capabilities and its ability to produce and competitively export sophisticated goods. Moreover, this measure is particularly relevant for Indonesia, where export diversification and upgrading remain central objectives of economic development and industrial policy. The findings are expected to provide policy-relevant insights into how market-oriented reforms and institutional quality influence export sophistication and long-term structural transformation in a resource-dependent economy.

Materials and Methods

Data and Variable

This study uses time-series data for the period 1998-2024, as data on the economic complexity of trade are only available for this period, although other variables are available for a longer timeframe. As shown in Table 1, the study utilizes a total of five variables. Economic complexity

of trade (ECT) serves as the dependent variable, while economic freedom (EF), proxied by the Index of Economic Freedom, is the main independent variable. GDP per capita, foreign direct investment (FDI) inflows, and trade openness are included as control variables, as they are widely recognized in the literature as key determinants of economic complexity through their influence on productive capabilities, technology transfer, and international market integration [18–20]. All variables are sourced from reliable and reputable databases such as The Observatory of Economic Complexity, Heritage Foundation, and World Bank [9,10,21].

Table 1. Operational definition of variables.

Variable Status	Variable Name	Variable Symbol	Variable Units	Source
Dependent	Economic Complexity of Trade Index	ECT	Scale approximately between -2.5 to +2.5	The Observatory of Economic Complexity
Main Independent	Index of Economic Freedom	EF	Scale from 0 to 100	Heritage Foundation
Control	GDP per Capita	GDP	Constant Rupiah	World Bank
Independent	FDI inflows	FDI	Percent	World Bank
	Trade Openness	TO	Percent	World Bank

Method

The study employs the Robust Least Squares (RLS) method, an estimation technique designed to address several limitations of Ordinary Least Squares (OLS), particularly in the presence of outliers, heteroskedasticity, and non-normal error distributions. Unlike OLS, which minimizes the sum of squared residuals and is highly sensitive to extreme observations, RLS applies weighting schemes that reduce the influence of atypical data points on parameter estimates [22]. This makes the method particularly suitable for time-series data characterized by structural breaks, volatility, or measurement errors, conditions that are common in macroeconomic datasets spanning long periods. As a result, RLS provides more reliable and efficient coefficient estimates, thereby enhancing the robustness and credibility of the empirical findings.

Within the RLS framework, this study employs M-estimation, S-estimation, and MM-estimation to ensure the stability and consistency of the results. M-estimation generalizes maximum likelihood estimation by using a loss function that downweights large residuals, thereby improving robustness to moderate outliers [23]. S-estimation focuses on minimizing the scale of residuals and offers a high breakdown point, making it effective for datasets with substantial contamination [24]. MM-estimation combines the strengths of both approaches by first achieving high robustness through S-estimation and then improving efficiency through M-estimation [25]. The use of these three estimators allows cross-validation of the results, ensuring that the estimated relationships are not driven by specific assumptions or data irregularities but remain stable and consistent across robust estimation techniques.

The mathematical specification of the study is expressed in the following equation:

$$ECT = f(EF, GDP, FDI, TO) \quad (1)$$

Based on the functional specification above, the econometric model of the study can be written as follows:

$$ECT_t = \beta_0 + \beta_1 EF_t + \beta_2 GDP_t + \beta_3 FDI_t + \beta_4 TO_t + \varepsilon_t \quad (2)$$

Considering that some independent variables, such as the Economic Freedom (EF) index, are not expressed in percentage form, while others, such as GDP per capita, exhibit substantially larger magnitudes than the remaining variables, this study transforms the EF and GDP variables into their natural logarithmic forms. This transformation standardizes the scale of the variables, compresses extreme values, and improves the linearity of the relationships, thereby allowing the coefficients to be interpreted in elasticity terms. This is particularly useful for examining proportional changes, where a percentage change in economic freedom or GDP per capita can be directly associated with changes in the economic complexity of trade.

Accordingly, the final econometric model of the study is specified as follows:

$$ECT_t = \beta_0 + \beta_1 lnEF_t + \beta_2 lnGDP_t + \beta_3 FDI_t + \beta_4 TO_t + \varepsilon_t \quad (3)$$

Here, ECT represents economic complexity of trade, EF represents economic freedom, GDP represents GDP per capita, FDI represents foreign direct investment inflows, TO represents trade openness, t denotes the study period, β_0 is the constant term, $\beta_1 - \beta_4$ are the estimated coefficients, and ε is the error term.

Classical Assumption Test

Despite the RLS method mitigating several limitations of OLS, this study nevertheless conducts classical assumption tests to enhance the validity and reliability of the estimated parameters. These diagnostic tests are essential to ensure that the empirical model does not suffer from serious econometric problems that could bias the results or weaken statistical inference [26].

First, the normality test is conducted to examine whether the residuals are normally distributed, which is important for valid hypothesis testing and confidence interval construction. This is assessed using the Jarque-Bera statistic, where a probability value above 0.05 indicates that the residuals are normally distributed. Second, the heteroskedasticity test is applied to determine whether the variance of the error terms remains constant across observations. The presence of heteroskedasticity can lead to inefficient estimates and biased standard errors. Therefore, the Breusch-Pagan-Godfrey test is employed to detect this issue. Third, multicollinearity is evaluated to assess the degree of correlation among the independent variables. High multicollinearity can inflate standard errors and make coefficient estimates unstable. The study diagnoses this issue using the Variance Inflation Factor (VIF). Finally, the autocorrelation test is used to identify correlation among residuals over time, which is particularly relevant in time-series analysis. The Breusch-Godfrey serial correlation LM test is typically used for this purpose, where the absence of autocorrelation indicates that the error terms are independent. Collectively, these tests provide a comprehensive diagnostic framework to support the robustness and credibility of the empirical findings

Results and Discussion

Descriptive Statistics

Descriptive statistics are presented to provide a preliminary understanding of the data by summarizing its central tendency, dispersion, and overall distribution before conducting econometric analysis. In this context, Table 2 reports the descriptive statistics of all variables in their original scale, offering an overview of their mean, median, range, and variability.

The Economic Complexity of Trade (ECT) exhibits a negative average value (mean = -0.35; median = -0.33), indicating that, over the sample period, the country's export structure remains below the global average level of complexity. The relatively small standard deviation (0.24) suggests limited variation over time, while the narrow range between the minimum (-0.85) and maximum (0.02) indicates that structural transformation toward more sophisticated exports has been modest. The Index of Economic Freedom (EF) shows a mean of 58.45, with values ranging from 51.9 to 67.2. This places the country in a moderately free category, with moderate dispersion (standard deviation = 5.00), suggesting gradual institutional changes rather than abrupt reforms.

GDP per capita (GDP) displays substantial variation, as reflected by a high standard deviation (8,693,504.6) and a wide range between minimum and maximum values. This indicates significant economic growth over time, consistent with a developing economy undergoing structural expansion. Foreign Direct Investment (FDI), measured as a percentage, shows notable volatility. Although the mean is positive (1.21), the minimum value (-2.76) implies periods of net disinvestment or capital outflows. The relatively high standard deviation (1.44) confirms that FDI inflows are unstable and potentially sensitive to external and domestic shocks. Trade

Openness (TO) has a mean of 51.76, indicating that trade constitutes a substantial share of the economy. However, the wide range (32.97 to 96.19) and relatively large standard deviation (13.45) suggest considerable fluctuations in trade intensity over time, possibly reflecting changes in global demand, commodity prices, or trade policy.

Overall, the descriptive statistics reveal that while economic freedom and GDP per capita show relatively stable upward tendencies, variables such as FDI and trade openness exhibit higher volatility. Meanwhile, the persistently low and weakly varying ECT suggests that improvements in institutional quality and economic scale have not yet translated into significant gains in Indonesia's export sophistication.

Table 2. Descriptive statistics.

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
ECT	-0.35	-0.33	0.02	-0.85	0.24
EF	58.45	56.9	67.2	51.9	5.00
GDP	29,992,076.1	29,212,467.9	45,576,126.1	18,442,995.5	8,693,504.6
FDI	1.21	1.79	2.92	-2.76	1.44
TO	51.76	48.64	96.19	32.97	13.45

Classical Assumption Test

The classical assumption tests were conducted to ensure the validity and reliability of the regression model. The normality test evaluates whether the residuals are normally distributed, which is important for valid statistical inference. Based on Figure 2, the Jarque-Bera statistic is 0.355216 with a probability value of 0.837271. Since the probability exceeds the 5% significance level, the null hypothesis of normal distribution cannot be rejected, indicating that the residuals are normally distributed. Furthermore, the heteroskedasticity test was performed using the Breusch-Pagan-Godfrey test to examine whether the variance of the residuals remains constant across observations. The results reported in Table 3 show that the probability value of the Chi-square statistic is 0.8689, which is higher than the 5% significance level. Therefore, the null hypothesis of homoskedasticity cannot be rejected, suggesting that the model does not suffer from heteroskedasticity and that the error variance is constant.

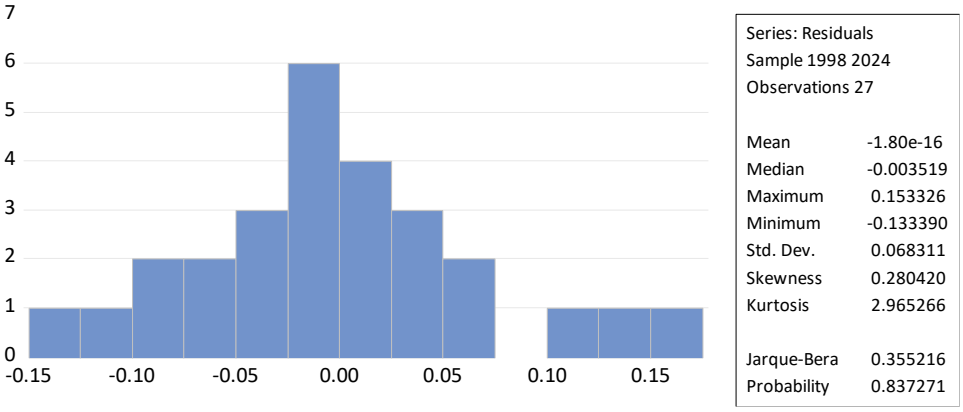

Figure 2. Results of normality test.

Table 3. Results of heteroskedasticity and autocorrelation tests.

Test	Prob.	Conditions	Conclusions
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.8689	>0.05	No heteroskedasticity problem.
Breusch-Godfrey Serial Correlation LM Test	0.0667	>0.05	No autocorrelation problem.

Moreover, the autocorrelation test using the Breusch-Godfrey Serial Correlation LM test was conducted to determine whether the residuals are correlated over time. As reported in Table 3,

the probability value of the Chi-square statistic is 0.0667, which exceeds the 5% significance level. Therefore, the null hypothesis of no serial correlation cannot be rejected, indicating that the model does not exhibit autocorrelation in the residuals. In addition, the multicollinearity test was conducted to assess the degree of correlation among the independent variables. Based on the centered Variance Inflation Factor (VIF) values reported in Table 4, all variables exhibit VIF values below the commonly accepted threshold of 10, indicating that multicollinearity is not a serious concern in the model. Specifically, EF, FDI, and TO have relatively low VIF values, while GDP, although comparatively higher, remains within acceptable limits. Overall, these results confirm that the regression model satisfies the classical linear regression assumptions.

Table 4. Results of variance inflation factors.

Variable	Uncentered VIF	Centered VIF
EF	426.03	2.9833
GDP	99.67	7.4604
FDI	3.29	1.8997
TO	55.67	3.4010

Robust Least Squares Estimation

This study employs Robust Least Squares with M-, S-, and MM-estimation not only to obtain robust coefficient estimates but also to ensure consistency of the results, thereby improving the reliability of inference. Starting with the main independent variable, the results in Tables 6 to 8 consistently show that economic freedom (EF) exerts a statistically significant negative effect on economic complexity (ECT) across all estimation techniques. In the M-estimation, EF has a coefficient of -0.6361 ($p < 0.01$), while in the S-estimation it is -0.6881 ($p < 0.01$), and the MM-estimation yields a comparable magnitude and significance. The stability of both the sign and significance across the three robust estimators indicates a high degree of consistency and robustness in the estimated relationship. Substantively, this suggests that increases in economic freedom, potentially reflecting deregulation, trade liberalization, and reduced state intervention, are associated with a decline in export complexity. In the Indonesian context, this may imply that liberalization policies have disproportionately facilitated the expansion of resource-based and low-value-added exports rather than promoting structural transformation toward more sophisticated, knowledge-intensive products.

Regarding the control variables, GDP per capita exhibits a positive and highly significant effect on ECT across all estimations, indicating that economic growth is a key driver of increasing export sophistication. In contrast, FDI and trade openness (TO) both display negative but statistically insignificant coefficients in all models, suggesting that neither foreign investment inflows nor trade intensity have a meaningful direct impact on economic complexity within the sample period. This pattern may reflect the composition of FDI and trade in Indonesia, which tends to be concentrated in extractive and low-complexity sectors, thereby limiting their contribution to structural upgrading.

In terms of model fit and overall significance, the results indicate strong explanatory power across all robust estimations. The M-estimation reports an Rw-squared value of 0.9773, suggesting that approximately 97.73% of the variation in economic complexity (ECT) is explained by the included variables. The S-estimation yields an R-squared of 0.8212, indicating a substantial, albeit more conservative, explanatory capacity. The MM-estimation similarly produces a high goodness-of-fit measure, reinforcing the consistency of the model's explanatory strength across different robust techniques. Furthermore, the Rn-squared statistics in all estimations are associated with probability values of 0.0000, implying that the null hypothesis of joint insignificance can be rejected at the 1% level. This confirms that the set of independent variables is collectively significant in explaining variations in ECT, thereby supporting the robustness and overall validity of the model specification.

Table 6. Robust Least Squares M-estimation.

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EF	-0.6361***	0.1756	-3.6222	0.0003
GDP	0.8746***	0.0901	9.7020	0.0000
FDI	-0.0075	0.0094	-0.7993	0.4241
TO	-0.0013	0.0013	-0.9611	0.3365
C	-12.7171***	1.1697	-10.8720	0.0000
R-squared	0.9773			
Rn-squared statistic	667.3341***			
Prob(Rn-squared stat.)	0.0000			

Note: *** Significant at 1%.

Table 7. Robust Least Squares S-estimation.

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EF	-0.6881***	0.1096	-6.2765	0.0000
GDP	0.8971***	0.0563	15.9424	0.0000
FDI	-0.0069	0.0059	-1.1674	0.2430
TO	-0.0011	0.0008	-1.2685	0.2046
C	-12.9011***	0.7302	-17.6679	0.0000
R-squared	0.8212			
Rn-squared statistic	1745.2813***			
Prob(Rn-squared stat.)	0.0000			

Note: *** Significant at 1%.

Table 8. Robust Least Squares MM-estimation.

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EF	-0.5250***	0.1805	-2.9082	0.0036
GDP	0.7964***	0.0927	8.5939	0.0000
FDI	-0.0042	0.0097	-0.4306	0.6668
TO	-0.0022	0.0014	-1.6004	0.1095
C	-11.7827***	1.2025	-9.7988	0.0000
R-squared	0.9522			
Rn-squared statistic	612.0716***			
Prob(Rn-squared stat.)	0.0000			

Note: *** Significant at 1%.

Discussion

The empirical findings provide consistent insight into the relationship between economic freedom and economic complexity, particularly in the context of a developing, resource-dependent economy such as Indonesia. Across all robust estimation techniques, economic freedom is found to exert a statistically significant negative effect on economic complexity. This result runs counter to the conventional expectation that greater economic freedom, through improved market efficiency, reduced regulatory burdens, and stronger property rights, should facilitate structural transformation and diversification. Instead, the evidence suggests that, in this case, liberalization may have reinforced existing comparative advantages in low-complexity sectors rather than fostering the development of more sophisticated productive capabilities. Evidence from Indonesia is also supported by previous studies, such as [27], which find that distortions in economic freedom, especially in the service sector, have a negative and significant impact on export sophistication. Similarly, [28] show that economic freedom, through terms-of-trade volatility, negatively affects economic complexity, particularly in commodity-dependent developing economies.

One plausible explanation lies in the structural characteristics of the Indonesian economy, which remains heavily influenced by commodity-based activities despite periods of liberalization. Empirical evidence indicates that Indonesia's export structure has increasingly relied on commodities and resource-based products, with more than two-thirds of exports consisting of primary or commodity-related goods, many of which are exported with limited processing [29].

This shift has been associated with a decline in export sophistication and a weakening share of high-technology exports. Even within the manufacturing sector, a large portion is concentrated in natural resource and low-skill-intensive industries rather than technologically advanced production [30]. In such a context, greater economic freedom, through deregulation, trade openness, and investment liberalization, tends to reinforce existing comparative advantages rather than induce structural transformation. Consequently, capital and resources are more likely to flow into extractive industries such as mining, palm oil, and basic processing sectors, where Indonesia already holds strong competitiveness.

The positive and highly significant effect of GDP per capita on economic complexity is consistent with the theoretical literature on structural transformation. Higher income levels typically reflect improvements in productivity, human capital accumulation, and technological adoption, all of which are essential for producing more complex goods [31]. This finding suggests that economic growth remains a necessary, albeit not sufficient, condition for increasing export sophistication. However, the divergence between the effects of GDP and economic freedom indicates that growth alone does not guarantee a shift toward higher complexity if the underlying policy environment does not actively support diversification [12].

In contrast, foreign direct investment and trade openness do not exhibit statistically significant effects on economic complexity. Although both variables are often considered channels for technology transfer and market expansion, their insignificance in this study suggests that the composition and quality of these flows matter more than their volume. In particular, if FDI is concentrated in resource-based sectors and trade is dominated by primary exports, their contribution to knowledge diffusion and capability building will be limited [32]. This highlights the importance of absorptive capacity and sectoral targeting in leveraging globalization for structural upgrading.

From an Indonesian perspective, these findings are highly relevant. Indonesia has pursued various liberalization policies over the past decades, including trade openness and investment facilitation. However, the persistence of a resource-oriented export structure implies that these policies have not been fully effective in promoting industrial deepening [33]. The negative association between economic freedom and complexity may reflect a policy mix that emphasizes market liberalization without sufficiently strong industrial, technological, and human capital policies to guide the economy toward higher value-added activities.

Conclusions

This study concludes that economic freedom does not necessarily promote structural upgrading in the context of a developing, resource-dependent economy such as Indonesia. The empirical results consistently show that economic freedom exerts a negative and significant effect on economic complexity, indicating that liberalization, in the absence of complementary policies, may reinforce specialization in low-complexity, resource-based sectors rather than encourage diversification. While economic growth, as proxied by GDP per capita, contributes positively to export sophistication, this effect is not sufficient to offset structural constraints embedded in the economy. Moreover, the insignificance of FDI and trade openness further suggests that external integration alone does not guarantee knowledge diffusion or capability upgrading. Overall, the findings highlight that the relationship between liberalization and economic complexity is highly conditional on domestic structural factors, particularly sectoral composition, institutional capacity, and the ability to absorb and utilize external resources.

The results imply that Indonesia should move beyond a purely liberalization-oriented policy framework and adopt a more strategic approach to structural transformation. Economic freedom should be complemented with targeted industrial policies that promote diversification into higher value-added and technologically intensive sectors. This includes strengthening

downstream industries, particularly in resource-based sectors, to enhance value addition rather than relying on raw commodity exports. In addition, improving human capital, innovation capacity, and technological readiness is essential to increase absorptive capacity and ensure that FDI and trade contribute more effectively to economic complexity. Policymakers should also focus on improving the quality, rather than merely the quantity, of investment by incentivizing FDI in advanced manufacturing and knowledge-intensive industries. In this regard, a coordinated policy mix that integrates liberalization with industrial, education, and innovation policies is crucial to avoid the risk of persistent structural dependence and to facilitate a transition toward a more complex and resilient economic structure.

Despite the valuable findings of this study, several limitations should be acknowledged and addressed in future research. First, the analysis focuses exclusively on Indonesia, which may limit the generalizability of the findings to other developing or resource-dependent economies with different institutional and economic structures. Second, the study employs a static estimation approach, which may not fully capture the dynamic interactions between economic freedom and economic complexity over time. Future studies could apply dynamic estimation techniques, such as FMOLS and DOLS, as well as Granger causality analysis, to provide a more comprehensive understanding of these relationships. Third, although the model includes GDP per capita, FDI inflows, and trade openness as control variables, other relevant determinants of economic complexity, such as human capital, innovation capacity, institutional quality, and infrastructure development, are not considered due to data and model constraints. Future research may incorporate these variables to provide a more comprehensive analysis.

Funding: This study does not receive external funding.

Data Availability Statement: Data is available upon request.

Acknowledgments: The author would like to express the gratitude to Universitas Syiah Kuala.

Conflicts of Interest: All the authors declare that there are no conflicts of interest.

References

[1] Sarin V, Mahapatra SK, Sood N. Export Diversification and Economic Growth: A Review and Future Research Agenda. *Journal of Public Affairs* 2022;22. https://doi.org/10.1002/pa.2524.

[2] Nguyen CP, Schinckus C, Su TD. Determinants of Economic Complexity: A Global Evidence of Economic Integration, Institutions, and Internet Usage. *Journal of the Knowledge Economy* 2023;14:4195–215. https://doi.org/10.1007/s13132-022-01053-3.

[3] Maulidar P, Yulfianti C, Prasetyo FH. Economic Complexity as a Driver of Economic Growth in Indonesia: A Multidimensional Analysis of Trade, Technology, and Research. *Ekonomikalia Journal of Economics* 2025;3:132–49. https://doi.org/10.60084/eje.v3i2.346.

[4] Tran DV. A Study on the Impact of Economic Freedom on Economic Growth in ASEAN Countries. *Business and Economic Horizons* 2019;15:423–49.

[5] Adjemian MK, Petroff C, Robe MA. The Political Economy of Export Bans and Commodity Price Volatility: Theory and Evidence from Agricultural Markets. *Journal of International Money and Finance* 2026;164:103552. https://doi.org/10.1016/j.jimonfin.2026.103552.

[6] Angulo-Guerrero MJ, Pérez-Moreno S, Abad-Guerrero IM. How Economic Freedom Affects Opportunity and Necessity Entrepreneurship in the OECD Countries. *Journal of Business Research* 2017;73:30–7. https://doi.org/10.1016/j.jbusres.2016.11.017.

[7] Rifa'i A, Purwoharyono D, Fickri Ramadhan M. Economy-Wide Impacts of Natural Resource Downstream Policy: A Case of Nickel Moratorium in Indonesia. *Mineral Economics* 2025. https://doi.org/10.1007/s13563-025-00562-2.

[8] Suryanta B, Patunru AA. Trade Impediments in Indonesia. *Journal of Economic Integration* 2023;38:247–77.

[9] The Observatory of Economic Complexity. The Economic Complexity Index 2025.

[10] Heritage Foundation. Explore the Data of the Index of Economic Freedom 2025.

[11] Bradley P. An Institutional Economics Framework to Explore Sustainable Production and Consumption. *Sustainable Production and Consumption* 2021;27:1317–39. https://doi.org/10.1016/j.spc.2021.02.035.

[12] Ahmed S, Mushtaq M, Fahlevi M, Aljuaid M, Saniuk S. Decomposed and Composed Effects of Economic Freedom on Economic Growth in South Asia. *Heliyon* 2023;9:e13478. https://doi.org/10.1016/j.heliyon.2023.e13478.
[13] Erkan B, Ceylan F. Determinants of Economic Complexity in Transitional Economies. *Journal Transition Studies Review* 2021;28:57–80. https://doi.org/10.14665/1614-4007-28-2-004.
[14] Dang BK. The Impact of Economic Freedom and International Tourism on International Trade: An Empirical Study in Asian Countries. *Organizations and Markets in Emerging Economies* 2024;15:267–87.
[15] Masrizal, Sukmana R, Fianto BA, Gultom RZ. Does Economic Freedom Fosters Islamic Rural Banks Efficiency? Evidence from Indonesia. *International Journal of Productivity and Performance Management* 2023;72:2538–58. https://doi.org/10.1108/IJPPM-11-2021-0660.
[16] Hardi I, Afjal M, Khan M, Idroes GM, Noviandy TR, Utami RT. Economic Freedom and Growth Dynamics in Indonesia: An Empirical Analysis of Indicators Driving Sustainable Development. *Cogent Economics & Finance* 2024;12. https://doi.org/10.1080/23322039.2024.2433023.
[17] Defung F, Yudaruddin R. Economic Freedom on Bank Stability and Risk-Taking in Emerging Economy: Indonesian Case Study. *Cogent Business & Management* 2022;9. https://doi.org/10.1080/23311975.2022.2112816.
[18] Zhu S, Li R. Economic Complexity, Human Capital and Economic Growth: Empirical Research Based on Cross-Country Panel Data. *Applied Economics* 2017;49:3815–28. https://doi.org/10.1080/00036846.2016.1270413.
[19] Hardi I, Mose N, Tanchev S, Siregar MI, Bozkaya S. Freedom and Prosperity: The Impact of Political Rights and Civil Liberties on Economic Complexity. *Ekonomikalia Journal of Economics* 2025;3:78–92. https://doi.org/10.60084/eje.v3i2.329.
[20] Ko S, Kim W, Lee K. Exploring the Factors Affecting Technology Transfer in Government-Funded Research Institutes: The Korean Case. *Journal of Open Innovation: Technology, Market, and Complexity* 2021;7:228. https://doi.org/10.3390/joitmc7040228.
[21] Bank W. World Development Indicators 2021. https://databank.worldbank.org/source/world-development-indicators.
[22] Wooldridge JM. Introductory Econometrics: A Modern Approach 6rd ed. Cengage learning; 2016.
[23] Huber PJ. Robust Regression: Asymptotics, Conjectures and Monte Carlo. *The Annals of Statistics* 1973;1:799–821.
[24] Rousseeuw P, Yohai V. Robust Regression by Means of S-Estimators, 1984, p. 256–72. https://doi.org/10.1007/978-1-4615-7821-5_15.
[25] Yohai VJ. High Breakdown-Point and High Efficiency Robust Estimates for Regression. *The Annals of Statistics* 1987;15:642–56.
[26] Gujarati DN, Porter DC. Basic Econometrics. 6th ed. McGraw-Hill Education; 2020.
[27] Su X, Anwar S, Zhou Y, Tang X. Services Trade Restrictiveness and Manufacturing Export Sophistication. *The North American Journal of Economics and Finance* 2020;51:101058. https://doi.org/10.1016/j.najef.2019.101058.
[28] Avom D, Kamguia B, Ngameni JP. Does Volatility Hinder Economic Complexity. *Economics Bulletin* 2021;41:1187–202.
[29] Trihatmoko RA, Susilo YS. Natural Resource Governance and Strategic Economic Resources: The Perspective of Indonesia Raya Incorporated. *Humanities and Social Sciences Communications* 2024;11:395. https://doi.org/10.1057/s41599-024-02772-5.
[30] Saptioratri Budiono HD, Nurcahyo R, Habiburrahman M. Relationship between Manufacturing Complexity, Strategy, and Performance of Manufacturing Industries in Indonesia. *Heliyon* 2021;7:e07225. https://doi.org/10.1016/j.heliyon.2021.e07225.
[31] Nguea SM, Fotio HK, Baida LA. Investigating the Effects of Globalization on Economic Sophistication in Selected African Countries. *African Development Review* 2022;34:324–38. https://doi.org/10.1111/1467-8268.12666.
[32] Kurniawan MLA, A'yun IQ. Dynamic analysis on export, FDI and growth in Indonesia: An Autoregressive Distributed Lag (ARDL) model. *Journal of Economics, Business, & Accountancy Ventura* 2022;24:350–62.
[33] Ifa K, Yahdi M. Trade Openness and Economic Growth in Indonesia. *Wiga: Jurnal Penelitian Ilmu Ekonomi* 2020;10:163–70.