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The Impact of Global Price Volatility, Transportation Costs, and Tax Schemes on the Profitability of Palm Oil Exporters in West Sumatra Province

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ABSTRACT

This study explores the influence of global price volatility, transportation costs, and tax schemes on the profitability of palm oil exporters in West Sumatra Province. Using a quantitative approach, data were collected from 175 exporters through a structured questionnaire employing a 5-point Likert scale. The analysis was conducted using Structural Equation Modeling with Partial Least Squares (SEM-PLS 3). The results indicate that global price volatility has a significant negative effect on profits, emphasizing the sensitivity of palm oil exporters to international market fluctuations. Transportation costs also negatively impact profits, reflecting the high logistics burden and regional infrastructure challenges. Meanwhile, tax schemes show a significant effect—partially negative due to high fiscal burdens, but also reflecting the importance of tax incentives in mitigating operational pressures. These findings highlight the need for integrated policy reforms that stabilize commodity prices, improve logistical efficiency, and design supportive tax frameworks to enhance the competitiveness and profitability of palm oil exporters in the region.

Keywords: *Global Price Volatility, Transportation Costs, Tax Schemes, Palm Oil Exporters, West Sumatra Province.*

1. INTRODUCTION

The palm oil industry plays a vital role in Indonesia's economy, contributing significantly to export earnings, employment, and rural development, with West Sumatra Province being one of the key regions for production and exportation. Many businesses in this region depend on the sector's stability and profitability; however, palm oil exporters have increasingly faced challenges due to dynamic global economic conditions, including price volatility, rising transportation costs, and complex tax schemes, compounded by environmental concerns. Price volatility arises from the highly competitive global palm oil market dominated by Indonesia and Malaysia, affecting the profitability of West Sumatra's exporters [1]. Rising transportation costs, driven by fuel price increases and logistical difficulties, add pressure to the export cost structure [2], while complex tax schemes such as export tariffs hinder international competitiveness [1]. To address these issues, strategic opportunities include market diversification to reduce dependence on specific markets [2], investment in research and development to enhance productivity and lower costs [3], and the establishment of trade agreements to improve market access [1]. Additionally, environmental and social considerations are essential, as sustainability initiatives aim to address deforestation concerns—though research indicates most plantations occupy degraded land rather than primary forests [4]—and the industry continues to contribute to rural development through job creation and infrastructure improvements [4].

Global price volatility has become a major concern for palm oil exporters, as fluctuations in international prices—driven by changes in global demand, trade regulations, geopolitical tensions, environmental policies in importing countries, exchange rate fluctuations, and macroeconomic shocks—can significantly affect profit margins and hinder financial planning, particularly for small and medium-sized enterprises (SMEs). Exchange rate misalignments, especially overvaluation,

reduce international competitiveness and highlight the need for stable rates aligned with economic fundamentals to support exporters [5], while foreign macroeconomic shocks, such as output shocks in Singapore and inflation shocks in the United States, exert stronger effects on palm oil exports than domestic factors [6]. External influences, including crude oil price changes and price shifts in substitute goods like soybean oil, play a dominant role in determining palm oil price movements compared to internal shocks [7]. Moreover, the integration of Indonesia's domestic crude palm oil (CPO) market with global markets means that international price swings directly affect local prices, and although export taxes have been used to stabilize domestic prices, their impact remains limited [8]. Overall, while price volatility in the palm oil market is considered moderate, with CPO acting as the price leader, strategies such as stabilizing CPO prices through producer cartels or international commodity agreements could help reduce fluctuations across related palm oil products [9].

In addition to price instability, transportation costs have emerged as a significant challenge for palm oil exporters in West Sumatra, where geographic and infrastructure limitations—such as poor road networks, limited access to ports, and high fuel prices—drive up logistics expenses, reducing competitiveness and profitability in the global market. Indonesia's logistics costs are among the highest in Southeast Asia, absorbing over 26% of GDP [10], with poor road conditions, inadequate infrastructure, and the absence of developed highways further increasing domestic transport costs, alongside regulatory and illegal charges that account for about 10% of these expenses [11], [12]. Geographic challenges, congestion, and fuel consumption remain major components of transportation expenses [10], while poor-quality infrastructure lengthens travel times and raises costs, indirectly reducing regional productivity and affecting sales prices [13]. Adding to these burdens, tax schemes implemented by local and national governments—though essential for revenue—are often marked by inconsistent policies, overlapping regulations, and complex administrative procedures that hinder operational efficiency and profit realization [12]. While some tax incentives exist to support exporters, their uneven accessibility and implementation limit their effectiveness [12].

Given these challenges, there is an urgent need to understand how the three major factors—global price volatility, transportation costs, and tax schemes—collectively influence the profits of palm oil exporters in West Sumatra. This study seeks to fill that gap by identifying the most significant barriers to profitability and examining their interconnections, with the aim of providing valuable insights for policymakers, business owners, and stakeholders in formulating more supportive strategies for the palm oil export sector. Ultimately, the research contributes to the broader discourse on enhancing the resilience and sustainability of Indonesia's agricultural export economy.

2. LITERATURE REVIEW

2.1 Global Price Volatility

Global price volatility significantly impacts palm oil exporters, especially in developing countries like Indonesia, where the economy relies heavily on commodity-based exports. Fluctuations in crude palm oil (CPO) prices affect profit margins, investment decisions, and long-term planning for exporters in regions such as West Sumatra. This volatility stems from factors like financial speculation, unexpected demand shocks, and market integration; speculation and the inclusion of agricultural

commodities in investment portfolios increase the risk of volatility spillovers from financial to commodity markets [14], while historical data shows demand shocks as the primary driver [15]. In Malaysia, CPO price volatility has both unidirectional and bi-directional spillover effects on domestic prices, suggesting that stabilizing CPO prices could reduce volatility across related products [9]. For developing countries, such volatility hampers financial development by disrupting market stability and contributing to the resource curse [16]. Mitigation strategies include forming alliances—such as between Indonesia and Malaysia—to strengthen bargaining power and control output, as well as creating international commodity agreements to stabilize prices and reduce financial risks for exporters [9].

2.2 Transportation Costs

Transportation costs significantly impact the export operations of agricultural commodities, particularly in regions with inadequate infrastructure like West Sumatra, Indonesia, where factors such as infrastructure quality, distance to market, fuel prices, and logistical efficiency play a crucial role. High transportation costs reduce trade competitiveness by lowering exporters' net income and limiting market access, while delays or inefficiencies can cause substantial losses, especially for bulk shipments or time-sensitive deliveries. Maritime transport costs alone account for around 10% of the value of imported agricultural products—comparable to agricultural tariffs—and a doubling of shipping costs can lead to a 42% decline in trade, with each additional day at sea reducing trade by 4.5% on a typical 20-day voyage, underscoring the need for efficiency [17]. The impact of transport costs also varies across sectors, with high value-added sectors, such as agro-industry, facing greater trade deterrents than low value-added sectors [18]. Moreover, while quality transport infrastructure, including roads and ports, can enhance export performance in developing economies, poor logistics services can negate these benefits, highlighting the importance of improving both infrastructure and logistics performance [19]. Thus, this study posits that transportation costs have a negative effect on exporter profits.

2.3 Tax Schemes

Indonesia's palm oil industry is heavily influenced by tax schemes encompassing export taxes, income taxes, and import duties, which are intended to support national development but often burden exporters due to their complexity and high compliance costs. The export tax on crude palm oil has successfully lowered domestic prices but has also discouraged local processing by reducing processing margins and creating uncertainty in marketing margins, as tax rates are set independently of CPO prices [20]. Bureaucratic obstacles further limit the effectiveness of tax incentives for exporters, complicating compliance and diminishing potential benefits [21], while the overall complexity of tax regulations—including income tax and customs duties—poses challenges for the export-import trading sector [21]. As a key fiscal policy tool, taxation significantly impacts Indonesia's economic growth and remains a primary source of state revenue, with its effectiveness in achieving development goals shaped by both its structural design and implementation challenges [22]. Therefore, this study investigates both the positive and negative dimensions of tax schemes on exporter profitability.

2.4 Exporter Profits

Profitability in the palm oil sector is shaped by a complex interplay of internal factors, such as operational efficiency and financial management, and external factors, including global market dynamics, transportation infrastructure, and regulatory environments. Applying Porter's Five Forces framework underscores the significance of external pressures—such as costs and market risks—in influencing business performance and strategic responses, making it essential to understand how global price volatility, transportation costs, and tax schemes interact to inform robust strategies and policy recommendations. Global economic dynamics and crude palm oil (CPO) prices play a pivotal role, with economic growth and exchange rates in importing countries enhancing competitiveness, while inflation has a detrimental effect [23], and volatility in global energy prices impacts both input costs and market demand [24]. Transportation infrastructure is another key determinant, as high logistics costs can erode profit margins, and delays or inefficiencies exacerbate the effects of volatile prices on profitability [23], [24]. The regulatory environment also plays a critical role, where stringent environmental regulations and government interventions, such as domestic price allocations, can undermine competitiveness [25], while companies that adapt to these changes and leverage economic diplomacy are better positioned to sustain profitability [23].

2.5 Conceptual Framework and Hypotheses

Based on the reviewed literature, the study proposes the following hypotheses:

H1: Global price volatility has a significant negative effect on the profits of palm oil exporters.

H2: Transportation costs have a significant negative effect on the profits of palm oil exporters.

H3: Tax schemes have a significant effect (positive or negative) on the profits of palm oil exporters.

3. METHODS

This study used a quantitative research approach with an explanatory design to test hypotheses on the relationships between global price volatility, transportation costs, and tax schemes as independent variables, and exporter profits as the dependent variable. Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) version 3, suitable for complex models with latent constructs and small to medium sample sizes. The population comprised palm oil exporters in West Sumatra Province, focusing on managerial-level individuals such as business owners, export managers, and financial officers. Respondents were selected purposively based on criteria including at least three years of export experience, official business registration, and knowledge of price trends, logistics, and taxation in palm oil exports. The final sample of 175 respondents met the recommended size for SEM-PLS analysis (Hair et al., 2019).

Primary data were obtained via a structured questionnaire using a Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The instrument underwent pilot testing to ensure clarity, reliability, and validity before full deployment. Data collection was conducted both online and in person, depending on respondent availability, to maximize reach and response rates. The study included four latent variables: three independent variables and one dependent variable. Each variable was operationalized into measurable indicators, based on prior empirical research and relevant literature.

Table 1. Measurement Variable

Variable	Code	Indicator
Global Price Volatility (GPV)	GPV1	Perceived frequency of global palm oil price changes
	GPV2	Impact of global price fluctuations on export revenues
	GPV3	Difficulty in forecasting future profits due to price changes
Transportation Costs (TC)	TC1	Cost of inland transportation to port/export facilities
	TC2	Cost of international shipping/logistics
	TC3	Impact of transportation delays on product quality and profitability
Tax Schemes (TS)	TS1	Clarity and consistency of tax regulations related to exports
	TS2	Administrative burden and compliance costs
	TS3	Accessibility of tax incentives or reliefs
Exporter Profits (EP)	EP1	Stability of profit margins over the last three years
	EP2	Return on investment (ROI) from export operations
	EP3	Perceived impact of external factors on net profits

All indicators were measured reflectively and tested for validity and reliability during the measurement model evaluation. Data analysis was conducted using SEM-PLS 3 software through several stages: (1) descriptive analysis to present the demographic profile of respondents and provide an overview of responses; (2) measurement model (outer model) evaluation to assess indicator reliability, internal consistency reliability (Cronbach's alpha, composite reliability), convergent validity (Average Variance Extracted/AVE), and discriminant validity (Fornell-Larcker criterion and HTMT ratio); (3) structural model (inner model) evaluation to determine the significance and strength of hypothesized relationships using path coefficients (β), t-statistics, and p-values through bootstrapping with 5,000 samples; and (4) assessment of effect size (f^2) and coefficient of determination (R^2) to evaluate the contribution of each independent variable to the dependent variable and the model's predictive power.

4. RESULTS AND DISCUSSION

4.1 Demographic Profile of Respondents

The demographic characteristics of the 175 respondents in this study provide a clear profile of palm oil exporters in West Sumatra Province. In terms of gender, the majority were male (72.6%), reflecting the male-dominated nature of management and export-related positions in the industry. Most respondents were aged 35–44 years (37.7%), suggesting that middle-aged professionals dominate the sector. Regarding education, more than half of the participants had a bachelor's degree (50.9%), followed by those with a master's degree (20.0%), indicating a relatively well-educated sample with qualifications relevant to business and export operations. In terms of job position, owners and directors formed the largest group (42.3%), followed by export/logistics managers (36.0%) and finance/accounting officers (21.7%), showing that many responses came from decision-makers directly involved in strategic and financial aspects of exports.

The business profile data reveal that nearly half of the companies (46.9%) had been operating for 5–10 years, indicating a mature yet dynamic business environment, while 38.3% had been in operation for more than 10 years and 14.9% for less than 5 years. In terms of export capacity, most companies fell into the medium-export category of 500–1,500 tons annually (46.3%), followed by small exporters with less than 500 tons per year (30.9%) and large exporters exceeding 1,500 tons annually (22.9%). These characteristics collectively suggest that the sample represents experienced, moderately scaled businesses with strong managerial involvement and a substantial role in the regional palm oil export market.

4.2 Measurement Model Evaluation (Outer Model)

The measurement model (outer model) in SEM-PLS was evaluated to assess the validity and reliability of the research constructs using criteria such as indicator reliability, internal consistency

reliability, convergent validity, and discriminant validity, based on data from 175 respondents analyzed with SmartPLS 3. Indicator reliability was determined through the outer loading values, where a loading value above 0.70 indicates strong reliability and a significant contribution of the indicator to its respective construct.

Table 2. Loading Factor

Construct	Indicator	Outer Loading
Global Price Volatility	GPV1	0.772
	GPV2	0.834
	GPV3	0.809
Transportation Costs	TC1	0.816
	TC2	0.877
	TC3	0.842
Tax Schemes	TS1	0.765
	TS2	0.801
	TS3	0.854
Exporter Profits	EP1	0.825
	EP2	0.894
	EP3	0.873

All indicators in this study have outer loadings above 0.70, indicating high indicator reliability and confirming that each item contributes strongly to its respective latent construct (Hair et al., 2019). For Global Price Volatility (GPV), all three indicators—GPV1 (0.772), GPV2 (0.834), and GPV3 (0.809)—show strong loadings, with GPV2 contributing most significantly in capturing the essence of global CPO price fluctuations and demand shocks. In Transportation Costs (TC), the indicators TC1 (0.816), TC2 (0.877), and TC3 (0.842) all exceed the 0.80 threshold, with TC2 emerging as the strongest, suggesting that factors such as fuel costs or distance to port are central in measuring transportation burdens. For Tax Schemes (TS), the indicators TS1 (0.765), TS2 (0.801), and TS3 (0.854) also display strong loadings, with TS3 standing out as the most influential, likely reflecting compliance or regulatory burdens in the tax system. Finally, Exporter Profits (EP) indicators—EP1 (0.825), EP2 (0.894), and EP3 (0.873)—exhibit excellent reliability, with EP2 having the highest loading, signifying its crucial role in explaining profitability, potentially linked to revenue growth or margin improvement. These results validate the measurement model and confirm that all constructs are robustly represented by their indicators.

1. Internal Consistency Reliability

The internal consistency reliability of each construct in this study, measured using Cronbach's Alpha and Composite Reliability (CR), shows that all values exceed the acceptable threshold of 0.70, indicating a reliable measurement model. Global Price Volatility recorded a Cronbach's Alpha of 0.764 and a CR of 0.854, confirming that indicators GPV1–GPV3 consistently capture perceived fluctuations in global palm oil prices. Transportation Costs achieved a Cronbach's Alpha of 0.798 and a CR of 0.879, demonstrating that TC1–TC3 reliably measure transportation-related expenses in palm oil exports. Tax Schemes posted a Cronbach's Alpha of 0.783 and a CR of 0.862, indicating that TS1–TS3 accurately represent respondents' perceptions of government tax policies affecting exporters. Exporter Profits exhibited the highest internal consistency, with a Cronbach's Alpha of 0.832 and a CR of 0.901, validating that EP1–EP3 effectively measure profitability outcomes among palm oil exporters in West Sumatra.

2. Convergent Validity

Convergent validity, assessed through Average Variance Extracted (AVE), confirms that all constructs in this study exceed the recommended threshold of 0.50, indicating that each construct

explains more than half of the variance of its indicators. Global Price Volatility has an AVE of 0.662, showing that GPV1–GPV3 validly measure fluctuations in global palm oil prices. Transportation Costs records an AVE of 0.709, reflecting strong shared variance among TC1–TC3 in capturing export-related cost burdens. Tax Schemes achieves an AVE of 0.673, confirming that TS1–TS3 effectively represent perceptions of tax policies and regulations. Exporter Profits attains the highest AVE at 0.752, indicating that EP1–EP3 are highly representative of profitability among palm oil exporters in West Sumatra.

3. Discriminant Validity

Discriminant validity ensures that each construct in the model is distinct from the others, and in this study, it was assessed using the Fornell-Larcker Criterion, which requires that the square root of the AVE (placed on the diagonal of the correlation matrix) be greater than the correlations between the construct and all other constructs, thereby confirming that each construct measures a unique aspect of the research model.

Table 3. Fornell-Lacker

Construct	GPV	TC	TS	EP
Global Price Volatility	0.814			
Transportation Costs	0.468	0.842		
Tax Schemes	0.312	0.289	0.820	
Exporter Profits	0.557	0.604	0.436	0.867

The results show that the square root of AVE for each construct is higher than its correlations with other constructs, confirming strong discriminant validity: Global Price Volatility (0.814) exceeds its correlations with TC (0.468), TS (0.312), and EP (0.557); Transportation Costs (0.842) is higher than its correlations with GPV (0.468), TS (0.289), and EP (0.604); Tax Schemes (0.820) is greater than its correlations with GPV (0.312), TC (0.289), and EP (0.436); and Exporter Profits (0.867) surpasses its correlations with GPV (0.557), TC (0.604), and TS (0.436). These results confirm that each construct is distinct and well-defined within the model, while the Heterotrait-Monotrait (HTMT) ratio for all construct pairs remains below the 0.85 threshold, further supporting good discriminant validity.

Table 4. HTMT

Construct Pair	HTMT Value
GPV – TC	0.611
GPV – TS	0.432
GPV – EP	0.684
TC – TS	0.418
TC – EP	0.701
TS – EP	0.521

All HTMT values in the model are below the conservative threshold of 0.85, confirming sufficient discriminant validity between constructs. The highest HTMT value is 0.701 (TC–EP), still well below the 0.85 limit, while the lowest is 0.418 (TC–TS), indicating a very strong distinction between these constructs. These findings demonstrate that all latent variables in the model are empirically distinct from one another, thereby satisfying the HTMT criterion for discriminant validity.

4.3 Structural Model Evaluation (Inner Model)

After validating the measurement model, the next step was to evaluate the structural model (inner model) to examine the relationships among latent variables and test the research hypotheses. This evaluation included assessing collinearity, path coefficients, the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2). The analysis was performed using bootstrapping

with 5,000 subsamples in SmartPLS 3. Prior to hypothesis testing, multicollinearity was assessed using the Variance Inflation Factor (VIF), where a value below 5 indicates the absence of collinearity issues. The results showed that all constructs—Global Price Volatility (1.422), Transportation Costs (1.586), and Tax Schemes (1.334)—had VIF values well below the threshold, confirming that multicollinearity is not a concern in the model.

Path coefficients (β), t-statistics, and p-values were then used to test the direct effects of each independent variable on exporter profits, with the significance level set at $\alpha = 0.05$ ($t > 1.96$ and $p < 0.05$). This step allowed for the evaluation of the magnitude and significance of relationships among the constructs, providing the basis for hypothesis acceptance or rejection.

Table 5. Hypothesis Testing

Hypothesis	Path Coefficient (β)	t-Statistic	p-Value	Conclusion
H1: Global Price Volatility → Profits	-0.298	4.102	0.000	Supported (Significant Negative)
H2: Transportation Costs → Profits	-0.351	4.876	0.000	Supported (Significant Negative)
H3: Tax Schemes → Profits	0.186	2.432	0.016	Supported (Significant Positive)

The results indicate that global price volatility and transportation costs significantly reduce exporter profits, while tax schemes have a significant positive influence, suggesting that well-designed tax incentives can support profitability. For H1, the negative path coefficient ($\beta = -0.298$) with a high t-statistic (4.102) and p-value < 0.001 confirms a significant negative relationship, meaning that greater volatility in global prices diminishes profits by creating unpredictable market conditions and price instability that disrupt revenue forecasts and margins. For H2, transportation costs also show a significant negative effect ($\beta = -0.351$, $t = 4.876$, $p < 0.001$), reinforcing the idea that high logistical expenses are a major burden in international trade, directly impacting exporters' financial outcomes. Conversely, for H3, tax schemes exhibit a positive and statistically significant relationship with profits ($\beta = 0.186$, $t = 2.432$, $p = 0.016$), indicating that favorable or well-structured fiscal policies, including reduced tax burdens and effective incentives, can enhance profitability in the palm oil export sector.

The R^2 value measures the model's explanatory power, or the proportion of variance in the dependent variable explained by the independent variables. In this study, the R^2 value for Exporter Profits is 0.546, indicating that global price volatility, transportation costs, and tax schemes collectively explain 54.6% of the variance in exporter profits. This result reflects a moderately strong model, suggesting that while the included variables account for a substantial portion of profitability variations, other external and internal factors may also influence exporter performance.

The f^2 statistic shows how much each exogenous variable contributes to the R^2 value of the dependent variable.

Table 6. Effect Size

Path	f^2 Value	Effect Size Interpretation
Global Price Volatility → Profits	0.127	Medium
Transportation Costs → Profits	0.178	Medium to Large
Tax Schemes → Profits	0.067	Small to Medium

The effect size (f^2) analysis shows that transportation costs have the largest impact on exporter profits, making them the most critical factor, followed by global price volatility with a notable medium effect, and tax schemes with a smaller yet meaningful contribution. Global Price Volatility → Exporter Profits ($f^2 = 0.127$) demonstrates a medium effect, indicating that fluctuations in international prices meaningfully disrupt profitability, as unpredictable global market dynamics

erode margins and reduce planning certainty. Transportation Costs → Exporter Profits ($f^2 = 0.178$) has a medium-to-large effect, showing that logistical expenses and shipping inefficiencies strongly influence profitability. Given Indonesia's reliance on maritime and inter-island transportation, changes in freight rates and logistics costs can substantially affect exporters' bottom lines. Tax Schemes → Exporter Profits ($f^2 = 0.067$) exhibits a small-to-medium effect, suggesting that while favorable or simplified tax policies positively influence profitability, their impact is less direct compared to global and transportation-related factors, although improvements in tax policy efficiency can still help create a more supportive export environment.

The predictive relevance (Q^2) assessment using the Stone-Geisser test via blindfolding reveals a Q^2 value of 0.391 for Exporter Profits, which is well above zero, indicating strong predictive relevance. This result confirms that the model not only explains a substantial portion of the variance in exporter profits but also has good predictive capability in forecasting profitability outcomes for palm oil exporters in West Sumatra.

Discussion

The findings of this study provide a comprehensive understanding of the factors affecting the profitability of palm oil exporters in West Sumatra, particularly in the context of global economic uncertainty and local structural challenges.

The study confirms that global price volatility has a significant negative effect on exporter profits, aligning with prior research emphasizing that fluctuations in international crude palm oil (CPO) prices lead to unstable revenue streams for exporters. Given West Sumatra's reliance on export markets, local exporters are highly vulnerable to global market shocks, such as shifts in demand from major importers, changes in trade policies, and geopolitical tensions. [26] report that Indonesia's CPO export volume to India has fluctuated significantly, with a predicted decline by 2032, while [27] show that CPO prices, exchange rates, and export duty rates significantly affect export values, underscoring revenue sensitivity to price changes. Similarly, [28] note that market distribution and competitiveness influence export performance, with Indonesia shifting focus toward India, China, and Pakistan due to high EU taxes, and [29] confirm that international prices and exchange rates positively impact CPO export volumes. These findings reinforce the importance of implementing hedging mechanisms, diversifying export destinations, and enhancing forecasting models to mitigate price risks, with [26]demonstrating the value of trend analysis in predicting export volumes, and [28] recommending preferential trade agreements and improved distribution channels to strengthen comparative advantage.

Second, the significant negative impact of transportation costs on profits indicates that logistical inefficiencies remain a core challenge for palm oil exporters, as inadequate road infrastructure, high fuel expenses, and port congestion reduce competitiveness and erode profit margins, particularly for small and medium-sized businesses with limited market access. This finding is consistent with Nwauwa et al. (2016), who reported that poor transportation infrastructure in Nigeria substantially increases palm oil transport costs, with a potential 38% reduction if optimal conditions are achieved, and with Sinimbu (2010), who demonstrated through Agropalma's experience in Brazil that well-developed logistics systems—including internal roads and river ports—can lower costs, ensure timely delivery, and enhance product competitiveness. High transport costs also have broader economic implications, as highlighted by Shiferaw et al. (2013), who found that infrastructure investment can reduce poverty, improve market access, and foster economic integration, while [30] emphasized that lower transport costs facilitate international production fragmentation and improve trade efficiency. Addressing these issues requires both public investment in rural and port infrastructure [31] and private-sector initiatives, such as optimized supply chain systems, to maintain quality, reduce costs, and strengthen competitiveness [32].

Third, the study finds that tax schemes significantly influence profit, and the direction of the effect—although negative in most cases—offers a nuanced interpretation. Excessive or unclear tax burdens can erode net profits and increase compliance pressures for exporters; however, well-designed tax incentives—such as export tax exemptions or deductions for investments in sustainable practices—can enhance profitability. Evidence from Sub-Saharan Africa shows that tax incentives can lower financial barriers and align private sector activities with sustainable development goals (SDGs) [33], while in Indonesia, companies with higher sustainability growth rates enjoy reduced tax liabilities, indicating that strong sustainability practices can lead to fiscal advantages [34]. Fiscal policies, including targeted tax deductions and incentives, are also instrumental in improving SME financial performance by easing financial pressures and supporting growth, as demonstrated in India's Goods and Services Tax (GST) reform, which reduced borrowing costs and improved working capital flow [35]. Moreover, export incentives such as tax exemptions and concessional export financing have been shown to effectively lower tax burdens on export incomes, thereby enhancing profitability without diminishing net profits, especially when directed toward emerging and value-added exports that strengthen competitiveness in developing countries [36].

CONCLUSION

The findings of this study confirm that global price volatility, transportation costs, and tax schemes significantly influence the profits of palm oil exporters in West Sumatra. Global price volatility stands out as a critical external factor with a substantial negative impact on profitability, highlighting the sector's vulnerability to international price fluctuations. Transportation costs also significantly erode profit margins, reflecting inefficiencies in logistical systems and emphasizing the urgency of infrastructure improvements. Meanwhile, although tax schemes can create financial burdens, they also offer opportunities through well-designed, incentive-based mechanisms that can enhance exporter sustainability and competitiveness.

This research offers practical insights for policymakers, emphasizing the need for comprehensive macroeconomic strategies that incorporate price stabilization measures, targeted investments in transportation infrastructure, and revisions to tax policies that balance government revenue goals with exporters' growth needs. Exporters are encouraged to adopt adaptive strategies, such as forward contracts and hedging practices, to better manage market volatility and operational risks. Future research should examine the moderating effects of firm size, technological adoption, and supply chain integration to provide a deeper understanding of the factors shaping exporter performance in Indonesia's palm oil sector.

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