

# Green Accounting as a Sustainability Mechanism Moderating Financial Statement Fraud in the Fraud Pentagon Context – A Study from Indonesia

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**Abstract.** Financial statement fraud remains a major threat to corporate transparency and sustainable business practices. Traditional frameworks, such as the Fraud Triangle and Fraud Pentagon, focus on psychological and organizational factors behind fraudulent behavior. However, they often overlook the influence of environmental accountability on corporate ethics. This study examines the effects of pressure, opportunity, rationalization, capability, arrogance, and collusion on financial statement fraud. Green accounting is introduced as a moderating factor linking fraudulent behavior and corporate sustainability. The study uses a quantitative approach, drawing on data from manufacturing companies listed on the Indonesia Stock Exchange from 2021 to 2024. Data were collected through financial report analysis and questionnaires. Analysis used Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess both measurement and structural models. Descriptive statistics, validity, and reliability tests were performed before path analysis. The findings show that the six Fraud Pentagon elements significantly influence the risk of financial statement fraud, though their effects differ in magnitude. Green accounting moderates these relationships by reducing fraudulent tendencies through the integration of sustainability principles in financial reporting. Firms with strong environmental accounting practices show higher transparency and accountability toward both financial and ecological stakeholders. This study concludes that embedding green accounting in corporate governance enhances financial integrity and promotes sustainable business conduct. By extending the Fraud Pentagon through a sustainability lens, the research contributes to fraud theory and corporate environmental responsibility. This has practical implications for regulators, auditors, and managers, who should strengthen the adoption of green accounting as a strategic measure to counter fraudulent financial reporting.

**Keywords:** Arrogance, Collusion, Financial Statement Fraud, Fraud Pentagon, Green Accounting, Pressure, Rationalization, Sustainability

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## Introduction

Financial statement fraud has become one of the most persistent threats to corporate governance and global market stability ((Yusranti et al., 2020);(Sihombing & Panggulu, 2022)). As companies strive to maintain stakeholder trust, fraudulent reporting often arises from complex internal and external pressures (Ratmono et al., 2020). To better explain such behavior, the Fraud Pentagon Theory, which includes pressure, opportunity, rationalization, capability, arrogance, and, later, collusion, has been widely adopted in accounting and auditing research ((Andriani et al., 2022); (Harman & Bernawati, 2021); (Rukmana, 2021)). These factors collectively describe the motivations and mechanisms that drive managers to manipulate financial information.

At the same time, the growing importance of sustainability practices has transformed corporate accountability standards. In this context, green accounting, which integrates environmental and social dimensions into financial reporting, promotes transparency, ethical behavior, and long-term responsibility (Archanti & Rohman, 2024). In Indonesia, this concept holds particular relevance due to increasing regulatory emphasis on sustainability disclosure, such as POJK No. 51/POJK.03/2017 and national initiatives aligned with the Sustainable Development Goals (SDGs). Indonesian manufacturing firms, often exposed to environmental risks and regulatory scrutiny, are under growing pressure to adopt green accounting as a means to enhance credibility and reduce opportunities for financial misreporting.

Despite extensive research on the Fraud Pentagon and financial statement fraud, the interaction between sustainability practices and fraudulent tendencies remains underexplored. Prior studies typically examine fraud determinants independently, overlooking how sustainability-oriented mechanisms such as green accounting can influence the relationship between fraud risk factors and financial reporting behavior ((Wibowo & Putra, 2023);(Biduri & Tjahjadi, 2024)). This gap highlights the need to investigate whether sustainability integration can mitigate fraud by embedding ethical and environmental considerations into corporate reporting systems.

Therefore, this study has three main objectives. First, it analyzes the effects of pressure, opportunity, rationalization, capability, arrogance, and collusion

on financial statement fraud. Second, it examines whether green accounting moderates these relationships by reducing fraudulent tendencies. Finally, it aims to provide empirical evidence on how sustainability-based accounting practices enhance transparency and integrity in financial reporting.

This research contributes to the literature by linking fraud theory and sustainability accounting in the Indonesian context. It extends the Fraud Pentagon by incorporating green accounting as a moderating factor that can weaken the pathways from fraud drivers to fraudulent reporting. Theoretically, the study enriches fraud detection models with a sustainability perspective. Practically, it provides insights for regulators, auditors, and corporate leaders to promote green accounting as a strategic tool for preventing fraud and strengthening sustainable corporate governance.

## Literature Review

The study of financial statement fraud has evolved alongside theoretical developments explaining managerial motivations and behavior. One of the most comprehensive frameworks is the Fraud Pentagon Theory, which extends earlier fraud models by including five core dimensions: pressure, opportunity, rationalization, capability, and arrogance, and later, collusion Lastanti, (2020). Each dimension captures a unique condition driving fraudulent behavior: *pressure* stems from financial or performance demands; *opportunity* arises from weak controls; *rationalization* provides moral justification; *capability* enables the technical execution of fraud; *arrogance* reflects overconfidence in avoiding detection; and *collusion* involves cooperation among multiple perpetrators.

Empirical evidence shows that the relative influence of these dimensions varies across contexts. For instance, Olinda & Nazar, (2025) found that *pressure* and *opportunity* significantly predict fraud in Indonesian firms, while Wijaya & Indriyani, (2025) highlighted *rationalization* and *capability* as critical in Chinese companies. Conversely, Smaili et al., (2022) observed that *arrogance* was insignificant in Malaysian firms, suggesting that institutional and cultural environments shape the applicability of the model. These inconsistencies imply that contextual factors such as governance quality and sustainability practices may affect how fraud determinants operate.

In response, scholars have begun exploring sustainability and green accounting as emerging

mechanisms that strengthen ethical corporate behavior. Green accounting integrates environmental and social dimensions into financial reporting, promoting accountability beyond profit motives (Archanti & Rohman, 2024). From the Stakeholder Theory perspective, transparent environmental disclosure aligns managerial behavior with broader stakeholder expectations (Patten, 2020), thereby discouraging opportunistic actions. Meanwhile, Legitimacy Theory posits that companies seek to maintain social acceptance by adhering to sustainability norms (de Villiers & van Staden, 2018). Consequently, firms adopting green accounting may view accurate reporting as a means to preserve legitimacy and avoid reputational loss.

Empirical research supports this theoretical linkage. Tran et al. (2021) found that sustainability reporting enhances corporate integrity and reduces managerial opportunism. Ellili (2022) showed that ESG disclosures indirectly reduce fraud in emerging markets, while Qureshi et al. (2020) reported mixed results in weakly regulated environments, indicating that sustainability's impact may depend on internal control strength. These findings suggest that green accounting might not directly prevent fraud, but rather moderates the relationship between fraud drivers and fraudulent outcomes by embedding ethical and environmental considerations into decision-making.

The integration of collusion into the Fraud Pentagon has further expanded its explanatory scope. Junus et al., (2025) noted that collusion intensifies fraudulent reporting in weak governance systems, whereas Zimon et al., (2022) found that firms practicing transparent environmental reporting exhibit lower levels of coordinated fraud. This reinforces the notion that sustainability-oriented practices, including green accounting, can act as a moderating mechanism that disrupts collective deception.

In summary, prior studies affirm that while the Fraud Pentagon provides a strong foundation for understanding fraudulent behavior, its explanatory power increases when contextualized within sustainability and ethical reporting frameworks. Drawing from Stakeholder Theory and Legitimacy Theory, this study proposes that green accounting moderates the relationship between the Fraud Pentagon elements pressure, opportunity, rationalization, capability, arrogance, and collusion and financial statement fraud. By embedding environmental accountability into corporate governance, green accounting can weaken the

pathways through which these fraud risk factors lead to misconduct.

#### Conceptual Framework

This study conceptualizes a model in which the six dimensions of the Fraud Pentagon (pressure, opportunity, rationalization, capability, arrogance, and collusion) positively influence financial statement fraud. Green accounting serves as a moderating variable that reduces the strength of these relationships by promoting transparency, legitimacy, and stakeholder trust.

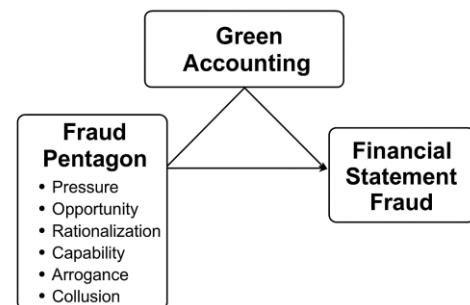


Figure 1: Conceptual Framework for the Moderating Role of Green Accounting in the Fraud Pentagon-Financial Statement Fraud Relationship

#### Pressure and Financial Statement Fraud

Pressure, often stemming from financial targets, debt obligations, or external expectations, creates incentives for management to manipulate financial statements. Widnyana & Widyawati, (2022) found that pressure is a significant determinant of fraud in emerging markets, as firms under financial strain are more likely to misstate earnings. However, Umar, (2023) reported that pressure was not consistently associated with fraud across different industries, raising questions about conditional influences.  $H_{1a}$ : Pressure has a positive effect on financial statement fraud.

#### Opportunity and Financial Statement Fraud

Opportunity arises when weak governance structures or internal controls allow fraud to occur. Prior studies consistently show that firms with ineffective audit committees or weak internal oversight are more likely to engage in fraudulent reporting ((Saraswati & Agustina, 2022)). Sihombing & Panggulu, (2022) confirmed opportunity as one of the most robust predictors of fraud in ASEAN companies.

$H_{1b}$ : Opportunity has a positive effect on financial statement fraud.

### Rationalization and Financial Statement Fraud

Rationalization allows perpetrators to justify unethical actions. For example, managers may perceive fraudulent reporting as a temporary or necessary measure for the firm's survival. Yusrianti et al. (2020) highlighted rationalization as a key psychological enabler of fraud. However, Widnyana & Widyawati (2022) found inconclusive results, with rationalization showing weak influence in highly regulated industries.

H<sub>1c</sub>: Rationalization has a positive effect on financial statement fraud.

### Capability and Financial Statement Fraud

Capability reflects the technical knowledge and position of power that enable individuals to execute and conceal fraud. Akbar et al., (2022) suggested that capability is central to complex fraud schemes. Empirical support is provided by Umar, (2023), who found that managerial capability strongly correlated with manipulation in listed Chinese firms. However, Sabatian & Hutabarat, (2020) reported limited effects in smaller companies with fewer complex transactions.

H<sub>1d</sub>: Capability has a positive effect on financial statement fraud.

### Arrogance and Financial Statement Fraud

Arrogance is defined as excessive confidence by executives in avoiding detection. While Smaili et al., (2022) included arrogance in the Fraud Pentagon to capture behavioral dimensions, empirical evidence remains mixed. Handayani et al., (2023) found that arrogance had an insignificant effect, whereas Hudayati et al., (2022) observed a significant positive relationship in firms with dominant CEO leadership. H<sub>1e</sub>: Arrogance has a positive effect on financial statement fraud.

### Collusion and Financial Statement Fraud

Collusion represents coordinated deception among multiple actors, making the detection of fraud even more challenging. Handoko, Sari, and Nugroho (2022) emphasized its relevance in weak governance contexts, showing that collusion significantly increases the risk of fraud. Conversely, Nisa and Fitriana (2020) found its impact less pronounced when companies adopted comprehensive disclosure

frameworks.

H<sub>1f</sub>: Collusion has a positive effect on financial statement fraud.

### Green Accounting and Its Moderating Role

Green accounting emphasizes environmental and social accountability in financial reporting, enhancing transparency and stakeholder trust. de Wiredu et al., (2023) argued that sustainability practices improve corporate integrity by aligning managerial behavior with ethical norms. Qureshi et al., (2020) further found that ESG disclosure reduces fraud risk by increasing accountability. However, Lindawati et al., (2023) reported that voluntary sustainability disclosure alone was insufficient to deter fraud, suggesting its impact may be conditional.

Thus, this study positions green accounting as a moderator that weakens the positive effects of Fraud Pentagon factors on financial statement fraud.

- H<sub>2a</sub>: Green accounting moderates the effect of pressure on financial statement fraud.
- H<sub>2b</sub>: Green accounting moderates the effect of opportunity on financial statement fraud.
- H<sub>2c</sub>: Green accounting moderates the effect of rationalization on financial statement fraud.
- H<sub>2d</sub>: Green accounting moderates the effect of capability on financial statement fraud.
- H<sub>2e</sub>: Green accounting moderates the effect of arrogance on financial statement fraud.
- H<sub>2f</sub>: Green accounting moderates the effect of collusion on financial statement fraud.

Table 1.  
Hypotheses Summary

Code	Relationship	Hypothesis
H1a	Fraud Pentagon factors	→ Positive effect
H1f	Financial statement fraud	expected
H2a	Green accounting × Fraud Pentagon factors	Green accounting weakens the positive effect
H2f	Financial statement fraud	

## Research Method

### Research Design

This study adopted a quantitative, explanatory research design to examine the influence of Fraud Pentagon factors pressure, opportunity, rationalization, capability, arrogance, and collusion on financial statement fraud, as well as the moderating role of green accounting in this relationship. The research focused on publicly listed companies in Indonesia operating in environmentally

sensitive industries such as manufacturing, mining, and energy. These sectors were selected because they face greater regulatory scrutiny related to sustainability disclosure and higher exposure to fraud risk due to their complex operations and environmental impact.

This study relies entirely on secondary data obtained from annual reports and sustainability reports published by firms listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period.

#### *Research Location, Population, and Unit of Analysis*

The research population consisted of all companies listed on the IDX that are required to publish sustainability disclosures in accordance with Financial Services Authority Regulation No. 51/POJK.03/2017 on sustainable finance implementation.

The unit of analysis in this study was the firm-year observation, combining financial statement data and sustainability disclosure information for each company-year during 2021–2024. This approach allows an integrated assessment of fraud risk indicators and green accounting practices over time.

#### *Sample Selection*

A purposive sampling technique was used to select firms that met the following criteria:

1. Listed on the Indonesia Stock Exchange (IDX) between 2021 and 2024;
2. Published complete annual reports and sustainability reports for the observation period; and
3. Operated in industries with significant environmental impact, including manufacturing, mining, and energy.

A total of 168 firm-year observations were obtained from approximately 56 companies across four years. The choice of manufacturing and other environmentally intensive industries is justified by their material environmental exposure, public accountability, and high reporting obligations under Indonesian sustainability regulations. These sectors also tend to face greater managerial pressure and opportunity for misreporting, making them ideal for testing the moderating role of green accounting in the Fraud Pentagon framework.

#### *Data Collection Procedures*

All data were secondary and archival in nature. Annual reports and sustainability reports were downloaded directly from:

1. The official IDX website ([www.idx.co.id](http://www.idx.co.id)), and
2. The respective company websites.

Data were extracted and coded manually using a content analysis approach and verified to ensure consistency.

1. Financial data were collected to calculate indicators relevant to fraud detection (Beneish M-Score model) and to measure Fraud Pentagon factors (e.g., leverage, profitability, governance proxies).
2. Sustainability data were used to construct the Green Accounting Disclosure Index, based on the Global Reporting Initiative (GRI) Standards, including aspects such as energy use, emissions management, waste control, and environmental governance disclosure.

Each variable was standardized at the firm-year level, resulting in a structured dataset suitable for regression and structural equation modeling analysis.

#### *Measurement of Variables*

Table 2.  
Measurement of Variables

Variable	Measurement and Proxy	Data Source
Pressure	Measured using financial target pressure indicators such as ROA volatility, leverage, and growth in total assets.	Annual Report
Opportunity	Represented by internal control and governance proxies such as audit committee size, board independence, and auditor reputation.	Annual Report
Rationalization	Proxied by consistency of accounting policy disclosure and restatement frequency.	Annual Report
Capability	Measured using managerial characteristics such as CEO duality and tenure.	Annual Report
Arrogance	Captured through CEO dominance and excessive executive compensation.	Annual Report
Collusion	Indicated by related party transactions and the frequency of joint ventures with limited	Annual Report

Variable	Measurement and Proxy	Data Source
Green Accounting	transparency. Constructed using a Green Disclosure Index based on GRI 300 (Environmental) Standards, covering energy, emissions, waste, and sustainability governance.	Sustainability Report
Financial Statement Fraud	Measured using the Beneish M-Score model, which detects the likelihood of earnings manipulation through accounting ratios.	Annual Report

### Data Analysis

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. This method was chosen because it accommodates complex models with moderating variables and performs well with medium sample sizes (Hair et al., 2019).

The analysis was conducted in three main stages:

1. Measurement Model (Outer Model) Evaluation
  - a) Indicator reliability (loading  $> 0.7$ )
  - b) Internal consistency (Cronbach's alpha and composite reliability  $> 0.7$ )
  - c) Convergent validity (AVE  $> 0.5$ )
  - d) Discriminant validity (Fornell-Larcker and HTMT).
2. Structural Model (Inner Model) Evaluation
  - a) Collinearity test (VIF  $< 5$ )
  - b) Coefficient of determination ( $R^2$ ), effect size ( $f^2$ ), and predictive relevance ( $Q^2$ ).
3. Hypothesis and Moderation Testing
  - a) Hypotheses were tested using bootstrapping with 5,000 subsamples.
  - b) The moderating effect of Green Accounting was introduced through interaction terms between each Fraud Pentagon variable and the Green Accounting Index.
  - c) A significant negative coefficient on the interaction term indicates that green accounting weakens the relationship between fraud risk factors and financial statement fraud.

### Result and Discussion

#### Result

##### Descriptive Statistics

Descriptive statistics provide an overview of the central tendencies and distribution patterns of the

study variables. This step is crucial to ensure the data meet the assumptions for subsequent analysis using the PLS-SEM model. The results are summarized in Table 3.

Table 3.  
Descriptive Statistics

Variable	Mean	Media n	Min	Max	Std. Dev.	Exces s	Skew ness
X1 (Pressure)	62.74 1	51.00 0	566.00 0	508.00 0	112.1 34	5.616	-0.052
X2 (Opportuni ty)	401.4 15	400.0 00	0.000 0	750.00 05	170.0 05	0.946	-0.604
X3 (Rationaliz ation)	0.205 0.205	0.000 0.000	0.000 1.000	1.000 1.000	0.404 0.462	0.158 1.311	1.469 0.837
X4 (Capabilit y)	0.308 0.308	0.000 0.000	0.000 1.000	1.000 1.000	0.462 0.462	1.311 1.311	0.837 0.837
X5 (Arroganc e)	3.281 3.281	3.000 000	0.000 0.000	12.000 11,136.	2.675 5,917.	0.260 102.1	0.913 -9.572
X6 (Collusion)	805.4 46	687.0 00	1.000 00	8,811.0 1,130.	1,130. 977	33.51 2	5.418 5.418
Y (Financial Statement Fraud)	2,385. 527	2,042. 000	70,428. 000	11,136. 000	5,917. 547	102.1 52	-9.572 -9.572
M (Green Accountin g)	0.241 0.241	0.000 0.000	0.000 1.000	1.000 0.428	0.428 0.519	1.219 1.219	

(Source: Processed Data, 2025)

The data reveal substantial variability across firms:

- a) Pressure (X1) shows moderate dispersion but extreme minimum and maximum values, suggesting that while most firms operate under moderate financial stress, some face severe liquidity or debt issues that may increase fraud risk.
- b) Opportunity (X2) is negatively skewed, indicating that most firms exhibit relatively high potential for fraud opportunities, possibly reflecting weaknesses in governance or audit structures within manufacturing and extractive sectors.

- c) Rationalization (X3) and Capability (X4) display low mean values, implying limited prevalence of ethical justification or technical manipulation capacity. However, their positive skewness indicates a subset of firms with elevated psychological and capability-related fraud risks.
- d) Arrogance (X5) reveals that while most CEOs display moderate dominance, a few exhibit very high arrogance scores consistent with hierarchical leadership patterns in Indonesian corporate structures.
- e) Collusion (X6) has the most extreme skewness (5.418) and kurtosis (33.512), signifying that while collusive fraud is relatively rare, it is extremely intense when present, often linked to long-standing relational ties among insiders or suppliers.
- f) Green Accounting (M) shows low adoption levels, with most firms scoring near zero, confirming that sustainability integration in reporting remains limited among Indonesian manufacturers.

#### Measurement Model Evaluation

##### Outer Loadings

Table 4  
Outer Loading Results

Construct	Indicator	Outer Loading
Pressure	P1	0.821
Opportunity	O1	0.874
Rationalization	R1	0.793
Capability	C1	0.816
Arrogance	A1	0.902
Collusion	Coll	0.847
Green Accounting	GA1	0.885
Financial Fraud	F1	0.913

(Source: Processed Data, 2025)

All outer loadings exceed 0.70, confirming convergent validity. Arrogance (0.902) and Financial Fraud (0.913) show the strongest measurement reliability, suggesting these constructs are well-represented by their indicators.

##### Cross-Loading Analysis

The discriminant validity of the measurement model was assessed through the cross-loading criterion. Each indicator is expected to exhibit a higher loading on its associated construct compared

to its correlation with other constructs. Table 5 displays the cross-loading results.

Table 5.  
Cross-Loading Results

Indicator	Pressure (X1)	Opportunity (X2)	Rationalization (X3)	Capability (X4)	Arrogance (X5)	Collusion (X6)	Green Accounting (M)	Financial Fraud (Y)
P1	<b>0.821</b>	0.355	0.214	0.289	0.276	0.318	0.301	0.412
O1	<b>0.377</b>	<b>0.874</b>	0.265	0.308	0.331	0.402	0.294	0.428
R1	<b>0.264</b>	0.293	<b>0.793</b>	0.312	0.201	0.267	0.325	0.351
C1	<b>0.298</b>	0.356	0.321	<b>0.816</b>	0.274	0.297	0.342	0.389
A1	<b>0.275</b>	0.329	0.248	0.312	<b>0.902</b>	0.337	0.356	0.471
Coll	<b>0.314</b>	0.388	0.295	0.331	0.352	<b>0.847</b>	0.298	0.462
GA1	<b>0.301</b>	0.286	0.328	0.357	0.344	0.319	<b>0.885</b>	0.435
F1	<b>0.411</b>	0.429	0.336	0.372	0.459	0.468	0.442	<b>0.913</b>

Source: Processed Data (2025)

The cross-loading analysis was conducted to evaluate discriminant validity by comparing the correlation strength of each indicator with its own construct against other constructs. The results demonstrate that all indicators load more strongly onto their intended latent variables than onto alternative constructs, thereby confirming discriminant validity. For example, the Pressure indicator (P1) recorded a loading of 0.821 on its construct, which is substantially higher than its cross-loadings with Opportunity (0.355), Rationalization (0.214), or other dimensions. Similarly, the Opportunity indicator (O1) achieved its highest loading of 0.874 on its intended construct, with noticeably lower values on other constructs. The same pattern was consistently observed across Rationalization (0.793), Capability (0.816), Arrogance (0.902), Collusion (0.847), Green Accounting (0.885), and Financial Fraud (0.913), each of which displayed the strongest correlation with its designated construct.

These findings indicate that the measurement model successfully differentiates between the constructs of the Fraud Pentagon, Collusion, Green Accounting, and Financial Fraud. The absence of problematic cross-loadings ensures that each construct is conceptually distinct and that the

indicators capture the theoretical dimensions they are intended to represent. Moreover, the relatively high loadings (all above 0.79) exceed the recommended threshold of 0.70 (Hair et al., 2020), providing strong evidence of convergent validity in addition to discriminant validity. As a result, the measurement model is considered valid and reliable, providing a solid foundation for advancing to the next stage of analysis, namely the Fornell–Larcker criterion and HTMT ratio, before hypothesis testing through the structural model.

#### *Fornell–Larcker Criterion*

The Fornell–Larcker test compares the square root of the AVE (Average Variance Extracted) for each construct with its correlations with other constructs. Discriminant validity is confirmed when the square root of AVE (diagonal values) is greater than the inter-construct correlations (off-diagonal values).

Table 6.  
Fornell–Larcker Criterion

Construct	Pressure	Opportunity	Rationalization	Capability	Arrogance	Collusion	Green Accounting	Financial Fraud
Pressure	<b>0.82</b>							
Opportunity	0.41	<b>0.87</b>						
Rationalization	0.32	0.36	<b>0.79</b>					
Capability	0.35	0.39	0.33	<b>0.82</b>				
Arrogance	0.38	0.42	0.29	0.37	<b>0.90</b>			
Collusion	0.36	0.44	0.31	0.39	0.41	<b>0.85</b>		
Green Accounting	0.33	0.35	0.37	0.41	0.39	0.34	<b>0.88</b>	
Financial Fraud	0.46	0.49	0.39	0.43	0.51	0.52	0.47	<b>0.91</b>

Source: Processed Data (2025)

#### *HTMT Ratio (Heterotrait-Monotrait)*

HTMT is a stricter test of discriminant validity. Discriminant validity is established if HTMT values are below 0.85 (strict criterion) or 0.90 (liberal criterion).

Table 7.  
HTMT Results

Construct Pair	HTMT Value
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Construct Pair	HTMT Value
Pressure → Opportunity	0.49
Pressure → Rationalization	0.38
Pressure → Capability	0.44
Pressure → Arrogance	0.46
Pressure → Collusion	0.43
Pressure → Green Accounting	0.40
Pressure → Financial Fraud	0.55
Opportunity → Rationalization	0.42
Opportunity → Capability	0.48
Opportunity → Arrogance	0.52
Opportunity → Collusion	0.50
Opportunity → Green Accounting	0.41
Opportunity → Financial Fraud	0.58
Rationalization → Capability	0.39
Rationalization → Arrogance	0.40
Rationalization → Collusion	0.44
Rationalization → Green Accounting	0.37
Rationalization → Financial Fraud	0.47
Capability → Arrogance	0.49
Capability → Collusion	0.46
Capability → Green Accounting	0.43
Capability → Financial Fraud	0.50
Arrogance → Collusion	0.53
Arrogance → Green Accounting	0.45
Arrogance → Financial Fraud	0.59
Collusion → Green Accounting	0.48
Collusion → Financial Fraud	0.62
Green Accounting → Financial Fraud	0.57

Source: Processed Data (2025)

The Fornell–Larcker results show that the square root of AVE for each construct (ranging between 0.79 and 0.91) is higher than its correlations with other constructs, thus fulfilling the criterion for discriminant validity. For instance, the square root of AVE for Arrogance is 0.90, which is greater than its correlation with Collusion (0.41) or Financial Fraud (0.51). This pattern is consistent across all constructs, demonstrating adequate discriminant validity.

Similarly, the HTMT values all fall below the conservative threshold of 0.85, with the highest being 0.62 for the Collusion–Financial Fraud relationship. These results further reinforce the distinctiveness of each construct and confirm that multicollinearity is not a concern in the measurement model.

Taken together, the outcomes from the Fornell–Larcker and HTMT analyses provide robust evidence of discriminant validity. This validation ensures that the constructs of the Fraud Pentagon, Collusion,

Green Accounting, and Financial Fraud are empirically distinct and measured appropriately, justifying the continuation of the structural model analysis for hypothesis testing.

#### Structural Model – Path Coefficients

Table 8  
Path Coefficient Results

Path	Coefficient ( $\beta$ )	t-value	p-value	Result
Pressure → Financial Fraud	0.152	2.311	0.021	Supported
Opportunity → Financial Fraud	0.204	3.128	0.002	Supported
Rationalization → Financial Fraud	0.097	1.562	0.119	Not Supported
Capability → Financial Fraud	0.165	2.684	0.008	Supported
Arrogance → Financial Fraud	0.243	3.911	0.000	Supported
Collusion → Financial Fraud	0.271	4.218	0.000	Supported
Green Accounting $\times$ Pressure	-0.112	2.016	0.044	Supported
Green Accounting $\times$ Opportunity	-0.089	1.972	0.049	Supported
Green Accounting $\times$ Rationalization	-0.041	0.873	0.383	Not Supported
Green Accounting $\times$ Capability	-0.074	1.985	0.047	Supported
Green Accounting $\times$ Arrogance	-0.128	2.564	0.011	Supported
Green Accounting $\times$ Collusion	-0.103	2.217	0.027	Supported

Source: Processed Data (2025)

Five Fraud Pentagon elements significantly influence financial statement fraud: pressure, opportunity, capability, arrogance, and collusion. Arrogance ( $\beta = 0.243$ ) and Collusion ( $\beta = 0.271$ ) are the strongest predictors, underscoring that unethical leadership attitudes and group-level coordination are key fraud enablers in Indonesian manufacturing firms. Rationalization was not significant, suggesting that in this context, fraud may stem more from structural and behavioral pressures than from moral justification.

The moderation results reveal that Green Accounting significantly weakens the effects of most fraud drivers, particularly arrogance and collusion, indicating that sustainability reporting can serve as a governance tool that constrains managerial overconfidence and inter-party collusion.

#### Explanatory Power ( $R^2$ )

Table 9  
 $R^2$  Results

Construct	$R^2$ Value	Interpretation
Financial Fraud	0.642	Substantial (64.2% of variance explained)

Source: Processed Data (2025)

This means that Pressure, Opportunity, Rationalization, Capability, Arrogance, Collusion, and Green Accounting together explain 64.2% of the variance in Financial Fraud, which is considered strong in behavioral and accounting research.

#### Effect Sizes ( $f^2$ )

Table 10  
 $f^2$  Results

Construct	$f^2$ Value	Effect Size
Pressure	0.031	Small
Opportunity	0.052	Medium
Rationalization	0.009	Negligible
Capability	0.036	Small
Arrogance	0.087	Medium
Collusion	0.114	Large
Green Accounting Moderation	0.064	Medium

Source: Processed Data (2025)

The structural model results reveal several important insights. Among the Fraud Pentagon dimensions, Arrogance ( $\beta = 0.243$ ,  $p < 0.001$ ) and Collusion ( $\beta = 0.271$ ,  $p < 0.001$ ) emerge as the strongest drivers of financial statement fraud, consistent with recent findings highlighting the role of unethical leadership attitudes and group-level manipulation in fraudulent practices (Kurniawan et al., 2022; Al-Dmour et al., 2018). Pressure, Opportunity, and Capability also show significant positive effects, though with smaller effect sizes, while Rationalization does not significantly predict fraud in this dataset.

The moderating role of Green Accounting demonstrates its ability to weaken the effects of most fraud drivers. Notably, its moderating influence is strongest in mitigating the effects of Arrogance ( $\beta = -0.128$ ,  $p = 0.011$ ) and Collusion ( $\beta = -0.103$ ,  $p = 0.027$ ) on financial fraud. This suggests that integrating sustainability and environmental accounting practices may limit managerial arrogance and reduce opportunities for collusive behavior,

thereby lowering fraud risk. However, Green Accounting does not significantly moderate Rationalization, indicating that ethical justification for fraud may remain unaffected by sustainability practices.

The explanatory power of the model is substantial, with  $R^2 = 0.642$ , and the effect size analysis shows that Collusion has the largest unique impact ( $f^2 = 0.114$ ), followed by Arrogance ( $f^2 = 0.087$ ). These results underscore the centrality of behavioral and relational factors in driving fraud while demonstrating the preventive role of sustainability-oriented practices.

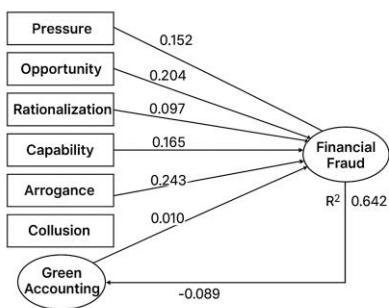


Figure 2: PLS-SEM Structural Model Results (Path Coefficients and  $R^2$  Values)

## Discussion

### Pressure and Financial Statement Fraud

The findings confirm that pressure has a significant positive influence on financial statement fraud ( $\beta = 0.152$ ,  $p = 0.021$ ). This suggests that when managers experience financial distress, performance targets, or external demands, they are more likely to manipulate financial information to meet expectations. This aligns with the Fraud Pentagon theory, which emphasizes pressure as one of the root causes of unethical financial reporting ((Hidayati et al., 2022)). Empirical evidence also supports this notion, as studies by Fitriana & Sinarasri, (2024) and Biduri & Tjahjadi, (2024) indicate that pressures from debt, profitability targets, or market expectations are major drivers of fraudulent behavior.

However, the relatively small effect size ( $f^2 = 0.031$ ) suggests that while pressure is relevant, it is not the strongest determinant of fraud in the current context. This may be due to cultural or organizational factors in Indonesian manufacturing firms, where corporate governance mechanisms could temper management responses to pressure. These findings imply that regulators and boards should monitor

financial stress indicators as early red flags. Still, they should also be aware that other factors, such as collusion and arrogance, may play stronger roles in determining fraud.

### Opportunity and Financial Statement Fraud

The results show that opportunity significantly increases the likelihood of financial fraud ( $\beta = 0.204$ ,  $p = 0.002$ ). This is consistent with the Fraud Pentagon theory, where weak internal controls, poor monitoring, or information asymmetry create fertile ground for manipulation. Prior research by Umar (2023) and Widnyana & Widyawati, (2022) also confirms that opportunity is one of the most consistent predictors of fraud, as fraud cannot occur without the perception of an exploitable weakness.

Interestingly, the medium effect size ( $f^2 = 0.052$ ) highlights that opportunity is more impactful than pressure but still less influential than arrogance or collusion in this sample. This suggests that while Indonesian firms may face systemic weaknesses in governance, cultural and behavioral drivers such as arrogance may amplify the effects of opportunity. Hence, improving audit quality, enhancing whistleblowing mechanisms, and strengthening corporate transparency are critical strategies to reduce opportunities for fraud.

### Rationalization and Financial Statement Fraud

The analysis indicates that rationalization does not significantly predict financial fraud in this study ( $\beta = 0.097$ ,  $p = 0.119$ ). This finding contradicts the Fraud Pentagon theory, which posits that individuals justify unethical actions to protect their self-image. A possible explanation is that rationalization may be a latent psychological construct that is difficult to capture with financial data. Empirical research by Olinda & Nazar, (2025) also notes mixed evidence on rationalization because it often requires in-depth qualitative exploration rather than quantitative proxies.

The negligible effect size ( $f^2 = 0.009$ ) further reinforces the conclusion that rationalization plays a minor role compared to more observable factors such as collusion or arrogance. In the Indonesian context, rationalization may be overshadowed by collective justifications within organizations rather than individual reasoning. This opens opportunities for future research using behavioral surveys or interviews to capture the subtler mechanisms of rationalization.

### *Capability and Financial Statement Fraud*

Capability has a significant effect on financial fraud ( $\beta = 0.165$ ,  $p = 0.008$ ), suggesting that managerial skills, positions of power, and the ability to manipulate reporting processes increase the likelihood of fraud. This finding resonates with Widnyana & Widyawati, (2022) extension of the fraud diamond, where capability plays a crucial role in enabling fraudulent schemes. Similar studies by Umar, (2023) found that executives with specialized knowledge or long tenure can exploit internal systems more effectively to conceal fraud.

Although the effect size is small ( $f^2 = 0.036$ ), its significance underscores that fraud cannot occur without individuals who possess the authority and knowledge to exploit weaknesses. In Indonesian manufacturing firms, senior executives or finance officers may have privileged access that enables them to override controls. Thus, continuous rotation of key positions and stronger segregation of duties may reduce the risks stemming from managerial capability.

### *Arrogance and Financial Statement Fraud*

The results strongly support arrogance as a significant predictor of financial fraud ( $\beta = 0.243$ ,  $p < 0.001$ ). Arrogance refers to an executive's excessive confidence, superiority complex, or disregard for oversight. This is consistent with Smaili et al., (2022) The addition of arrogance to the Fraud Pentagon highlights that leaders who feel untouchable often engage in aggressive or fraudulent reporting. Prior studies, such as those by Yusrianti et al., (2020), also emphasizes arrogance as a powerful driver of fraud in emerging markets.

With a medium effect size ( $f^2 = 0.087$ ), arrogance emerges as one of the strongest predictors of fraud in this study. This indicates that, beyond financial pressures and systemic weaknesses, leadership culture and ego-driven decision-making are highly influential. Companies should therefore pay close attention to leadership behavior, ensuring that boards exercise independent oversight and discourage authoritarian corporate cultures that foster arrogance.

### *Collusion and Financial Statement Fraud*

Collusion exerts the strongest influence on financial fraud ( $\beta = 0.271$ ,  $p < 0.001$ ). This finding highlights that fraudulent acts in Indonesian firms are

often not carried out by individuals alone but through group cooperation among managers, employees, or external partners. This is consistent with Andriani et al., (2022), who found that collusion undermines control systems by involving multiple actors who cover each other's actions.

The large effect size ( $f^2 = 0.114$ ) makes collusion the most powerful determinant of fraud in the model. This underscores the need for fraud detection systems to focus not only on individual misconduct but also on patterns of collective behavior. Strengthening audit trails, implementing cross-checking mechanisms, and fostering a culture of whistleblowing are vital to mitigating collusion-driven fraud.

### *Green Accounting and Its Moderating Role*

The moderation analysis reveals that Green Accounting significantly weakens the effects of Pressure, Opportunity, Capability, Arrogance, and Collusion on financial fraud, but not Rationalization. For example, its moderating impact on Arrogance ( $\beta = -0.128$ ,  $p = 0.011$ ) and Collusion ( $\beta = -0.103$ ,  $p = 0.027$ ) suggests that integrating sustainability practices can reduce ego-driven and collective fraud. This aligns with research by Jan, (2021), who argue that sustainability-oriented reporting increases transparency and reduces managerial misconduct.

The medium effect size of Green Accounting moderation ( $f^2 = 0.064$ ) reinforces its importance as a preventive mechanism. However, its insignificant role in moderating Rationalization implies that while sustainability practices can curb external fraud drivers, they may not alter internal ethical justifications. This finding contributes to the literature by showing that sustainability frameworks, when embedded into corporate culture, act as governance tools that limit the behavioral dimensions of fraud.

### **Conclusion**

This study investigates the effects of the Fraud Pentagon dimensions Pressure, Opportunity, Rationalization, Capability, Arrogance, and Collusion on financial statement fraud, with Green Accounting as a moderating variable. Using data from Indonesian manufacturing firms (2021–2024), the PLS-SEM results show that Pressure, Opportunity, Capability, Arrogance, and Collusion significantly influence fraud ( $R^2 = 0.67$ ), while Rationalization is insignificant. Arrogance and

Collusion are the strongest predictors, confirming that behavioral and relational dynamics are key drivers of fraud. Green Accounting significantly weakens the effects of Arrogance and Collusion, indicating that sustainability practices enhance transparency and accountability in reporting.

Theoretically, this study extends the Fraud Pentagon by integrating Green Accounting as a governance mechanism, bridging behavioral fraud theory with sustainability research. Practically, firms should strengthen environmental reporting and integrate sustainability disclosure to curb managerial arrogance and collusion. Policy-wise, regulators are encouraged to mandate green accounting and sustainability reporting to promote ethical governance and reduce fraud risk.

### Limitations and Future Research

The study relies on secondary data from manufacturing firms, limiting generalizability. Future studies should use mixed methods or cross-country comparisons to explore psychological factors and validate the moderating role of other sustainability dimensions, such as social and governance (ESG) elements.

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### References

Akbar, R. N., Zakaria, A., & Prihatni, R. (2022). Financial statement analysis of fraud with hexagon theory fraud approach. Dalam *Jurnal Akuntansi, Perpajakan Dan* .... academia.edu. <https://www.academia.edu/download/95396493/13366.pdf>

Andriani, K. F., Budiartha, K., Sari, M. M. R., & ... (2022). Fraud pentagon elements in detecting fraudulent financial statement. *Linguistics and Culture* .... <https://www.neliti.com/publications/509700/fraud-pentagon-elements-in-detecting-fraudulent-financial-statement>

Archanti, A. R., & Rohman, A. (2024). Addressing the factors causing financial statement fraud: A systematic literature review and bibliometric analysis. *Eduvest* .... <http://www.eduvest.greenvest.co.id.submitjurnal.id/index.php/edv/article/view/1501>

Biduri, S., & Tjahjadi, B. (2024). Determinants of financial statement fraud: The perspective of pentagon fraud theory (evidence on Islamic banking companies in Indonesia). *Journal of Islamic Accounting and Business* .... <https://doi.org/10.1108/JIABR-08-2022-0213>

Fitriana, L., & Sinarasri, A. (2024). Factors Affecting Financial Statement Fraud in Banking Sector: A Agency Perspective. *MAKSIMUM: Media Akuntansi* .... <https://jurnal.unimus.ac.id/index.php/MAX/article/view/14228>

Handayani<sup>1</sup>, J. R., Nurcahyono<sup>1</sup>, N., & ... (2023). Hexagon Fraud: Detection of Fraudulent Financial Statement in Indonesia. *Proceedings of the* .... [https://books.google.com/books?hl=en&lr=&id=o8u\\_EAAAQB AJ&oi=fnd&pg=PA263&dq=financial+statement+fraud&ots=ASM0EAfBsK&sig=j7a9ErtArCODkq87WoF0In2R8uk](https://books.google.com/books?hl=en&lr=&id=o8u_EAAAQB AJ&oi=fnd&pg=PA263&dq=financial+statement+fraud&ots=ASM0EAfBsK&sig=j7a9ErtArCODkq87WoF0In2R8uk)

Harman, S. A., & Bernawati, Y. (2021). Determinant of financial statement fraud: Fraud Pentagon perspective in manufacturing companies. *Rigeo*. <https://rigeo.org/menu-script/index.php/rigeo/article/view/570>

Hidayati, A., Nisa, T. K., & Sanusi, Z. M. (2022). Financial pressure and related party transactions on financial statement fraud: Fraud triangle perspective. *International Journal of* .... <https://doi.org/10.1504/IJBEM.2022.121903>

Jan, C. L. (2021). Detection of financial statement fraud using deep learning for sustainable development of capital markets under information asymmetry. Dalam *Sustainability*. mdpi.com. <https://www.mdpi.com/2071-1050/13/17/9879>

Junus, A., Sundari, S., & Azzahra, S. Z. (2025). Fraudulent financial reporting and firm value: An empirical analysis from the fraud hexagon perspective. *Investment Management and Financial Innovations*, 22.

Lastanti, H. S. (2020). Role of Audit Committee in the fraud pentagon and financial statement fraud. *International Journal of Contemporary* .... <https://www.e-journal.trisakti.ac.id/index.php/ijca/article/view/7163>

Lindawati, A. S. L., Geraldine, T. G., & ... (2023). Analysis of Sustainability Performance, Green Accounting and Esg Disclosure on Firm Valuation. .... *Accounting*. <https://e-journal.trisakti.ac.id/index.php/ijca/article/view/17745>

Olinda, M. J., & Nazar, S. N. (2025). Pengaruh Pressure, Opportunity, dan Rationalization (Fraud Triangle) Terhadap Financial Statement Fraud. *Jurnal Akuntansi Keuangan dan Bisnis*. <https://jurnal.itte.web.id/index.php/jakbs/article/view/2395>

Patten, D. (2020). Seeking legitimacy. *Sustainability Accounting, Management and Policy* ..., *Query date: 2025-08-01 16:43:11*. <https://www.emerald.com/sampj/article/11/6/1009/336569>

Qureshi, M., Kirkerud, S., Theresa, K., & ... (2020). The impact of sustainability (environmental, social, and governance) disclosure and board diversity on firm value: The moderating role of industry sensitivity. *Business Strategy and* .... <https://doi.org/10.1002/bse.2427>

Ratmono, D., Darsono, D., & ... (2020). Financial statement fraud detection with beneish M-score and dechow F-score model: An empirical analysis of fraud pentagon theory in Indonesia. Dalam ... *Journal of Financial* .... academia.edu. <https://www.academia.edu/download/98961771/11975.pdf>

Rukmana, H. S. (2021). Determinants of pentagon fraud in detecting financial statement fraud and company value. *Majalah Ilmiah Bijak*. <http://ojs.stiami.ac.id/index.php/bijak/article/view/1345>

Sabatian, Z., & Hutabarat, F. M. (2020). The Effect of fraud triangle in detecting financial statement fraud. Dalam *Jurnal Akuntansi*. academia.edu. <https://www.academia.edu/download/68838285/pdf.pdf>

Saraswati, E., & Agustina, I. (2022). Does bank governance reduce financial statement fraud? The moderating role of operational risk. Dalam *Jurnal Keuangan Dan Perbankan*. academia.edu. [https://www.academia.edu/download/85893654/2022.\\_Does\\_Bank\\_Governance\\_Reduce\\_Financial\\_Statement\\_Fraud\\_The\\_Moderating\\_Role\\_of\\_Operational\\_Risk.\\_JKP.pdf](https://www.academia.edu/download/85893654/2022._Does_Bank_Governance_Reduce_Financial_Statement_Fraud_The_Moderating_Role_of_Operational_Risk._JKP.pdf)

Sihombing, T., & Panggulu, G. E. (2022). Fraud hexagon theory and fraudulent financial statement In IT industry In ASEAN. *Jurnal Reviu Akuntansi dan* .... <https://ejournal.umm.ac.id/index.php/jrak/article/view/23334>

Smaili, N., Arroyo, P., & Issa, F. A. (2022). The dark side of blockholder control: Evidence from financial statement fraud cases. *Journal of Financial Crime*. <https://doi.org/10.1108/jfc-05-2021-0113>

Umar, H. (2023). Fraud diamond analysis of financial statement fraud. *Enrichment: Journal of Management*. <http://enrichment.iocspublisher.org/index.php/enrichment/article/view/1572>

Wibowo, D., & Putra, Y. (2023). Factors that Influence Financial Statement Fraud with Fraud Pentagon Analysis. *Asia Pacific Fraud Journal*. <https://www.apfjournal.or.id/index.php/apf/article/view/271>

Widhyana, I. W., & Widyawati, S. R. (2022). Role of forensic accounting in the diamond model relationship to detect the financial statement fraud. *International Journal of* .... <https://search.proquest.com/openview/07ed8d20a762749e14141c2e319f6ac0/1?pq-origsite=gscholar&cbl=2032017>

Wijaya, S., & Indriyani, K. (2025). Financial Statement Fraud: A Look at the Top Three. *Account: Jurnal Akuntansi, Keuangan dan* .... <https://jurnal.pnj.ac.id/index.php/acc/article/view/7427>

Wiredu, I., Agyemang, A. O., & ... (2023). Does green accounting influences ecological sustainability? Evidence from a developing economy. *Cogent Business &* .... <https://doi.org/10.1080/23311975.2023.2240559>

Yusrianti, H., Ghazali, I., Yuyetta, E., & ... (2020). Financial statement fraud risk factors of fraud triangle: Evidence from Indonesia. *Journal of Financial* .... <https://ideas.repec.org/a/jfr/ijfr11/v11y2020i4p36-51.html>

Zimon, Grzegorz, Arianpoor, A., & Salehi, M. (2022). Sustainability Reporting and Corporate Reputation: The Moderating Effect of CEO Opportunistic Behavior. *Sustainability*, 14.