The determinants of internal fraud using the fraud hexagon framework: a study of the banking sector listed on the Indonesia Stock Exchange

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Abstract: *This study examines the determinants of internal fraud in Indonesian listed banks by applying the Fraud Hexagon framework (pressure, opportunity, rationalization, capability, arrogance, and collusion) to the banking sector on the Indonesia Stock Exchange (IDX) over 2020–2024. Internal fraud is operationalised as the number of internal fraud cases disclosed in each bank's annual report during the study period. The analysis uses a balanced panel of 23 banks across five years (total 115 observations) and estimates a panel least squares model with cross-section fixed effects to control for time-invariant heterogeneity across banks. Pressure is proxied by the non-performing loan ratio, opportunity by the proportion of independent commissioners, rationalization by directors' remuneration relative to net income, capability by board turnover, arrogance by CEO image frequency, and collusion by political connections. The model is jointly significant (Prob(F) = 0.0000) with substantial explanatory power (adjusted R² = 0.7706). However, none of the Fraud Hexagon proxies shows a statistically significant partial effect on internal fraud (p > 0.05), indicating that the proposed direct relationships are not supported in the fixed-effects specification. The findings suggest that disclosure-based internal fraud outcomes may be shaped by bank-specific factors and reporting practices, underscoring the need for richer fraud measurement and governance indicators in future research and improved process-level anti-fraud monitoring in practice.*

Introduction

Fraud perpetrated by organizational insiders remains a persistent governance and risk-management concern in the financial services industry. Banks, in particular, operate in an environment characterised by intensive information asymmetry, high transaction volumes, complex products, and extensive reliance on trust conditions that increase both the opportunity set for malfeasance and the potential systemic consequences when fraud occurs. In occupational settings, internal fraud, broadly understood as intentional acts committed by employees or management that harm the organisation and/or its stakeholders, can erode confidence, distort decision-useful disclosures, weaken risk culture, and impose direct financial losses as well as regulatory and

reputational costs. Contemporary fraud risk management, therefore, requires explanatory frameworks that capture not only structural vulnerabilities (control weaknesses) but also behavioural and social mechanisms through which fraud is initiated, sustained, and concealed.

Global evidence underscores the materiality of occupational fraud. The Association of Certified Fraud Examiners (ACFE), synthesising 1,921 investigated cases across 138 countries and territories, estimates that organisations lose approximately 5% of annual revenue to fraud, with a median loss of USD 145,000 per case and an average loss of USD 1.7 million per case (ACFE, 2024). The same evidence base suggests that asset misappropriation is the most common category of occupational fraud (reported in 89% of

cases) even if it is typically less costly per case than financial statement fraud; moreover, a substantial share of frauds are enabled by control environments that are absent or overridden, 32% of cases involve a lack of internal controls and 19% involve override of existing controls (ACFE, 2024). Importantly, fraud risk is not purely individualistic: cases involving three or more perpetrators generate median losses more than four times those involving a single perpetrator (ACFE, 2024). These stylised facts collectively motivate a theoretical and empirical focus on (i) organisational opportunity structures, (ii) perpetrator attributes and motivations, and (iii) collusive dynamics that undermine segregation-of-duties and independent-check controls.

Within Indonesia's financial system, the policy and supervisory focus on fraud reflects similar concerns. The Financial Services Authority (Otoritas Jasa Keuangan/OJK) emphasises that the growing complexity of financial services business models increases risk exposure, including operational risk originating from fraud, and notes that fraud cases in financial services institutions have generated harms not only to consumers and the financial industry but also, in some instances, to the state. In response, OJK Regulation No. 12 of 2024 requires financial services institutions, including commercial banks to implement an anti-fraud strategy grounded in internal control strengthening and continuous improvement (OJK, 2024). The regulation defines fraud as intentional acts of deviation and/or wilful neglect undertaken to deceive, manipulate, or defraud the institution, consumers, or other parties, occurring within the institution and/or using its means, thereby causing losses and/or generating benefits for perpetrators (OJK, 2024). It further classifies fraud to include corruption, asset misuse, financial reporting fraud, deception, information leakage, and analogous acts (OJK, 2024). For banking institutions listed on the Indonesia Stock Exchange (IDX), these regulatory expectations intersect with public-market governance, disclosure, and accountability demands, making the sector a relevant empirical setting for examining determinants of internal fraud and for generating evidence with practical value for boards, audit committees, internal audit functions, and supervisors.

Despite the salience of internal fraud, empirical research has often operationalised fraud primarily through the lens of fraudulent financial reporting rather than broader forms of internal wrongdoing (employee corruption, asset misappropriation, or collusive schemes). This focus is understandable given the relative availability of archival proxies for financial statement fraud; however, it risks under-specifying the phenomenon of internal fraud in banking, where misconduct may manifest through operational processes (credit origination, procurement, treasury operations, branch cash handling, customer account administration) and where collusion can be particularly consequential. Theoretical development in fraud research similarly reflects an evolution from parsimonious individual-level models toward more comprehensive frameworks that integrate behavioural, organisational, and relational conditions.

The foundational fraud triangle proposed by Cressey (1953) posits that fraud arises from the convergence of pressure, opportunity, and rationalisation. Subsequent extensions sought to address limitations of the triangle, particularly its limited treatment of perpetrator traits and organisational-social dynamics. Wolfe and Hermanson's (2004) fraud diamond added capability, highlighting that fraud is more likely when an individual possesses the positional power, technical skill, and psychological fortitude to exploit opportunities and sustain concealment. Related developments include the fraud pentagon, which expands the behavioural domain by incorporating constructs such as capability and arrogance in addition to the triangle components. In this trajectory, Vousinas (2019) advanced the S.C.O.R.E. model, referring to stimulus, capability, opportunity, rationalisation, and ego, and then proposed an extended S.C.C.O.R.E. model by adding collusion, thereby forming the fraud hexagon. The central premise is that modern organisational fraud frequently involves networks of actors rather than isolated individuals; collusion both facilitates execution and materially weakens the effectiveness of controls that rely on segregation of duties and independent verification (Vousinas, 2019).

The fraud hexagon is therefore a theoretically appealing framework for investigating internal fraud in banking. First, the "stimulus" component enables a broader

conceptualisation of pressures and incentives, financial and non-financial that may be intensified by performance targets, career concerns, and competitive dynamics in financial institutions. Second, "capability" is particularly relevant in banks, where access rights, system knowledge, and procedural expertise can enable complex schemes. Third, "opportunity" remains central given the role of control architecture, oversight effectiveness, and governance quality. Fourth, "rationalisation" captures justificatory narratives that normalise misconduct, especially in environments where unethical practices are perceived as tolerated or rewarded. Fifth, "ego" reflects entitlement and superiority motives that may be amplified in hierarchical settings and among high-status decision-makers. Sixth, "collusion" is highly pertinent to banking operations because many high-impact schemes require coordination (between relationship managers and credit approvers, between front office and operations, or between employees and external counterparties), and because collusion directly targets the design logic of internal controls.

Notwithstanding this theoretical suitability, empirical applications of the fraud hexagon in Indonesia have predominantly examined financial statement fraud rather than internal fraud as a broader construct. For example, prior studies have applied hexagon elements to detect fraudulent financial reporting in state-owned enterprises and other listed entities, operationalising the model through archival proxies such as external pressure, monitoring effectiveness, management turnover, CEO image/arrogance indicators, or political connections (e.g., Achmad et al., 2022; Indriaty & Thomas, 2023; Adhania et al., 2024). While these studies provide useful insights, they also illustrate two limitations that motivate the present research. First, financial-statement-centric designs may not capture operationally embedded internal fraud prevalent in banking (e.g., asset misuse or corruption occurring within business processes). Second, empirical proxies for collusion and ego often vary widely across studies, raising questions about construct validity and sectoral specificity. Consequently, there is a need for banking-focused evidence that explicitly frames internal fraud as the outcome of interest and evaluates whether the fraud hexagon components provide explanatory power in the governance and operational context of listed Indonesian banks.

Accordingly, this study investigates the determinants of internal fraud using the fraud hexagon framework in the banking sector listed on the Indonesia Stock Exchange. The study is positioned to contribute to the literature in at least three ways. First, it extends fraud-hexagon testing beyond the dominant domain of fraudulent financial reporting by focusing on internal fraud within banking institutions, thereby aligning the dependent construct with regulatory classifications that encompass corruption, asset misuse, deception, and related acts (OJK, 2024). Second, it responds to calls for more context-sensitive fraud research by examining an emerging-market banking setting characterised by rapid industry development and evolving anti-fraud regulation. Third, it provides governance-relevant implications by identifying which hexagon dimensions appear most salient for internal fraud risk in listed banks, supporting more targeted anti-fraud strategies (strengthening control environments most relevant to opportunity and collusion, or enhancing ethics and accountability mechanisms relevant to rationalisation and ego).

Literature review and hypothesis development

Agency theory
Agency theory provides a comprehensive framework for understanding the relationship between shareholders, who serve as principals, and management, who function as agents under an employment contract. In this arrangement, the principals delegate a portion of their decision-making authority and specific responsibilities to the agents. This delegation forms the basis of the agency relationship, which is intended to ensure that the company's operations are managed efficiently and effectively to achieve the best outcomes for the shareholders. By entrusting agents with operational control, principals can focus on strategic oversight, assuming that the agents will act in the best interest of the company and its owners.

However, as emphasised by Jensen and Meckling (1976), this principal-agent relationship is inherently susceptible to conflicts of interest. Agents, who are empowered to make critical decisions, may

sometimes pursue personal objectives such as career advancement, higher financial compensation, or job security rather than focusing solely on maximising shareholder value. These misalignments can manifest in various ways, including the deliberate exploitation of authority for self-serving purposes. Agents might engage in selective disclosure or even withhold essential information from principals, actions that significantly compromise transparency, reduce accountability, and ultimately weaken the governance structure of the organisation.

The existence of such conflicts of interest carries serious consequences for corporate governance and organisational integrity. When agents act in self-interest, they might resort to unethical behaviour, including fraud, financial misreporting, or other manipulative practices aimed at concealing underperformance or extracting personal benefits (Jensen & Meckling, 1976; Bancin & Sari, 2023). These actions can gradually corrode shareholder trust, tarnish the company's reputation, and pose grave threats to its long-term sustainability. To counter these risks, it is crucial to implement effective monitoring mechanisms, align managerial incentives with shareholder objectives, and establish strong internal controls. By doing so, organisations can reduce agency costs and minimise the likelihood of fraud resulting from misaligned incentives.

Stakeholder theory
Stakeholder theory provides a comprehensive framework for understanding the complex network of relationships that exist between an organization and the various parties that influence or are influenced by its activities. According to Freeman (1984), this theory argues that companies should not solely prioritize their internal objectives or shareholder profits but must also acknowledge, respect, and address the interests of all stakeholders. Stakeholders may include employees, customers, suppliers, communities, regulators, investors, and even the environment.

In the context of implementing Good Corporate Governance (GCG), stakeholder theory underscores the necessity of ensuring that corporate management operates in a manner that is fair, transparent, and accountable. By upholding these principles, companies are better positioned to maintain the

trust and confidence of their stakeholders, which is essential for long-term sustainability. This approach fosters an environment where oversight is strengthened, and ethical conduct is prioritized, thereby minimizing the risk of fraudulent activities or misconduct.

Moreover, companies that actively engage stakeholders in decision-making processes and encourage their participation benefit from diverse perspectives and enhanced credibility. Practically, this can be achieved through consistent and transparent disclosure of information, open communication, and adherence to GCG principles. Such practices not only reinforce stakeholder confidence but also enhance the overall corporate image, positioning the company as a responsible and ethical entity in the market. Over time, this strategic alignment with stakeholder theory contributes to sustainable growth and resilience in the face of potential challenges.

Fraud hexagon concept
Fraud, as defined by the Association of Certified Fraud Examiners (ACFE), involves the misuse of one's position or authority for personal gain. This definition encompasses a wide range of dishonest actions that individuals may undertake to obtain benefits, such as manipulating company data or engaging in activities that lead to financial losses for the organization. These actions are not only unethical but also illegal, as they undermine the integrity and trust within an organization. The ACFE's definition highlights the core aspect of fraud, which is the exploitation of trust and authority for personal advantage, often at the expense of others.

The understanding of fraudulent behavior has evolved significantly over the years, beginning with the Fraud Triangle concept introduced by Cressey in 1953. This theory posits that three fundamental elements drive fraud: pressure, opportunity, and rationalization. Pressure refers to the financial or personal stress that compels an individual to commit fraud. Opportunity is the perceived chance to carry out the fraudulent act without being caught, while rationalization involves the justification of the dishonest behavior as acceptable or necessary. These elements provide a foundational framework for understanding why individuals might engage in fraudulent activities.

In 2004, Wolfe and Hermanson expanded on Cressey's theory by introducing the Fraud Diamond Theory, which added a fourth element: capability. Capability refers to the skills and abilities that an individual possesses to commit fraud, such as knowledge of the system or access to sensitive information. This addition acknowledged that not everyone who faces pressure and opportunity will commit fraud; they must also have the means to do so. The Fraud Diamond Theory offered a more comprehensive view of the factors that contribute to fraudulent behavior.

The theory continued to evolve in 2011 with the introduction of the Fraud Pentagon Theory by Crowe, which added two more factors: competence and arrogance. Competence involves the individual's ability to successfully execute the fraudulent act without detection, while arrogance is the belief that they are above the law and will not be caught. These additions highlighted the psychological aspects of fraud, emphasizing that overconfidence and a sense of invincibility can drive individuals to commit fraud despite the risks involved.

Most recently, in 2019, Vousinas introduced the Fraud Hexagon Theory, which added a sixth factor: collusion. Collusion involves the cooperation of multiple individuals to commit fraud, often within an organization. This factor underscores the importance of internal controls and vigilance in detecting and preventing fraud, as it can be more challenging to uncover when multiple parties are involved. The Fraud Hexagon Theory represents the most current and comprehensive model for understanding the complex interplay of factors that drive fraudulent behavior, providing valuable insights for organizations seeking to protect themselves from such threats.

Internal fraud

The Association of Certified Fraud Examiners (ACFE) provides a comprehensive definition of internal fraud, also known as occupational fraud. This type of fraud is characterized by deceptive actions carried out by individuals who are integral to an organization, such as employees, managers, or even top executives. The primary motivation behind internal fraud is the desire to gain personal benefits or advantages at the expense of the organization that employs them. This form of fraud involves the intentional misuse, misappropriation, or exploitation of the company's resources, funds,

or assets to fulfill personal interests. According to Ewa et al. (2020), internal fraud is a significant concern for organizations as it undermines the integrity and trust within the workplace.

Internal fraud can manifest in various forms, each with its own set of implications for the organization. Common examples include the embezzlement of company funds, where employees or managers divert money for personal use; manipulation of financial records, which involves altering accounting documents to misrepresent the company's financial health; theft of physical assets, such as equipment or inventory; falsification of expense claims, where employees submit false receipts or inflate expenses to receive reimbursements; and unauthorized use of company resources, such as using company vehicles or technology for personal purposes. These fraudulent activities not only breach the trust between the employee and the organization but can also lead to substantial financial losses and damage the organization's reputation.

To maintain transparency and comply with regulatory requirements, organizations are often mandated to disclose instances of internal fraud in their annual reports. While these disclosures are essential for accountability, they can have adverse effects on the organization's image. Stakeholders, including investors, may perceive the company as having inadequate internal controls or governance structures, leading to a decline in investor confidence. This potential erosion of trust highlights the critical need for organizations to implement robust anti-fraud measures. These measures can include conducting regular internal audits to identify vulnerabilities, establishing whistleblower programs to encourage reporting of suspicious activities, and deploying continuous monitoring systems to detect and prevent fraudulent activities before they escalate. By taking proactive steps, organizations can mitigate the risks associated with internal fraud and foster a culture of integrity and accountability.

Pressure and internal fraud

Pressure is widely regarded as a primary motivational antecedent of internal (occupational) fraud, reflecting a perceived need to resolve financial or non-financial strains through illicit means when legitimate options are viewed as insufficient. In Cressey's (1953) fraud triangle, pressure originates from a "non-

shareable problem" (debt, personal financial commitments, or urgent obligations) that creates a compelling incentive to misappropriate assets or manipulate information, and later extensions of fraud theory retain pressure as a core driver even as additional conditions are introduced (Wolfe & Hermanson, 2004; Crowe, 2011; Vousinas, 2019). In organisational contexts, pressure may also be intensified by job insecurity, unrealistic performance targets, incentive schemes linked to short-term outcomes, and fear of sanctions, which can heighten perceived urgency and encourage individuals to frame misconduct as a necessary coping strategy (Albrecht et al., 2012). When such pressures accumulate, individuals may become more willing to engage in internal fraud to obtain immediate financial relief or to avoid negative career consequences, implying a direct positive association between pressure and internal fraud risk; therefore, this study proposes:

H1: Pressure is positively associated with internal fraud.

Opportunity and internal fraud
Opportunity is consistently identified as a central enabling condition for internal (occupational) fraud because it reflects the situational possibility to commit and conceal misconduct within organisational processes. In Cressey's (1953) fraud triangle, opportunity arises when control environments and monitoring mechanisms are insufficient to deter wrongdoing, allowing individuals with access and authority to exploit assets or manipulate records with a low perceived risk of detection. Subsequent theoretical developments retain opportunity as a core element, emphasising that even when motivation exists, fraud is more likely to occur where internal controls are weak, duties are poorly segregated, approvals are ineffective, or management override is possible (Wolfe & Hermanson, 2004; Vousinas, 2019). From a governance and control perspective, opportunity is shaped by deficiencies in the internal control system, such as inadequate risk assessment, limited control activities, weak information and communication, and ineffective monitoring conditions that reduce the probability of detection and increase the feasibility of misappropriation or data manipulation (COSO, 2013). Consistent with this logic, practitioner evidence indicates that

control weaknesses and circumvention of controls frequently underpin occupational fraud cases, reinforcing the proposition that greater opportunity elevates internal fraud risk (ACFE, 2024). Accordingly, the literature supports the expectation that opportunity increases the likelihood of internal fraud, leading to:

H2: Opportunity is positively associated with internal fraud.

Rationalization and internal fraud.
Rationalization is widely recognised as the key cognitive mechanism through which individuals neutralise the moral tension of wrongdoing and thereby make internal (occupational) fraud psychologically acceptable. In Cressey's (1953) fraud triangle, rationalization reflects the self-justifying narratives offenders use to reconcile fraudulent acts with a self-image as a "good" person, such as viewing misappropriation as temporary borrowing, as deserved compensation, or as a justified response to perceived organisational injustice. This logic is consistent with neutralization theory, which explains how offenders employ techniques (denial of injury, denial of responsibility, condemnation of the condemners, appeal to higher loyalties) to reduce guilt and inhibit self-sanctioning (Sykes & Matza, 1957). Subsequent fraud frameworks retain rationalization as a core antecedent, implying that even when pressure and opportunity exist, fraudulent behaviour is more likely when individuals can construct plausible moral justifications that minimise perceived harm or shift blame (Wolfe & Hermanson, 2004; Crowe, 2011; Vousinas, 2019). Organisational conditions, such as weak ethical climate, tolerance of minor rule-breaking, ambiguous policies, and perceptions of unfair treatment, may further facilitate rationalization by providing cues that normalise misconduct or portray the organisation as an acceptable target, thereby increasing the likelihood of internal fraud. Accordingly, the literature suggests that stronger rationalization increases the propensity to engage in internal fraud, leading to:

H3: Rationalization is positively associated with internal fraud.

Capability and internal fraud.
Capability is theorised to increase the likelihood of internal (occupational) fraud because it

captures an individual's personal and positional capacity to execute, sustain, and conceal fraudulent conduct within organisational systems. While the fraud triangle emphasises motivation and situational access, Wolfe and Hermanson's (2004) fraud diamond posits that fraud is more likely when a potential offender possesses the requisite capability, such as technical competence, process knowledge, confidence, persuasive ability, and the authority to exploit control weaknesses or override procedures. In practice, capability is reflected in employees' familiarity with accounting and information systems, their understanding of control gaps, and their capacity to manipulate documentation, timing, or approvals without triggering detection, particularly when they occupy roles with privileged access and discretion (Albrecht et al., 2012). Capability also facilitates fraud persistence: individuals with superior problem-solving skills and organisational influence may better manage concealment strategies, coordinate circumvention, and withstand scrutiny, thereby increasing both the feasibility and continuation of internal fraud (Dorminey et al., 2012). Consistent with later integrative frameworks that retain capability as a core driver alongside other fraud antecedents, the literature implies that higher capability strengthens the enactment and concealment of fraudulent behaviour, leading to:

H4: Capability is positively associated with internal fraud.

Arrogance and internal fraud.
Arrogance is increasingly recognised as a behavioural antecedent that elevates the risk of internal (occupational) fraud because it reflects an excessive sense of superiority, entitlement, and perceived immunity from organisational rules and oversight. In the fraud pentagon framework, arrogance is introduced to explain why certain individuals, particularly those with status, discretion, or organisational influence may believe internal controls do not apply to them and may therefore override procedures, intimidate subordinates, or disregard ethical constraints when pursuing personal or performance-related objectives (Crowe Horwath, 2011). This logic is retained in later integrative formulations of fraud (including the fraud hexagon), which emphasise that arrogance can facilitate both the initiation and

continuation of fraud by reducing fear of detection and strengthening the belief that one can control outcomes or manipulate scrutiny (Vousinas, 2019). In organisational behaviour research, arrogance overlaps with traits such as narcissism and hubris, which have been linked to unethical decision-making, rule-breaking, and heightened propensity for misrepresentation, particularly when individuals hold power, face weak governance constraints, or operate in environments where deference is common (Rijsenbilt & Commandeur, 2013; Owen & Davidson, 2009). Accordingly, the literature suggests that when arrogance is salient, manifested through dominance, contempt for controls, and confidence in evading sanctions, the probability of internal fraud increases, leading to:

H5: Arrogance is positively associated with internal fraud.

Collusion and internal fraud
Collusion is increasingly viewed as a critical antecedent of internal (occupational) fraud because it enables coordinated wrongdoing that can neutralise formal controls and materially reduce the likelihood of detection. In organisational settings, many key controls, particularly segregation of duties, dual authorisation, and independent review, assume that at least one actor in the process remains honest; when two or more insiders cooperate, they can systematically circumvent these safeguards by sharing access credentials, coordinating transaction approval and documentation, and mutually reinforcing concealment strategies across functions (Albrecht et al., 2012; Dorminey et al., 2012). This logic underpins the Fraud Hexagon, which explicitly incorporates collusion to address limitations of earlier models that often implicitly treat fraud as an individual act; Vousinas (2019) argues that collusive arrangements can amplify both the feasibility and sustainability of fraud by combining complementary capabilities, distributing tasks (execution vs. cover-up), and leveraging social influence to suppress reporting. Practitioner evidence further suggests that collusion is associated with more complex schemes and substantially greater organisational losses, precisely because colluders can defeat routine monitoring and extend scheme duration (ACFE, 2024). Accordingly, the literature implies that

greater propensity or presence of collusion increases internal fraud risk, leading to:

H6: Collusion is positively associated with Internal Fraud.

Research methods

Research Design and data
This study adopts a quantitative research approach, emphasizing the systematic collection and analysis of numerical data to objectively evaluate and test the proposed hypotheses. By relying on measurable variables and statistical techniques, the research aims to identify patterns, relationships, and trends that can provide empirical support for the hypotheses under investigation. The study primarily utilizes secondary data, which were meticulously gathered from reliable existing documentation, such as institutional reports, statistical records, and other published sources that are relevant to the research context. This approach not only ensures that the study is grounded in verifiable evidence but also enhances the credibility and validity of its findings by leveraging data that have already been subjected to prior scrutiny and verification.

The empirical analysis employs a balanced panel dataset covering the period 2020–2024 (five annual periods) across 23 cross-sectional units, yielding a total of 115 observations (23 units × 5 years). The balanced structure indicates that each unit is observed consistently in every year of the study period, thereby supporting comparability across time and entities and reducing concerns associated with missing time-series entries. This panel configuration enables the study to capture both cross-sectional heterogeneity among the units and intertemporal variation over the five-year horizon, providing an appropriate basis for estimating relationships while accounting for differences across units and changes over time.

Operationalization of variables
This study aims to comprehensively analyze banking sector companies listed on the Indonesia Stock Exchange (IDX) over the period 2020–2024, focusing on the relationship between internal fraud and the elements of the Fraud Hexagon framework. The research specifically examines six dimensions: pressure, which is measured by financial targets; opportunity, assessed through the level of effective supervision; rationalization, evaluated via directors' remuneration; capability, indicated by the turnover of the board of directors; arrogance, reflected in the frequency of CEO images appearing in publications; and collusion, measured through the existence of political connections. These six elements function as independent variables (X), while internal fraud represents the dependent variable (Y). The detailed operationalization, measurement methods, and variable descriptions relevant to this study are systematically summarized in Table 1, providing the foundation for the data analysis and interpretation of findings.

Table 1. Variable description and measurement

Variable	Description and measurement
Internal Fraud (Y)	Internal fraud is used as the dependent variable (Y) and is expressed as a ratio variable, measured based on the number of internal fraud cases reported by each bank in their annual reports during the research period.
Pressure (X1)	The Non-Performing Loan (NPL) ratio measures the percentage of non-performing loan those classified as Substandard, Doubtful, or Loss relative to the total loans disbursed by the bank. NPL reflects the quality of the bank's credit assets, which is a key focus of bank management, and may create pressure that potentially drives the occurrence of internal fraud. The NPL measurement is derived from the NPL ratio reported in the banks' annual reports.
Opportunity (X2)	Effective supervision is one of the key efforts in minimizing the occurrence of fraud (Skousen et al., 2009). Corporate supervision is believed to be more effective with the presence of an independent board of commissioners, thereby reducing the risk of fraud. This variable is measured by the percentage of independent commissioners in the company, as follows: $$KES = \frac{Number\ of\ Independent\ Commissioners}{Total\ Board\ of\ Commissioners}$$

Rationalization (X3)	Rationalization is measured using the ratio of directors' remuneration, calculated by dividing the total directors' remuneration by the bank's net income for the same period. This ratio is used to capture the perception of unfair compensation, which may lead to moral justification for committing fraud, and is measured as follows: $$RAS = \frac{Total\ Director's\ Remuneration}{Net\ Profit\ After\ Tax}$$
Capability (X4)	Frequent changes in the board of directors can lead to unstable transition periods, weaken oversight functions, and create pressure and uncertainty within the company's internal environment. Such conditions may increase the risk of internal fraud. The proxy for board of directors' turnover is represented by the following classification: $$KAP = \frac{Number\ of\ Directors\ Changing\ in\ One\ Period}{Total\ Directors}$$
Arrogance (X5)	The number of CEO images featured in the company's annual report is used as an indicator to assess the extent to which the CEO exhibits arrogance or a sense of superiority. The scale is classified into two ordinal categories: low (code 1) for 0–3 photos, and high (code 2) for more than 3 photos.
Collusion(X6)	Collusion, proxied by political connections, can create opportunities for cooperation in committing fraud for the benefit of certain parties. The stronger the collusive practices within an entity, the greater the likelihood of fraudulent behavior. This study measures collusion using the following proxy: $$KOL = \frac{Number\ of\ Commissioners\ Holding\ Concurrent\ Government\ Positions}{Total\ Board\ of\ Commissioners}$$

Results

Table 2 reports the panel least squares estimation of internal fraud with a cross-section fixed-effects specification (dummy variables), indicating that the coefficients are identified from within-bank variation over 2020–2024 after accounting for unobserved, time-invariant differences across banks. The model demonstrates strong overall fit, with R-squared = 0.826932 and adjusted R-squared = 0.770584, and the joint significance test confirms that the regressors (together with the fixed effects) are statistically meaningful in explaining internal fraud (F-statistic = 14.67547; Prob(F) = 0.000000). Consistent with the table note, the dependent variable is internal fraud, and the reported Root MSE and standard error of regression summarise the remaining unexplained variation around the fitted values.

Turning to the Fraud Hexagon predictors, the coefficient estimates do not provide statistical support for the proposed hypotheses at conventional significance levels (p > 0.05). Specifically, pressure (X1) exhibits a positive but insignificant association with internal fraud (β = 0.313035; t = 0.772905; p = 0.4417), implying that H1 is not supported in this specification. Opportunity (X2) shows a negative but insignificant coefficient (β = −1.604523; t = −0.329792; p = 0.7424), therefore H2 is not supported. Rationalization (X3) is positive but statistically insignificant (β = 5.690442; t = 1.135276; p = 0.2594), indicating H3 is not supported. Capability (X4) is also positive yet insignificant (β = 2.055996; t = 1.454091; p = 0.1496), providing no empirical support for H4. Arrogance (X5) yields a near-zero positive coefficient and is highly insignificant (β = 0.117844; t = 0.131708; p = 0.8955), thus H5 is not supported. Finally, collusion (X6) is positive but insignificant (β = 2.104168; t = 0.555315; p = 0.5801), indicating H6 is not supported.

Table 2 provides a comprehensive overview of the results obtained from the fixed-effects panel model. This table summarises the statistical outputs, including the coefficients of the predictors, the significance levels, and the overall model fit indicators. The model itself demonstrates strong statistical significance, as evidenced by the outcomes of the F-test. This result indicates that, collectively, the set of predictors contributes meaningfully to explaining variations in internal fraud across banks. The explanatory strength of the model is

supported further by the adjusted R-squared value, which accounts for the proportion of variance in the dependent variable after adjusting for the number of predictors used.

This suggests that, even after controlling for model complexity, the predictors collectively capture a notable portion of the behaviour of internal fraud cases.

Table 2. Panel least square regression result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.330435	0.251601	17.21154	0.0000
Pressure (X1)	0.313035	0.405011	0.772905	0.4417
Opportunity (X2)	-1.604523	4.865254	-0.329792	0.7424
Rationalization (X3)	5.690442	5.012386	1.135276	0.2594
Capability(X4)	2.055996	1.413939	1.454091	0.1496
Arrogance(X5)	0.117844	0.894737	0.131708	0.8955
Collusion(X6)	2.104168	3.789141	0.555315	0.5801
	Effects Specification			
Cross-section fixed (dummy variables)				
Root MSE	2.333248	R-squared		0.826932
Mean dependent var	4.330435	Adjusted R-squared		0.770584
S.D. dependent var	5.633113	S.E. of regression		2.698116
Akaike info criterion	5.036748	Sum squared resid		626.0655
Schwarz criterion	5.728948	Log likelihood		-260.6130
Hannan-Quinn criter.	5.317708	F-statistic		14.67547
Durbin-Watson stat	2.491922	Prob(F-statistic)		0.000000

Note: dependent variable is internal fraud

Despite the overall model significance, the analysis indicates that none of the individual Fraud Hexagon proxies exerts a statistically significant partial effect on internal fraud during the observation period. In other words, when the risk factors are considered individually, none of them shows sufficient evidence to directly influence internal fraud in isolation. This outcome implies that the effect of each risk factor is muted when controlling for other variables, meaning that no single proxy seems to drive the occurrence of fraud independently.

This finding leads to the interpretation that internal fraud in banks may be more accurately understood as the result of the combined influence of multiple risk factors rather than the dominance of any single factor within the Fraud Hexagon framework. In practical terms, it indicates that the interplay among the proxies, rather than their isolated effects, is what contributes to variations in internal fraud. Consequently, risk assessments and mitigation strategies should focus on evaluating the collective dynamics of these factors, as relying on any single proxy may fail to capture the underlying complexity of fraudulent behaviour within the banking sector.

Discussion

This study set out to examine whether the Fraud Hexagon dimensions, namely pressure, opportunity, rationalization, capability, arrogance, and collusion explain variations in internal fraud among IDX-listed banks over 2020–2024 using a balanced panel of 23 banks (115 observations)**.** The empirical model employs cross-section fixed effects, thereby controlling for unobserved, time-invariant differences across banks (persistent governance quality, risk appetite, and organisational culture). The overall model is statistically adequate (R^2 = 0.8269; adjusted R^2 = 0.7706; Prob(F) = 0.0000), indicating that the specification, including bank fixed effects, captures substantial variation in internal fraud. However, the central finding is that none of the six Fraud Hexagon proxies displays a statistically significant partial effect ($p > 0.05$), implying that H1–H6 are not supported in the fixed-effects estimation.

A plausible interpretation is that the Fraud Hexagon remains theoretically appropriate for banking, particularly because it integrates behavioural, organisational, and relational conditions, and explicitly incorporates collusion which can undermine

segregation-of-duties controls. Yet, when the analysis is restricted to within-bank changes over time (as in fixed effects), the selected proxies may not adequately capture the short-run, within-entity dynamics of internal fraud. For instance, several constructs in this study are operationalised using relatively coarse or slow-moving indicators, such as CEO-image frequency for arrogance (two-category ordinal coding) and turnover-based classifications for capability. If these indicators do not vary substantially within a bank across five years or vary in ways weakly aligned with fraud incidents, the resulting coefficients will tend to be statistically indistinguishable from zero even if the underlying construct is theoretically relevant.

In addition, the use of internal fraud cases disclosed in annual reports as the dependent variable, while appropriate for archival research, introduces a key measurement consideration: reported cases reflect not only the underlying occurrence of fraud, but also detection intensity and disclosure practices. This matters particularly for "opportunity" and governance-related indicators. Opportunity is proxied by the proportion of independent commissioners as a measure of effective supervision. Stronger supervision may reduce fraud incidence, but it may simultaneously increase detection and reporting of cases that would otherwise remain hidden; these countervailing channels can attenuate net effects in regression estimates. The same logic can apply to collusion proxied by political connections: political ties may facilitate concealment, yet they may also heighten scrutiny and compliance demands, yielding an empirically ambiguous association with disclosed cases.

The insignificance of pressure, rationalization, capability, arrogance, and collusion should also be understood in light of the model structure and study horizon. Pressure is proxied by NPL as a financial-target stressor. Rationalization is proxied by directors' remuneration relative to net income, intended to reflect perceived unfairness that could support moral justification. Capability is proxied by board turnover classifications that may create transitional instability and weaker oversight. While these operationalisations are conceptually defensible, their effects on internal fraud may operate through longer lags, interact with internal control maturity, or become

visible only under particular organisational conditions (weak enforcement, permissive culture). In a five-year window, and after absorbing stable cross-bank heterogeneity via fixed effects, the remaining within-bank variation may be insufficient to identify robust effects.

When viewed against prior Fraud Hexagon applications, the findings are also consistent with an important distinction noted in the manuscript: much of the existing empirical work in Indonesia has focused on fraudulent financial reporting rather than internal fraud as a broader phenomenon. Banking internal fraud may be more operationally embedded, manifesting in credit origination, procurement, treasury, branch operations, and customer account administration where the mechanisms linking hexagon elements to observed disclosures can be more complex than in financial statement fraud settings. This broader conceptualisation strengthens the contribution of the present study, but it also raises the empirical bar for measurement: internal fraud in operational processes may require more granular indicators (internal audit findings, enforcement actions, whistleblowing metrics, or detailed loss event databases) than annual-report case counts can provide.

From a practical standpoint, the results underscore that anti-fraud effectiveness in banking may not be adequately captured by a small set of publicly observable proxies alone, especially when institutions differ systematically in unobservable ways. This implication aligns with the regulatory emphasis on strengthening internal controls and adopting an anti-fraud strategy with continuous improvement. For boards, audit committees, and internal audit functions, the findings suggest prioritising integrated control architecture and detection capabilities rather than relying on singular signals (independent commissioners' proportion or CEO-visibility cues) as sufficient predictors of internal fraud risk.

Finally, several limitations point directly to future research opportunities. First, reliance on disclosed internal fraud cases may understate latent fraud and conflate occurrence with detection. Second, some proxies are coarse (e.g., two-level arrogance) and may be strengthened with richer measures of executive traits and governance processes. Third, with 23 banks over five years, statistical power for

detecting modest effects may be limited, particularly under fixed effects where identification depends on within-bank variation. Future studies could (i) extend the observation window, (ii) incorporate time effects and lag structures, and (iii) triangulate annual-report disclosures with supervisory enforcement releases, internal control ratings, or operational risk loss-event data to better align Fraud Hexagon mechanisms with observable outcomes.

Conclusion

This study investigated whether the six elements of the Fraud Hexagon—pressure, opportunity, rationalization, capability, arrogance, and collusion—are associated with internal fraud among banking firms listed on the Indonesia Stock Exchange over 2020–2024. The analysis employed a balanced panel dataset comprising 23 banks across five annual periods (115 observations) and operationalised internal fraud as the number of internal fraud cases reported in banks' annual reports, with each Fraud Hexagon construct measured using observable governance- and financial-based proxies. The estimation was conducted using a cross-section fixed-effects (dummy variables) specification to account for unobserved, time-invariant heterogeneity across banks.

Empirically, the model is jointly significant and demonstrates substantial explanatory power ($R^2 = 0.8269$; adjusted $R^2 = 0.7706$; Prob(F) = 0.0000). However, none of the individual Fraud Hexagon proxies exhibits statistical significance at conventional levels ($p > 0.05$): pressure ($p = 0.4417$), opportunity ($p = 0.7424$), rationalization ($p = 0.2594$), capability ($p = 0.1496$), arrogance ($p = 0.8955$), and collusion ($p = 0.5801$). Accordingly, the hypotheses predicting direct effects of each Fraud Hexagon element on internal fraud (H1–H6) are not supported in the fixed-effects specification. Conceptually, this pattern suggests that, after controlling for stable bank-specific characteristics, year-to-year changes in the selected proxies do not systematically explain changes in disclosed internal fraud during the period studied.

From a practical perspective, the findings imply that stakeholders should be cautious in relying on these public proxies alone (e.g., NPL-based pressure, independent commissioner proportion, remuneration ratios,

turnover categories, CEO-image frequency, and political connections) as stand-alone indicators of internal fraud risk in listed banks. In addition, the study highlights several directions for future work. First, given that the dependent variable is based on annual-report disclosures, subsequent research could triangulate disclosed cases with alternative sources (enforcement releases or supervisory reports) to better distinguish fraud occurrence from detection and reporting intensity. Second, extending the observation period and refining construct measurement may improve the ability to detect effects that are potentially lagged or conditional. Overall, this study contributes evidence that, within Indonesian listed banks during 2020–2024, the Fraud Hexagon proxies used here do not show statistically significant direct associations with internal fraud once bank fixed effects are taken into account.

Limitations

First, the dependent variable is based on disclosed cases. Internal fraud is operationalised as the number of internal fraud cases reported by each bank in its annual report *during* 2020–2024. While this approach is transparent and replicable, it may conflate fraud occurrence with fraud detection and disclosure intensity. Banks with stronger internal controls and reporting systems may disclose more cases because they detect more incidents, whereas banks with weaker detection or disclosure practices may understate the true incidence of internal fraud. This potential reporting bias can attenuate estimated relationships between Fraud Hexagon proxies and the observed outcome.

Second, construct measurement relies on archival proxies that may only partially capture the underlying behavioural mechanisms. Each Fraud Hexagon element is proxied using observable indicators derived from annual reports and related disclosures (pressure via NPL; opportunity via independent commissioners; rationalization via remuneration-to-income; capability via board turnover; arrogance via CEO-image frequency; collusion via political connections). Some proxies are necessarily simplified, for example, arrogance is coded into two ordinal categories based on CEO-photo frequency (low vs. high). Such operationalisations may introduce measurement error and

limit construct validity, particularly for latent constructs such as rationalization and collusion that may be better captured through more granular governance/process indicators, enforcement events, or qualitative evidence.

Third, the sample size and context constrain statistical power and generalisability. The empirical analysis uses a balanced panel of 23 banks over five years (115 observations). Although adequate for baseline panel estimation, this sample may have limited power to detect small-to-moderate effects, especially in a fixed-effects framework where identification depends on within-bank variation over time. Moreover, the setting is restricted to IDX-listed banks in Indonesia, which may limit the extent to which the findings generalise to non-listed financial institutions or other country contexts.

Fourth, the modelling strategy may not fully address endogeneity and dynamic effects. The study employs a quantitative, secondary-data design. In this setting, relationships between governance/financial proxies and internal fraud may be bidirectional (fraud events may trigger governance changes or policy tightening) or may operate with lags. In addition, macro-level shocks during 2020–2024 could influence both bank risk profiles and fraud control intensity. Consequently, causal interpretation should be made cautiously, and future studies may benefit from lag structures, time effects, instrumental-variable strategies, or quasi-experimental designs where feasible.

Fifth, the operationalisation of "internal fraud" as a count outcome may warrant alternative estimators. Because the dependent variable is a number of cases, models designed for count data (Poisson or negative binomial panel specifications) may be informative robustness checks, particularly if the distribution is skewed or over-dispersed. This does not invalidate the present estimation, but it represents an important extension for methodological robustness.

Suggestions

Banks and regulators should prioritise strengthening fraud detection and disclosure governance, not only preventive controls. Because internal fraud in this study is captured through the number of cases disclosed in annual reports, differences in reporting discipline and detection capability can influence the observed outcome. Accordingly, consistent disclosure standards, robust whistleblowing arrangements, continuous auditing, and more systematic forensic monitoring are recommended to improve comparability and reduce the risk that internal fraud remains latent or under-reported.

In addition, banks should move beyond reliance on publicly observable proxies as stand-alone indicators of fraud risk. The proxies used to represent the Fraud Hexagon elements, such as NPL for pressure, independent commissioners for opportunity, remuneration ratios for rationalization, board turnover for capability, CEO image frequency for arrogance, and political connections for collusion—may not fully capture process-level vulnerabilities that generate internal fraud. A more risk-based approach is therefore advisable, combining governance structures with operational controls and measurable control outcomes, including transaction-level red flags, internal audit findings, remediation timeliness, repeated control exceptions, and loss-event analytics.

For governance practice, the findings suggest that effectiveness should be evaluated in terms of control performance rather than composition alone. Opportunity is proxied by the proportion of independent commissioners as an indicator of effective supervision, yet supervisory impact is likely to be reflected more directly in the execution quality of anti-fraud programmes, audit committee follow-through, and the strength of compliance reviews. Similarly, political exposure, operationalised as political connections to represent collusion, should be treated as a governance risk factor requiring enhanced transparency, due diligence for politically exposed persons and related-party transactions, and strengthened compliance monitoring.

For future research, the most important extension is to improve measurement of internal fraud beyond annual-report disclosures, given that disclosed cases may reflect detection and reporting intensity as much as underlying incidence. Researchers could triangulate disclosures with supervisory or enforcement publications, court decisions, or operational loss-event databases to strengthen validity. Further, several constructs, particularly those that are behavioural or relational in nature—would benefit from richer operationalisation; for example, arrogance, currently proxied through CEO-photo frequency categories,

could be complemented by textual indicators from annual reports, executive communication patterns, or other behavioural markers.

Methodologically, subsequent studies should consider longer time horizons and dynamic specifications, because effects may be lagged and governance adjustments may follow fraud incidents rather than precede them. Given that internal fraud is measured as a count of cases, panel count-data models (e.g., Poisson or negative binomial fixed effects) and robustness checks for over-dispersion or excess zeros would also be appropriate. Finally, future empirical tests may be strengthened by examining interaction or configurational effects implied by fraud theory (e.g., pressure becoming consequential primarily when opportunity is high), and by expanding the scope beyond listed banks to improve generalisability across institutional settings.

References

Achmad, T., Ghozali, I., & Pamungkas, I. D. (2022). Hexagon fraud: Detection of fraudulent financial reporting in state-owned enterprises Indonesia. *Economies, 10*(1), 13.

Adhania, S., Holiawati, & Nofryanti. (2024). The effect of hexagon fraud theory in detecting financial statement fraud. *International Journal of Digital Marketing Science, 1*(1), 10–23. https://doi.org/10.54099/ijdms.v1i1.854

Albrecht, W. S., Albrecht, C. O., Albrecht, C. C., & Zimbelman, M. F. (2012). *Fraud examination* (4th ed.). South-Western Cengage Learning.

Association of Certified Fraud Examiners (ACFE). (2024a). *Report to the nations: Global study on occupational fraud and abuse*. ACFE.

Association of Certified Fraud Examiners (ACFE). (2024b). *Occupational fraud 2024: A report to the nations (Key findings)*. ACFE.

Boyle, D. M., DeZoort, F. T., Hermanson, D. R., & Wolfe, D. T. (2018, March 1). Improving fraud risk management with an enhanced fraud triangle. *Fraud Magazine (ACFE)*.

Committee of Sponsoring Organizations of the Treadway Commission (COSO). (2013). *Internal control—Integrated framework*. COSO.

Crowe Horwath. (2011). *The fraud pentagon theory*. Crowe Horwath LLP.

Cressey, D. R. (1953). *Other people's money: A study in the social psychology of embezzlement*. Free Press.

Dorminey, J. W., Fleming, A. S., Kranacher, M.-J., & Riley, R. A. (2012). The evolution of fraud theory. *Issues in Accounting Education, 27*(2), 555–579.

Indriaty, L., & Thomas, G. N. (2023). Analysis of hexagon fraud model, the S.C.C.O.R.E model influencing fraudulent financial reporting on state-owned companies of Indonesia. *Economics – Innovative and Economics Research Journal, 11*(Special 1).

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305–360.

Otoritas Jasa Keuangan (OJK). (2024). *Peraturan Otoritas Jasa Keuangan Republik Indonesia Nomor 12 Tahun 2024 tentang Penerapan Strategi Anti Fraud bagi Lembaga Jasa Keuangan*.

Owen, D., & Davidson, J. (2009). Hubris syndrome: An acquired personality disorder? A study of US Presidents and UK Prime Ministers over the last 100 years. *Brain, 132*(5), 1396–1406.

Rijsenbilt, A., & Commandeur, H. (2013). Narcissus enters the courtroom: CEO narcissism and fraud. *Journal of Business Ethics, 117*(2), 413–429.

Sykes, G. M., & Matza, D. (1957). Techniques of neutralization: A theory of delinquency. *American Sociological Review, 22*(6), 664–670.

Vousinas, G. L. (2019). Advancing theory of fraud: The S.C.O.R.E. model. *Journal of Financial Crime, 26*(1), 372–381. https://doi.org/10.1108/JFC-12-2017-0128

Wolfe, D. T., & Hermanson, D. R. (2004). The fraud diamond: Considering the four elements of fraud. *The CPA Journal, 74*(12), 38–42.