

-RESEARCH ARTICLE-

INDEPENDENT DIRECTOR'S ATTRIBUTES AND TUNNELLING: THE MODERATING ROLE OF INTERNAL CONTROL

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—Abstract—

Tunnelling, defined as the appropriation of corporate assets by controlling shareholders, presents substantial challenges to effective corporate governance and stakeholder protection. Independent directors are regarded as essential oversight mechanisms to curb such practices. However, much of the existing literature has concentrated on board diversity, with limited emphasis on the specific human capital characteristics that bolster the performance of independent directors. Addressing this research gap, the

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present study examines the impact of various attributes of independent directors—namely, financial expertise, political ties, equity ownership, and network centrality—on tunnelling behaviour within the context of Chinese firms. Drawing upon Resource Dependence Theory, the study explores how these human capital traits contribute to governance efficacy. Employing a dataset comprising 4,016 Chinese A-share listed companies over the period 2018 to 2023, the analysis utilises a Feasible Generalised Least Squares (FGLS) model to assess the effects of director attributes on tunnelling, with internal control quality considered as a moderating variable. The findings demonstrate that financial expertise, political connections, shareholding, and network position of independent directors are inversely related to tunnelling. Furthermore, the quality of internal controls strengthens the negative relationship between tunnelling and the attributes of financial expertise, shareholding, and network centrality, underscoring the importance of robust internal control systems in enhancing the monitoring role of independent directors. These insights offer practical implications for improving board functionality and curbing resource misappropriation in corporate governance frameworks.

Keywords: Independent Directors; Tunnelling; Internal Control; Corporate Governance; Political Connections.

INTRODUCTION

Both academic researchers and practitioners have increasingly recognised the critical monitoring function that contributes to improving the efficiency of corporate governance over dominant shareholders (Arifah et al., 2023; Ibrahim et al., 2020; Nwakoby et al., 2018). Prior studies have highlighted that independent directors play a vital role in strengthening governance mechanisms and safeguarding the interests of minority shareholders (Arifah et al., 2024). In emerging economies, it is common for controlling shareholders to engage in expropriation of other investors' interests (Chen et al., 2018; Li et al., 2021).

To counteract such opportunistic behaviour, regulatory authorities have introduced the independent director system. Although previous literature has assessed the broader impact of independent directors on corporate governance (Atanasov et al., 2011; Chen et al., 2020; Du, 2014; Gong et al., 2021; Johnson et al., 2000), the particular human capital attributes that define their value remain insufficiently examined. The present study aims to address this gap by investigating how independent directors' characteristics—specifically financial expertise, political ties, shareholding, and network centrality—contribute to mitigating tunnelling practices, with internal control considered as a moderating factor. Tunnelling is defined as the diversion of corporate wealth by controlling shareholders, often at the expense of minority stakeholders (Bertrand et al., 2002; Claessens & Fan, 2002). The implications of tunnelling are severe, as it erodes investor confidence and undermines trust in the corporate system

(Johnson et al., 2000). In the context of China's emerging market, where ownership is highly concentrated and minority shareholder protection is comparatively weak, tunnelling remains a persistent governance issue (Fan & Wong, 2002; Jiang et al., 2010).

Empirical research has established that board diversity among independent directors can be instrumental in limiting the extent of tunnelling by controlling shareholders (Gong et al., 2021; Zalata et al., 2022). Nonetheless, earlier studies have largely focused on macro-level board attributes such as size and gender composition. Consequently, the specific competencies and resource advantages that individual independent directors contribute to governance remain underexplored. Drawing from Resource Dependence Theory, this study posits that four key human capital dimensions—financial expertise, political affiliations, shareholding, and network positioning—may effectively constrain tunnelling activities. Moreover, the efficacy of independent directors is likely contingent upon the strength of a firm's internal control systems. Therefore, this research investigates the interplay between director attributes and internal control quality in limiting tunnelling behaviour.

Using a dataset of Chinese A-share listed companies, this study evaluates the effects of independent directors' financial expertise, political connections, equity holdings, and network centrality on tunnelling. The empirical findings indicate that each of these attributes is significantly and negatively associated with tunnelling behaviour. These results suggest that directors possessing specialised human capital are more capable of curbing opportunistic actions by controlling shareholders. Additionally, the study finds that internal control quality positively moderates the relationships between tunnelling and three of the four director attributes—namely financial expertise, shareholding, and network position—underscoring the critical role of robust internal governance in enhancing the oversight function of independent directors. Together, these findings highlight the complementary role of external board monitoring and internal control mechanisms in addressing tunnelling in Chinese corporate governance.

This study contributes theoretically in several ways. Firstly, it moves beyond conventional board diversity metrics to highlight the significance of individual human capital in shaping governance outcomes. Secondly, the application of Resource Dependence Theory offers insights into how the external resources embedded in independent directors' backgrounds enhance their monitoring capacities over controlling shareholders. Lastly, by incorporating internal control as a moderating variable, the study offers a novel lens through which to understand the interaction between internal and external governance mechanisms. The empirical insights derived from this research also carry substantial policy relevance for the enhancement of corporate governance in China. Firstly, the results suggest that appointing independent directors with financial expertise can significantly strengthen board oversight and reduce tunnelling. As many Chinese firms face deficiencies in financial supervision,

incorporating directors with accounting or finance backgrounds could enhance governance efficacy. Secondly, the finding that directors with equity stakes are more inclined to protect shareholder interests implies that aligning financial incentives may help mitigate conflicts between stakeholders. Thirdly, the positive influence of network position indicates that directors with broader social and professional networks can access external information and resources that enhance their ability to monitor managerial behaviour. Lastly, the moderating role of internal control suggests that even highly qualified independent directors may fall short in effectiveness without strong internal governance frameworks. Hence, policymakers and regulatory bodies should consider reinforcing internal control systems in tandem with board reforms.

The remainder of this paper is organised as follows. Section 2 presents an extensive literature review and outlines the hypotheses. Section 3 introduces the conceptual framework. Section 4 discusses the research methodology, including data sources, variable definitions, and analytical techniques. Section 5 reports the empirical results, followed by Section 6, which offers a comprehensive discussion of the findings, their theoretical implications, managerial relevance, and policy recommendations. Section 7 concludes with the study's limitations and outlines directions for future research.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

China's legal system provides relatively weak safeguards for minority shareholders, while controlling shareholders often exploit this institutional gap by engaging in tunnelling activities (Gong et al., 2021; Jiang et al., 2010). These governance issues pose significant barriers to the sustainable development of the country's financial markets. This study concentrates on related-party loan guarantees (RPLG), which serve as a principal mechanism through which controlling shareholders divert corporate resources.

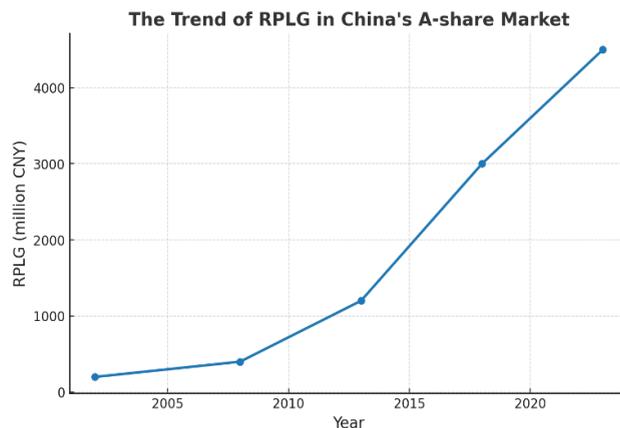


Figure 1: The Trend of RPLG in China's A-Share Market (Authors' Compilation)

Given that RPLG falls under the scrutiny of the China Securities Regulatory Commission (CSRC), it constitutes a critical area of regulatory oversight. As illustrated in [Figure 1](#), there has been a consistent rise in the use of RPLG within China's A-share market from 2002 to 2023, with a marked acceleration observed after 2013. This increasing trend highlights the urgency of enhancing governance frameworks to curb tunnelling behaviours in the Chinese context. In response, the CSRC has promoted the appointment of independent directors as a monitoring mechanism intended to reduce such expropriation.

Independent Director and Tunnelling

Empirical research consistently highlights the importance of independent directors in enhancing the effectiveness of corporate governance, particularly in the context of mitigating the influence of controlling shareholders. Global studies suggest that independent directors play a crucial role in strengthening firm performance, promoting transparency in financial reporting, and enhancing oversight mechanisms ([Masulis & Zhang, 2019](#)). For example, [Masulis and Zhang \(2019\)](#) demonstrated that external directors improve merger and acquisition outcomes and accounting quality in the United States. In the context of emerging economies, [Awais Amin and Cumming \(2023\)](#) noted that independent directors are instrumental in reducing earnings manipulation in both Singapore and Vietnam. Within China, [Gong et al. \(2021\)](#) showed that a higher proportion of independent directors is effective in curbing tunnelling through other receivables. Collectively, these findings support the view that independent directors are key governance agents. Nonetheless, a notable gap remains in the literature, as prior studies have not fully examined how specific human capital attributes of independent directors' influence tunnelling behaviours.

Resource Dependence Theory provides a robust theoretical foundation for understanding the mechanisms through which independent directors limit tunnelling. The theory posits that organisational sustainability depends on securing vital external resources, which independent directors are uniquely positioned to deliver ([Reitz et al., 1979](#)). Those with expertise in finance, established political affiliations, and extensive social networks are particularly valuable in this regard, as they facilitate access to critical knowledge and relationships that reinforce governance structures. Such attributes equip independent directors to perform their monitoring responsibilities more effectively ([Alquhaif & Alobaid, 2024](#)), reduce informational disparities, and promote heightened regulatory vigilance. Empirical findings support these claims. For instance, [Alquhaif et al. \(2021\)](#) observed that independent directors serving on audit committees are negatively associated with value-reducing share repurchases in Malaysia. Taken together, this evidence suggests that independent directors possessing specialised human capital represent a significant deterrent to tunnelling practices.

Independent Director Financial Expertise and Tunnelling

A substantial body of empirical research has established that independent directors possessing financial expertise significantly contribute to the enhancement of corporate governance mechanisms. For instance, [Malik and Shafie \(2021\)](#) found that the financial proficiency of independent directors is linked to lower agency costs within Malaysian firms. In the United States, [Gilani et al. \(2021\)](#) observed that financially skilled independent directors play a pivotal role in promoting stable decisions concerning bank capital, thereby reinforcing governance structures. Likewise, [Safari Gerayli et al. \(2021\)](#) reported that audit committees comprising financial experts markedly improve the quality of financial disclosures among listed companies in Iran. In the Chinese setting, [Bilal et al. \(2023\)](#) demonstrated that independent directors with financial expertise are effective in limiting earnings management, a common avenue for tunnelling. These empirical findings collectively suggest that financial expertise enhances the capacity of independent directors to monitor and restrain the opportunistic behaviour of controlling shareholders.

Nonetheless, although existing studies provide useful evidence regarding the benefits of financial expertise, many adopt a largely descriptive orientation, lacking in theoretical depth or rigorous causal analysis of the mechanisms through which such expertise translates into improved governance. Furthermore, much of the existing literature is based on institutional contexts characterised by relatively strong legal enforcement and diffused ownership and therefore may not be directly applicable to environments such as China, where legal protections for minority shareholders are limited and ownership concentration is high. This indicates a research gap: while consensus is emerging around the value of financial expertise, few studies have systematically examined the contextual factors and boundary conditions that influence its effectiveness. To address this gap, the present study applies Resource Dependence Theory to construct a comprehensive theoretical model explaining the manner and conditions under which financial expertise influences tunnelling behaviours.

Resource Dependence Theory posits that organisations rely on access to external resources for survival and effective functioning, with corporate boards acting as critical interfaces that enable the acquisition of such resources ([Reitz et al., 1979](#)). Independent directors with financial expertise provide valuable knowledge in areas such as financial analysis, risk oversight, and regulatory compliance. These competencies reduce information asymmetry and strengthen internal control mechanisms. Moreover, their expertise enhances the scrutiny of external stakeholders, including auditors and regulators, thereby increasing the likelihood of tunnelling practices being identified and penalised. On the basis of this theoretical and empirical rationale, this study puts forward the following hypothesis.

H1: *Independent directors' financial expertise will reduce tunnelling by controlling shareholders.*

Independent Director Political Connections and Tunnelling

Empirical findings from both international and Chinese research suggest that political affiliations of independent directors can play a constructive role in strengthening corporate governance and constraining tunnelling by controlling shareholders. For instance, [Goldman et al. \(2013\)](#) found that, in the United States, firms with politically connected board members generally achieve superior financial performance. Comparable conclusions have been drawn in other settings; [Fremeth and Holburn \(2020\)](#) reported that political ties among board members in Canada are associated with improved financial outcomes, while [de Andres et al. \(2023\)](#) documented a positive relationship between board-level political connections and corporate social responsibility in Spain. Despite this substantial body of literature, a critical gap remains existing studies have not explicitly examined whether, or in what manner, political connections among independent directors' influence tunnelling behaviour. This omission is particularly pertinent to China, where the legal framework offers limited protection for minority shareholders, creating conditions conducive to tunnelling. Drawing on the principles of Resource Dependence Theory ([Reitz et al., 1979](#)), it is posited that organisations depend on external resources to navigate complex and uncertain environments. Independent directors with political ties are uniquely positioned to secure such resources through their access to governmental institutions and regulatory authorities. These connections serve to intensify external oversight and encourage stronger internal compliance systems. As a result, the risk of tunnelling by controlling shareholders is significantly diminished. Considering this reasoning, the study proposes the following hypothesis.

H2: *Independent directors' political connections will reduce tunnelling by controlling shareholders.*

Independent Director Shareholding and Tunnelling

Existing research indicates that equity ownership by independent directors is positively associated with improved corporate governance outcomes. For example, [Keasey et al. \(1994\)](#) found that when directors hold greater equity stakes, key performance metrics such as return on assets and shareholder value tend to exhibit enhancement. In a more recent study, [Chan et al. \(2023\)](#) demonstrated that equity ownership by independent directors contributes to mitigating agency conflicts between directors and shareholders, thereby promoting more robust oversight. Nonetheless, although prior studies highlight the governance benefits of independent directors' shareholding in alleviating general agency issues, limited empirical attention has been devoted to its effect on tunnelling—an acute and harmful manifestation of value diversion by controlling shareholders.

Much of the extant literature has concentrated on broader governance indicators, such as board independence and firm profitability, while offering minimal insight into how director ownership addresses specific agency risks, particularly tunnelling practices involving related-party asset transfers or loan guarantees for dominant shareholders.

Drawing on Resource Dependence Theory, equity ownership can be viewed as a strategic resource that aligns the interests of independent directors with those of the firm (Keasey et al., 1994). This alignment not only enhances directors' commitment to corporate success but also strengthens their capacity to secure external resources and exercise greater oversight authority (Daily & Dalton, 2003). Independent directors who hold substantial equity stakes are therefore better equipped to identify and prevent tunnelling behaviour, as they would personally incur losses from value-depleting actions. Based on these theoretical and empirical insights, the study advances the following research hypothesis.

H3: *Independent directors shareholding will reduce tunnelling by controlling shareholders.*

Independent Director Network Position and Tunnelling

Existing research from both international and Chinese contexts offers strong evidence that the network positions of independent directors enhance corporate governance and alleviate agency conflicts, including tunnelling by controlling shareholders. For example, Fan et al. (2023) find that director networks significantly increase firm value by improving access to information, especially within American companies that rely heavily on information sourced through networks. Likewise, investigations into China A-share listed companies (Liu & Li, 2024; Zhao & Chan, 2023) indicate that independent directors occupying influential network positions foster open innovation and corporate social responsibility by easing financing constraints and lowering transaction costs. These outcomes correspond with wider literature (H. Li et al., 2022; Liu et al., 2024) demonstrating that socially connected directors utilise their networks to obtain vital resources, enhance decision-making processes, and rehabilitate reputations following financial misstatements. Despite confirmation that independent directors' networks improve governance by facilitating information flow and resource acquisition, their effectiveness in curbing tunnelling has yet to be explored.

Network position reflects an independent director's capacity to access and mobilise essential resources, information, and expertise through their immediate network links. This study operationalises independent directors' network position as network centrality, measured specifically by degree centrality, which quantifies the number of direct external ties a firm holds via directors' connections (for example, the total number of firms directly linked through shared directors) (Liu & Li, 2024). Resource Dependence Theory posits that organisations depend on external networks to acquire resources and diminish environmental uncertainty. A higher degree of network

centrality indicates that independent directors maintain stronger and more direct connections within the corporate network (Fan et al., 2023). By utilising these direct links, independent directors with greater network centrality can more effectively reduce agency costs and limit opportunistic behaviour regarding resources (Zhao & Chan, 2023). Consequently, this study proposes the following hypothesis.

H4: *Independent directors' network positions are negatively associated with tunnelling by controlling shareholders.*

The Moderator Role of Internal Control

Agency Theory posits that internal control systems are vital mechanisms within corporate governance, serving to enhance transparency, mitigate agency conflicts, and improve the quality of financial reporting. An effective internal control framework can significantly reduce earnings management (J. Li et al., 2022), reflecting improved supervision of corporate decisions. Independent directors play a central role in resolving conflicts of interest between controlling and minority shareholders; however, their capacity to do so is heavily influenced by the quality of internal controls in place. For example, independent directors who possess valuable external resources may detect and prevent manipulative practices that facilitate tunnelling, but such effectiveness depends on the presence of robust internal control systems that guarantee transparency and accountability. Therefore, internal control functions as a critical moderator that strengthens the oversight capabilities of independent directors and restricts tunnelling behaviours. Accordingly, this study advances the following hypothesis.

H5a: *Internal control quality positively moderates the relationship between independent directors' financial expertise and tunnelling.*

H5b: *Internal control quality positively moderates the relationship between independent directors' political connections and tunnelling.*

H5c: *Internal control quality positively moderates the relationship between independent directors' shareholding and tunnelling.*

H5d: *Internal control quality positively moderates the relationship between independent directors' network positions and tunnelling.*

Research Framework

This study is based on the theoretical framework of Resource Dependence Theory, which offers a foundation for understanding how independent directors can leverage human resources to improve governance effectiveness and mitigate tunnelling. As illustrated in Figure 2, tunnelling by controlling shareholders is treated as the dependent variable. The independent variables comprise independent directors' financial expertise, political connections, shareholding, and network position. Internal control quality is incorporated as the moderating variable in this study.

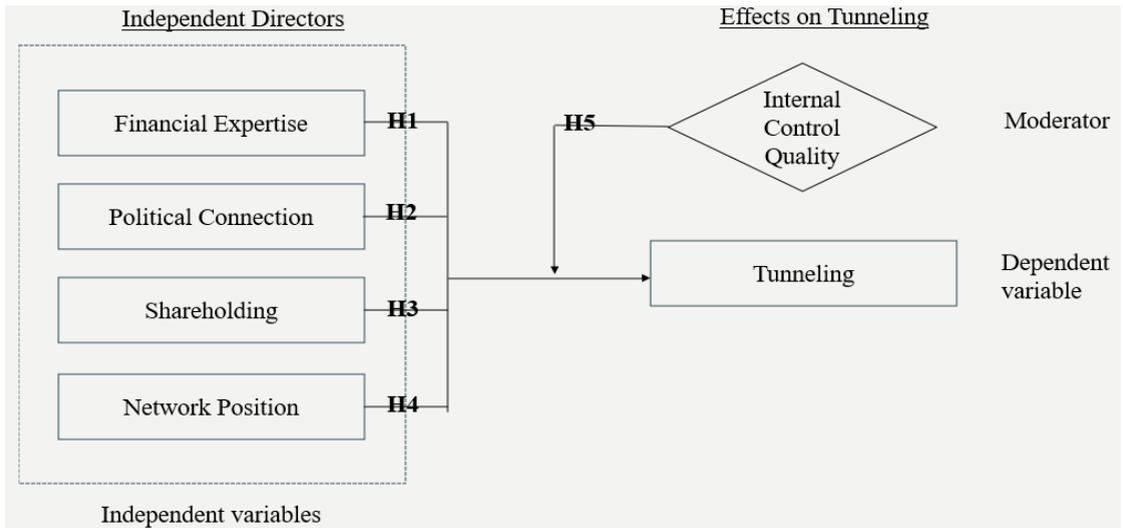


Figure 2: Research Framework of this Study

METHODOLOGY

The sample period for this study commences in 2018, coinciding with the CSRC issuance of the “Guiding Opinions on Further Strengthening the Work Independence of Independent Directors in Listed Companies.” This regulation aims to enhance the autonomy of independent directors by tightening eligibility criteria and establishing clearer guidelines to prevent conflicts of interest between controlling and minority shareholders. The regulatory reform marks a significant shift in board independence and is expected to improve the operational efficiency of independent directors from 2018 onwards. The 2018 reform fundamentally redefined the qualifications of independent directors and conflict-of-interest regulations, thereby creating a natural experiment for analysing governance changes. Data prior to this period reflects pre-reform governance dynamics. This study uses panel data from 2018 to 2023, focusing on independent director attributes in A-share listed firms. The dataset excludes companies without RPLG disclosures, missing data on female independent directors, or incomplete control variables. As shown in Table 1, the initial sample includes 5,469 firm-year observations. After removing 1,257 observations lacking internal control data and 206 with missing control variables, the final sample consists of 4,016 firm-year observations.

Table 1: Sampling Procedure

Procedure	Remaining Firm-Year Observations
Initial Sample	5,469
Excluding Firms with Missing Values of Internal Control	1,257
Excluding Firms with Missing Values of Control Variables	206
Final Sample	4,016

Drawing on prior research (Berkman et al., 2009; Cheng et al., 2020; Huang et al., 2023; Lin, 2024), tunnelling is measured by the ratio of RPLG to total assets, as RPLG—debt guarantees provided by firms to controlling shareholders or affiliates—are a key tunnelling channel (Berkman et al., 2009; Huang, 2016). RPLG data are sourced from the CSMAR database and scaled by total assets. Independent director profiles for Chinese A-share firms from 2018 to 2023 are also retrieved from CSMAR. Financial expertise (EXPERTISE) reflects the number of independent directors with financial qualifications, based on Kang and Peng (2020). Political connection (POLITIC) is defined as the number of independent directors with prior government experience (Ye & Li, 2017). Shareholding (SHARE) is a dummy variable equal to 1 if any independent director holds shares, and 0 otherwise, following DENG and DONG (2021). Network position is captured through the degree centrality index, indicating a firm's link strength within the independent director network (Fan et al., 2023). A higher degree centrality denotes a more prominent position within the network, implying greater influence and enhanced access to shared information and resources. The network is constructed based on independent directors holding concurrent positions across multiple firms. Degree centrality (Degree) is calculated as follows, consistent with prior research (Fan et al., 2023; Liu & Li, 2024).

$$Degree_i = \sum_{j=1}^n \frac{P_{ij}}{n-1}$$

Where, n represents the total number of firms in the independent director network. P_{ij} is a binary variable indicating whether firm i and firm j are connected. If an independent director of firm i also serves as an independent director in firm j , then $P_{ij} = 1$; otherwise, $P_{ij} = 0$.

Firms disclosing internal control deficiencies are classified as having low-quality internal control, while those without such disclosures are regarded as possessing high-quality internal control (J. Li et al., 2022). The Dibo database, a specialised resource for internal control evaluation, provides assessment reports for companies listed on China's A-share market. This database is used to identify firms reporting internal control deficiencies (Xu & Huang, 2021). In this study, internal control quality is represented by the variable ICQ. Companies with reported internal control deficiencies in the Dibo database are assigned a value of 0 for ICQ, indicating poor internal control quality; otherwise, ICQ is set to 1, denoting high-quality internal control. Furthermore, several control variables are incorporated to strengthen the robustness of the analysis, including the shareholding proportion of the top ten shareholders (TOP10), leverage ratio (LEV), firm size (FSIZE), return on assets (ROA), and firm age (FAGE).

Table 2: Variable Definitions

Variable	Abbreviation	Definitions
Tunnelling	TUNNEL	The balance of related-party debt guarantees (RPLG) divided by total assets (Berkman et al., 2009; Cheng et al., 2020; Huang, 2016).
Financial Expertise	EXPERTISE	The number of independent directors with financial expertise (Kang & Peng, 2020).
Political Connection	POLITIC	The number of independent directors with political connections (Wang et al., 2023).
Independent Director Shareholding	SHARE	Dummy variable which is assigned a value of 1 if a company has independent directors holding shares; otherwise, it is assigned a value of 0 (DENG & DONG, 2021).
Network Position	NETWORK	Degree centrality which quantifies a firm's connectivity within the independent director network (Fan et al., 2023).
Internal Control Quality	ICQ	A higher internal control quality (no internal control deficiencies disclosed by the Dibo database) is assigned a value of 1; otherwise, it is assigned a value of 0 (H. Li et al., 2022).
Top 10 Shareholders	TOP10	The shareholding of top10 shareholders (Yang & Zhu, 2022).
Leverage	LEV	Total liabilities divided by total assets (I. Khan et al., 2024).
Firm Size	FSIZE	The natural logarithm of total assets (Chen & Jebran, 2023).
Return on Assets	ROA	Return to total assets (Al-Absy, 2023).
Firm Age	FAGE	The natural logarithm of the number of years since the firm was established (Yang et al., 2022).

Model Identification

To examine the relationships among the variables, the following multiple regression model is employed.

$$TUNNEL = \alpha_0 + \alpha_1 EXPERTISE + \alpha_2 POLITIC + \alpha_3 SHARE + \alpha_4 NETWORK + \alpha_5 TOP10 + \alpha_6 LEV + \alpha_7 FSIZE + \alpha_8 ROA + \alpha_9 FAGE + \varepsilon (1)$$

All variable definitions are detailed in Table 2. α_i means the coefficients of variables or constant. ε means the random error of this model. Furthermore, to evaluate the moderating effect of internal control, the following model is introduced.

$$TUNNEL = \alpha_0 + \alpha_1 EXPERTISE + \alpha_2 POLITIC + \alpha_3 SHARE + \alpha_4 NETWORK + \alpha_5 ICQ + \alpha_6 EXPERTISE_ICQ + \alpha_7 POLITIC_ICQ + \alpha_8 SHARE_ICQ + \alpha_9 NETWORK_ICQ + \alpha_{10} TOP10 + \alpha_{11} LEV + \alpha_{12} FSIZE + \alpha_{13} ROA + \alpha_{14} FAGE + \varepsilon (2)$$

Where EXPERTISE_ICQ, POLITIC_ICQ, SHARE_ICQ, and NETWORK_ICQ denote the interaction terms between EXPERTISE, POLITIC, SHARE, NETWORK and ICQ, respectively.

Feasible Generalized Least Squares (FGLS) regression was utilised as the primary estimation technique to address critical econometric issues inherent in panel data analysis. This method was specifically chosen to correct for two empirically observed

problems: significant heteroscedasticity, as confirmed by White's test ($\chi^2 = 384.38$, $p < 0.001$), and first-order autocorrelation, identified through the Wooldridge test ($F = 50.60$, $p < 0.001$). Additionally, to ensure that multicollinearity among the independent variables was not problematic, Pearson correlation coefficients and Variance Inflation Factors (VIF) were examined. Robustness was further tested by substituting the principal explanatory variables with alternative measures. To address potential endogeneity stemming from reverse causality or omitted variable bias, models incorporating lagged independent variables were also employed.

RESULTS AND DISCUSSION

Descriptive Analysis

Descriptive statistics for the principal variables are presented in [Table 3](#). The dependent variable, TUNNEL, has a mean value of 0.028 and ranges from 0 to 0.402, which is consistent with figures reported in previous studies ([Chen et al., 2024](#)). The independent variables display expected levels of variation: EXPERTISE has a mean of 0.755, POLITIC 1.378, SHARE 0.027, and NETWORK 0.384, all of which correspond with established benchmarks ([Chan et al., 2023](#); [Liu & Sun, 2021](#)). The internal control quality variable, ICQ, has a mean of 0.795, indicating generally robust internal control systems ([J. Li et al., 2022](#)).

Table 3: Descriptive statistics

Variables	Obs	Mean	Std.Dev.	Min	Max	P1	P99
TUNNEL	4,016	0.028	0.075	0.000	0.402	0.000	0.402
EXPERTISE	4,016	0.755	0.221	0.143	1.000	0.333	1.000
POLITIC	4,016	1.378	0.978	0.000	3.000	0.000	3.000
SHARE	4,016	0.027	0.161	0.000	1.000	0.000	1.000
NETWORK	4,016	0.453	0.339	0.000	3.000	0.000	1.330
ICQ	4,016	0.795	0.975	0.000	1.000	0.000	1.000
TOP10	4,016	0.565	0.155	0.115	0.968	0.234	0.897
LEV	4,016	0.512	0.186	0.036	0.861	0.113	0.861
FSIZE	4,016	22.84	1.397	19.15	28.61	20.21	26.85
ROA	4,016	0.021	0.121	-1.859	4.489	-0.368	0.196
FAGE	4,016	3.004	0.297	1.609	3.829	2.197	3.526

Multicollinearity Analysis

To limit the influence of outliers, all continuous variables were winsorised at the 1st and 99th percentiles. Multicollinearity was examined using Pearson correlation coefficients and VIF analysis ([Table 4](#)). Most correlations are low, with none exceeding 0.7, and all VIF values are below 2, well beneath the accepted threshold of 10. These results suggest that multicollinearity is not a major concern in this study.

Table 4: Pearson Correlation Matrix

Variables	RPLG	IDEXP	IDPC	IDSHARE	IDNET	TOP10	LEV	FSIZE	ROA	FAGE	ICQ	VIF
TUNNEL	1											1.180
EXPERTISE	0.016***	1										1.040
POLITIC	-0.018***	-0.129***	1									1.060
SHARE	-0.002***	-0.005	0.046***	1								1.010
NETWORK	-0.001***	0.052***	0.015	-0.002	1							1.010
TOP10	-0.026*	-0.035***	0.064***	0.003	0.044***	1						1.140
LEV	0.360***	0.070***	0.043***	0.043***	-0.016	-0.003	1					1.510
FSIZE	0.196***	0.015	0.167***	0.073***	0.049***	0.238***	0.441***	1				1.520
ROA	-0.135***	-0.067***	0.076***	0.017	0.016	0.198***	-0.309***	0.092***	1			1.260
FAGE	0.072***	0.071***	0.099***	0.023*	-0.022	-0.129***	0.188***	0.186***	-0.049***	1		1.120
ICQ	0.014	0.012	0.081***	0.018	0.065***	0.139***	0.055***	0.228***	0.201***	0.164***	1	1.130

Notes: *p < 0.1, **p < 0.05, ***p < 0.01. (Source: Data Analysis).

Heteroscedasticity Test and Autocorrelation Test

White's test ($p = 0.000$) and the Wooldridge test ($p = 0.000$) in [Table 5](#) indicate significant heteroskedasticity and autocorrelation. To address these, FGLS regression was used, correcting both issues and providing reliable estimates. Standard errors were also clustered for robust inference. [Table 5](#) presents White's test and Wooldridge test results, which are used to check for heteroskedasticity and autocorrelation in panel data, respectively.

Table 5: The Results of White's Test and Wooldridge Test

Test	Chi2(61)	F (1,1484)	P-Value
White's Test	384.380	N/A	0.000
Wooldridge Test	N/A	50.595	0.000

Main Regression

[Table 6](#) displays the results of the FGLS regression analysing factors influencing TUNNEL. The coefficient for EXPERTISE is -0.002 , significant at the 1% level ($p = 0.000$), indicating that greater financial expertise reduces tunnelling activities. This supports H1 and aligns with [Bilal et al. \(2023\)](#), who argue that financial expertise helps independent directors limit earnings management. POLITIC shows a negative coefficient (-0.002) with weak significance at the 10% level ($p = 0.069$), suggesting political connections may modestly deter tunnelling, consistent with H2 and [Mustun and Abdul Wahab \(2023\)](#). This contrasts with [Arifah et al. \(2024\)](#), likely due to China's distinctive institutional context where political ties can create conflicting loyalties ([Z. Wang et al., 2023](#)). The SHARE variable has a negative coefficient (-0.006) and is weakly significant ($p = 0.072$), implying that firms with independent directors holding shares experience less tunnelling, as their financial stake aligns their interests with firm performance, discouraging collusion with controlling shareholders. This finding supports H3 and [DENG and DONG \(2021\)](#) "skin-in-the-game" hypothesis, and is further strengthened under high internal control quality ($\beta = -0.006$, $p < 0.05$), extending [Daily and Dalton \(2003\)](#) by illustrating the interplay between formal governance and incentives.

NETWORK also demonstrates a significant negative coefficient (-0.001 , $p = 0.000$), indicating that stronger network connections reduce tunnelling. This confirms H4 and aligns with [Fan et al. \(2023\)](#), suggesting that firms with extensive director networks are subject to greater scrutiny, which limits opportunistic behaviours. [Z. Chen et al. \(2020\)](#) note that independent directors with robust networks often possess reputational concerns and greater exposure to regulatory and business communities, motivating effective monitoring and reducing resource expropriation by controlling shareholders. Overall, these findings reveal that independent directors' financial expertise, political connections, shareholding, and network positions are vital in curbing tunnelling

activities. They also support Resource Dependence Theory, emphasising the role of these external resources in strengthening corporate governance.

Table 6: The Results of FGLS Regression

TUNNEL	Coef.	St. Err	T-Value	P-Value	Sig.
EXPERTISE	-0.002	0.000	-6.110	0.000	***
POLITIC	-0.002	0.001	-1.818	0.069	*
SHARE	-0.006	0.003	-1.802	0.072	*
NETWORK	-0.001	0.000	-5.340	0.000	***
TOP10	-0.010	0.001	-15.74	0.000	***
LEV	0.087	0.001	68.01	0.000	***
FSIZE	0.003	0.000	39.28	0.000	***
ROA	-0.025	0.001	-19.87	0.000	***
FAGE	-0.001	0.000	-2.460	0.014	**
cons	-0.087	0.002	-51.64	0.000	***
Mean Dependent Var	0.027	SD dependent var		0.074	
Number of Obs	4,016	Chi-square		5,310.86	

*** p<0.01, ** p<0.05, * p<0.1

The Moderator Role of Internal Control

Table 7 illustrates the moderating role of ICQ in the relationship between independent directors' attributes and TUNNEL.

Table 7: The Moderating Effect of ICQ

TUNNEL	Coef.	St. Err	T-Value	P-Value	Sig.
EXPERTISE	-0.015	0.001	-21.02	0.000	***
POLITIC	0.002	0.000	4.22	0.000	***
SHARE	-0.004	0.004	-0.900	0.367	
NETWORK	-0.002	0.001	-1.65	0.100	*
ICQ	-0.022	0.001	-29.23	0.000	***
EXPERTISE ICQ	-0.023	0.001	-28.73	0.000	***
POLITIC ICQ	-0.004	0.000	-9.51	0.000	***
SHARE ICQ	-0.011	0.006	-1.74	0.083	*
NETWORK ICQ	-0.005	0.001	-7.13	0.000	***
TOP10	-0.012	0.001	-16.57	0.000	***
LEV	0.095	0.001	78.01	0.000	***
FSIZE	0.004	0.000	32.71	0.000	***
ROA	-0.028	0.001	-23.96	0.000	***
FAGE	0.001	0.000	2.71	0.007	***
cons	-0.118	0.003	-41.92	0.000	***
Mean Dependent Var	0.027	SD dependent var		0.074	
Number of Obs	4,016	Chi-square		8,966.82	

*** p<0.01, ** p<0.05, * p<0.1

The coefficient for ICQ is negative and significant (-0.022 , $p = 0.000$), indicating that higher internal control quality significantly reduces tunnelling activities. This finding aligns with (Chen et al., 2020), who argue that robust internal controls serve as an effective monitoring mechanism against tunnelling by controlling shareholders. The interaction term between expertise and ICQ (EXPERTISE_ICQ) also shows a significant negative coefficient (-0.023 , $p = 0.000$), suggesting that strong internal controls enhance the ability of financially expert directors to detect and mitigate expropriation. This supports hypothesis H5a.

The interaction between network connections and internal control quality (NETWORK_ICQ) is significantly negative (-0.005 , $p = 0.000$), indicating that strong internal controls enhance the role of well-connected independent directors in curbing tunnelling, supporting H5b. While political connections alone increase tunnelling (0.002 , $p < 0.01$), their interaction with internal controls (POLITIC_ICQ) is significantly negative (-0.004 , $p < 0.01$), showing that effective controls mitigate the risks of political ties, consistent with Nuraina et al. (2022), but H5c is not supported. The direct effect of director shareholding is negative but insignificant (-0.004 , $p = 0.367$); however, its interaction with internal control quality (SHARE_ICQ) is marginally significant and negative (-0.011 , $p = 0.083$), supporting H5d.

Robust Check

To test the robustness of the main regression and the moderating effect of internal control, this study employs an alternative measure for the dependent variable TUNNEL. Specifically, TUNNEL is substituted with high-risk debt guarantees (HRDG). According to the CSRC, HRDG in China refers to guarantees that exceed 50% of the guarantor's net assets or are extended to entities with a debt-to-asset ratio above 70%. Such guarantees are classified as high risk due to their substantial impact on the guarantor's financial stability and increased default risk exposure (M. B. Khan et al., 2024). The alternative measure is denoted as TUNNEL_r. The robustness check results are presented in Table 8.

The results in Table 8 align with the main regression outcomes in Table 6 and the moderating effects shown in Table 7. Notably, coefficients for variables such as EXPERTISE, NETWORK, and ICQ remain significant and consistent in direction, indicating that well-connected NETWORK and high ICQ continue to reduce tunnelling behaviour.

Interaction terms like EXPERTISE_ICQ and NETWORK_ICQ also exhibit significant negative effects, reinforcing the moderating influence of internal controls. The coefficient for POLITIC is negative and significant in the initial model (Coef. = -0.001 , $p = 0.030$), suggesting that political connections among independent directors contribute to lowering tunnelling, consistent with Table 6. For SHARE, the negative

coefficient (Coef. = -0.015, $p = 0.087$) similarly implies that independent directors' shareholding may help reduce tunnelling, supporting the main regression findings. Both interaction terms *POLITIC_ICQ* and *SHARE_ICQ* are negative and highly significant, indicating that superior internal control quality enhances the negative impact of political connections and shareholding on tunnelling, further curbing such behaviour. This concurs with the results in [Table 7](#). Overall, the robustness analysis confirms the reliability of the main findings and underscores the stability of the relationships among director networks, internal controls, and the protection of minority shareholders' interests.

Table 8: The Results of Robust Check

TUNNEL_r	Model (1)				Model (2)			
	Coef.	T-Value	P-Value	Sig.	Coef.	T-Value	P-Value	Sig.
EXPERTISE	-0.011	-17.78	0.000	***	-0.015	-10.840	0.000	***
POLITIC	-0.001	-2.173	0.030	**	0.001	1.64	0.100	*
SHARE	-0.015	-1.710	0.087	*	-0.007	-0.960	0.336	
NETWORK	-0.012	-25.02	0.000	***	-0.008	-11.410	0.000	***
ICQ					0.046	35.390	0.000	***
EXPERTISE_ICQ					-0.036	-23.600	0.000	***
POLITIC_ICQ					-0.002	-4.38	0.000	***
SHARE_ICQ					-0.016	-3.89	0.000	***
NETWORK_ICQ					-0.009	-10.940	0.000	***
TOP10	-0.004	-3.79	0.000	***	-0.002	-3.040	0.002	***
LEV	0.122	78.69	0.000	***	0.141	15.470	0.000	***
FSIZE	0.005	27.66	0.000	***	0.005	37.300	0.000	***
ROA	-0.027	-11.52	0.000	***	-0.029	-19.250	0.000	***
FAGE	0.007	10.04	0.000	***	0.007	18.000	0.000	***
_cons	-0.138	-35.21	0.000	***	-0.185	-55.730	0.000	***
Number of Obs	4,016				4,016			
P-Value	0.000				0.000			

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Endogeneity Test

This study uses lagged independent variables, internal control quality, and their interactions to address endogeneity concerns, as lagging reduces reverse causality and

omitted variable bias (El Mahdy et al., 2024). Table 9 shows result consistent with the main regression and moderation analysis, confirming that endogeneity does not affect the study's conclusions.

Table 9: Results of Endogeneity Test

TUNNEL	Model (1)				Model (2)			
	Coef.	T-Value	P-Value	Sig.	Coef.	T-Value	P-Value	Sig.
L.EXPERTISE	-0.007	-13.82	0.000	***	-0.017	17.87	0.000	***
L.POLITIC	-0.001	-1.670	0.095	*	-0.003	-19.23	0.095	*
L.SHARE	-0.011	-2.000	0.046	**	-0.006	-2.810	0.046	**
L.NETWORK	-0.002	-6.690	0.000	***	-0.001	-1.100	0.000	
L.ICQ					-0.013	-20.01	0.000	***
L.EXPERTISE_ICQ					-0.094	-66.72	0.000	***
L.POLITIC_ICQ					0.004	1.700	0.089	*
L.SHARE_ICQ					-0.04	-2.000	0.045	**
L.NETWORK_ICQ					-0.003	-8.92	0.000	***
TOP10	-0.013	-20.01	0.000	***	-0.097	-44.47	0.000	***
LEV	0.094	66.72	0.000	***	-0.007	-13.82	0.000	***
FSIZE	0.004	39.98	0.000	***	-0.001	-1.670	0.095	*
ROA	-0.04	-44.43	0.000	***	-0.011	-2.000	0.046	**
FAGE	-0.003	-8.92	0.000	***	-0.002	-6.690	0.000	***
_cons	-0.097	-44.47	0.000	***	-0.013	-20.01	0.000	***
Number of Obs	4,016				4,016			
P-Value	0.000				0.000			

*** p<0.01, ** p<0.05, * p<0.1

CONCLUSION AND SUGGESTION

The findings indicate that various attributes of independent directors—including financial expertise, political connections, shareholding, and network positions—substantially mitigate tunnelling activities by controlling shareholders. Independent directors possessing EXPERTISE are more capable of identifying and preventing resource expropriation, while those with POLITIC can utilise their influence to discourage opportunistic conduct. SHARE tend to have interests more closely aligned

with those of minority shareholders, thereby diminishing motivations for tunnelling. Furthermore, NETWORK can draw upon external relationships and reputational assets to deter controlling shareholders from engaging in value extraction. Additionally, internal control mechanisms positively moderate the associations between EXPERTISE, SHARE, NETWORK, and tunnelling, enhancing their governance effect. Conversely, internal control appears to negatively moderate the link between political connections and tunnelling. These results corroborate Resource Dependence Theory, which posits that directors contribute vital resources such as specialised financial knowledge, political capital, and networks to strengthen governance structures. This research contributes to corporate governance by showing that independent directors reduce tunnelling through their expertise, political ties, networks, and shareholding, extending Resource Dependence Theory. It also highlights how internal control strengthens or weakens this effect. The findings offer empirical support for improving governance frameworks by emphasising these key director attributes.

In summary, this study underscores the pivotal contribution of independent directors' attributes alongside the quality of internal control in deterring tunnelling, findings that are theoretically grounded in Resource Dependence Theory. The results demonstrate that independent directors are not merely symbolic governance figures but serve as active and effective monitoring agents. The implications suggest that firms should prioritise appointing board members with strong financial expertise and extensive networks. Additionally, investment in robust internal control systems is vital to enhance governance efficacy. Despite these contributions, the study is subject to certain limitations. Primarily, the sample is confined to China, which may limit the extent to which the findings are generalisable to other institutional contexts. Furthermore, there may be unobserved variables influencing tunnelling behaviour that warrant further investigation. These limitations advise caution in the interpretation of results. Future research could build upon this study by conducting comparative analyses of tunnelling oversight in other emerging markets. Moreover, additional studies should explore potential factors exerting subtle or conditional effects on tunnelling practices.

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