Shareholding Networks and Related Transactions: Insights from Institutional Investors

Qiuli Huang[1,a,*], Guilong Li[1,b]

[1]*Business School, Central University of Finance and Economics, Haidian District, Beijing, China*
[a]*2018211028@email.cufe.edu.cn,* [b]*944862326@qq.com*
[*]*Corresponding author*

Abstract: In the evolving corporate governance landscape, institutional investors stand out as pivotal figures. This study delves into their complex networks, established via significant investments across companies, to explore if these connections bolster their governance capabilities, especially in overseeing related-party transactions. We assess the impact of geographical proximity between investors and their investees and the role of public information, as indicated by analyst ratings, on their governance functions. Our findings reveal that greater network centrality—represented by degree, closeness, and eigenvector centrality—is associated with heightened related transactions, indicating that these networks enhance information exchange, competitive dynamics, and collective action. Furthermore, geographic proximity and favorable public information strengthen these investor-company ties. Yet, betweenness centrality shows no significant link to improved governance, suggesting indirect information access does not necessarily translate into better governance for one's own investments. This research advances our comprehension of institutional investors' governance role in a tightly interlinked financial ecosystem.

1. Introduction

Related-party transactions (RPTs) pose a significant challenge in corporate governance due to their complexity and the opacity of the involved relationships. These transactions, often leading to unfair outcomes, involve a company's interactions with entities that have direct or indirect interests, including managers, directors, owners, and their affiliates. Despite legal efforts to mitigate their negative impacts, enforcing fair practices in RPTs is difficult, mainly due to the challenge in identifying the vast network of relationships and transactions.

The real-world consequences of RPTs are well-documented, highlighted by scandals such as Hebang Biotechnology in 2017 and Enron. Empirical evidence supports the notion that a higher level of RPTs is inversely related to corporate governance quality. Existing research shows an inverse relationship between RPTs and corporate governance quality, supporting the agency theory's conflict of interest perspective [1]. This theory suggests internal actors often exploit company resources, compromising the board's oversight and shareholder interests.

In the context of corporate governance reform, institutional investors emerge as key stakeholders

[2]. Their significant holdings and capacity for information analysis make them effective monitors of RPTs [3], driven by the need for transparency and investor trust [4]. Beyond shareholding, institutional investors' influence is also shaped by their social networks, including educational backgrounds, previous business affiliations, and geographical proximity [5-6].

This study investigates how network structures among institutional investors, defined by mutual ownership, affect RPT governance. It also examines the role of geographical distance between investors and firms, and the moderating effect of analyst ratings on this relationship. Corporate governance quality is assessed through the lens of RPTs. The paper includes sections on literature review, theoretical framework, hypothesis development, research methodology, empirical findings, and discussions.

2. Literature Review

2.1. Factors Influencing Related-Party Transactions

RPTs are pivotal in corporate governance discussions, given their influence on firm performance and trust. The nature and extent of RPTs are largely determined by a firm's fundamental characteristics.Ju and Pan (2010) identified that smaller firms, especially those with fewer independent directors, higher leverage, lower profit margins, and significant non-operating income, tend to partake in non-compliant RPTs [7]. The governance structure significantly impacts RPTs, with poor governance correlating with an increase in unfair RPTs. Liu and Zou (2009) used the shareholding percentages of the second to tenth largest shareholders to gauge equity balance, revealing that less equity balance is associated with more unfair RPTs [8]. International studies echo these findings. Kohlbeck and Mayhew (2004) demonstrated a negative correlation between the cash compensation of CEOs and directors and the occurrence of RPTs [9]. Yeh et al. (2012) supports the notion that effective corporate governance can constrain RPTs consistently across different types of transactions (such as related sales, loans and guarantees, and related borrowings) and various measurement approaches (raw values, net values, and industry-adjusted values) [10].

2.2. The Economic Consequences of Institutional Investor Networks

This section examines the role of asset allocation in institutional investor networks and its impact on investment behavior and market dynamics. Shared investments among institutional investors enhance communication and can influence trading decisions. Shiller and Pound (1989) noted significant discussion among institutional investors affecting trading choices [11], while Pareek (2012) found such networks encourage herding behavior due to active information sharing [12].

Asset allocation ties significantly affect investment actions. Colla and Mele (2010) discovered a positive correlation in investment behaviors among investors closely linked in information networks, in contrast to a negative correlation among less connected investors [13]. Xiao et al. (2012) highlighted these networks' role in spreading investor behaviors, with trading decisions often based on network information rather than public data [14]. Furthermore, these connections impact market dynamics. Chen et al. (2017) linked denser information networks with increased likelihood of extreme stock price fluctuations [15]. Guo observed that information exchange within funds enhances market pricing efficiency and reduces long-term volatility [16], and decreases stock price synchronicity, though market conditions may alter these outcomes [17].

Considering this backdrop, this paper raises the following question: What impact does the interconnectedness of institutional investors through asset allocation have on corporate governance? Specifically, does the network centrality of institutional investors within corporate governance mechanisms reduce agency problems and enhance oversight of related-party transactions?

3. Theoretical Foundation and Research Hypothesis

3.1. The Impact of Institutional Investor Networks on Related-Party Transactions

The complexity of related-party transactions (RPTs) requires detailed information for institutional investors to effectively monitor and detect practices detrimental to shareholder interests and company growth. Institutional investors' monitoring of RPTs involves strategic interactions with related parties, necessitating collaborative efforts. Borgatti et al. (2009) outline two core models in social network theory: the flow model, focusing on networks as conduits for information and resource exchange, and the structural model, emphasizing networks' role in enabling interdependence and coordinated actions [18]. Through asset allocation, institutional investors create networks that facilitate information sharing and collective action, thereby diminishing information asymmetry and improving RPT oversight.

Information sharing among institutional investors and with investee companies enhances transparency and provides valuable feedback, fostering reciprocal information exchange [19]. Social learning allows investors to understand the motivations behind others' actions, aligning information and ensuring its accuracy. Importantly, these networks serve as crucial avenues for private information, augmenting public data and significantly impacting investment decisions [20].

Coleman's (1988) social capital closure theory suggests that dense relationships among actors facilitate collective support, enabling more effective cooperation and collective voting among investors in the same company [21]. Such cooperation bolsters governance by mitigating information gathering costs, overcoming the limitations of dispersed ownership, and reducing "rational apathy" and free-riding through stronger network ties [22]. Frequent interactions foster trust, essential for successful collaboration, while long-term shareholding enhances governance expertise and collaborative capacity [23].Therefore, this paper proposes the following hypothesis:

H1: Higher centrality within institutional investor networks is associated with lower levels of related-party transactions.

3.2. The Moderating Role of Geographic Proximity

Geographic distance naturally impedes the flow of information and collaboration among individuals. Coval and Moskowitz (2001) highlighted that investors tend to collect information more conveniently from companies geographically close to them, facilitating information transmission due to proximity [23]. Hong et al. (2005) validated the local-investor-relations (LIR) hypothesis, suggesting that the dissemination of information is governed by geographic proximity, allowing fund managers to acquire insider information more readily from managers of the companies they invest in within the same city [24]. Based on these insights, we propose the following hypothesis:

H2: Institutional investor network centrality more significantly reduces related-party transactions when investors and their major holdings are geographically co-located within the same province.

3.3. The Moderating Role of Public Information

The judgments and actions of institutional investors are predicated on information, which can be broadly categorized into positive and non-positive types. The behavior of investors varies with the nature of the information they face. While the transmission of private information within institutional investor networks is a key reason for their effectiveness, these networks also serve as vital conduits for the dissemination of public information. We posit that when public information is positive, the efficiency of information transmission within institutional investor networks increases.

This efficiency stems from the alignment of long-term investment strategies focused on company value enhancement with the inclination to disseminate positive news, thereby motivating the spread of such information. Improved transmission efficiency helps reduce information opacity. Thus, we propose the following hypothesis:

H3: The impact of institutional investor network centrality on related-party transactions is greater when public information is positive, compared to when it is non-positive.

4. Theoretical Foundation and Research Hypothesis

4.1. Sample Selection and Data Sources

Our research focuses on passive index funds, which aim to mirror the performance of specific indices by investing in their constituent stocks. These funds typically adjust their stock portfolios annually or semi-annually, reflecting a strategy of infrequent changes and long-term stock holdings. We sourced annual holding data for passive index funds from 2013 to 2018 from the Wind Database - Institutional Investor Holdings, selecting stocks comprising 5% or more of a fund's net value for our analysis. This approach allows us to examine the influence of institutional investors with significant stakes and long-term investment horizons on corporate governance [12]. Data regarding related-party transactions, moderating, and control variables were extracted from the CSMAR database.

4.2. Variable Descriptions

4.2.1. Dependent Variable: Extent of Related-Party Transactions

The scale of related-party transactions (RPTs) in this study is quantified by dividing the total RPT amount by the total market value of the stock, with the result log-transformed for analysis. Our investigation is limited to transactions between listed companies and their related parties, specifically excluding any transactions solely among the listed company's related parties or other types. We measure the frequency of RPTs as the annual number of transactions between the listed company and its related entities.

4.2.2. Independent Variable: Institutional Investor Network Centrality

This research quantifies the institutional investor network's structure using four centrality measures: degree, betweenness, closeness, and eigenvector centrality [25]. These measures evaluate a fund's network position by its direct connections, role as an intermediary, proximity to other funds, and the influence of its connections, respectively. Company-level network centrality is calculated by first transforming mutual fund holdings into an association matrix via Python—denoting connections with 1 and non-connections with 0. Then, Ucinet software calculates each fund's centrality scores, which are averaged to establish company-level centrality.

4.2.3. Moderating Variables

This study examines the moderating effects of geographic proximity and public information. Geographic proximity is assessed through a dummy variable, where a fund and the company it invests in being in the same province is marked as 1, otherwise 0. Public information's influence is measured using analyst consensus ratings, assigning "neutral," "buy," and "hold" ratings values of 1, 2, and 3, respectively, with no "sell" or "reduce" ratings in our sample. The company's annual average rating is calculated, with averages below the 33rd percentile labeled as non-positive (0) and

above as positive public information (1).

4.2.4. Control Variables

Control variables includes the top nine shareholders' shareholding percentage, the total number of directors, and the top three executives' total compensation. Samples lacking data were omitted.

4.3. Empirical Model

The basic model to analyze the direct relationshipbetween related-party transactions (RPTs) and the characteristics of institutional investor networks is given by equation (1), where RPT_{it} denotes the measures of related-party transactions, including both the scale and frequency. $\mathrm{Centrality}_{it}$ represents the network centrality measures for institutional investors, encapsulating degree, betweenness, closeness, and eigenvector centrality. $\mathrm{Control\ Variables}_{it}$ comprises all control variables, with $\mu_i$and τ_t accounting for individual and annual effects, respectively:

$$RPT_{it} = \alpha + \alpha_1 \mathrm{Centrality}_{it} + \alpha_2 \mathrm{Control\ Variables}_{it} + \mu_i + \tau_t + \varepsilon_{it} \tag{1}$$

To explore the moderating effects of public information and geographic proximity on this relationship, we extend our model to include interaction terms, as shown in equation (2) and equation (3). Here, $\mathrm{SameProvince}_{it}$and $\mathrm{PositiveInfo}_{it}$respectively indicate whether the institutional investor and the company are located in the same province and whether the public information is positive.

$$RPT_{it} = \beta + \beta_1 \mathrm{Centrality}_{it} + \beta_2 \mathrm{dumsamcity}_{it} + \beta_3(\mathrm{Centrality} \times \mathrm{dumsamcity}_{it})$$
$$+ \beta_4 \mathrm{Control\ Variables}_{it} + \mu_i + \tau_t + \varepsilon_{it} \tag{2}$$
$$RPT_{it} = \gamma + \gamma_1 \mathrm{Centrality}_{it} + \gamma_2 \mathrm{dumsamrank}_{it} + \gamma_3(\mathrm{Centrality} \times \mathrm{dumsamrank}_{it})$$
$$+ \gamma_4 \mathrm{Control\ Variables}_{it} + \mu_i + \tau_t + \varepsilon_{it} \tag{3}$$

5. Empirical Results

5.1. Benchmark Regression Model

Table 1: Related-Party Transactions and Institutional Investor Network Centrality.

VARIABLES	(1) lnRelatsum	(2) lnumber	(3) lnRelatsum	(4) lnumber	(5) lnRelatsum	(6) lnumber	(7) lnRelatsum	(8) lnumber
frmdeg	-0.008*	-0.002*						
	(-1.78)	(-1.66)						
frmclo			-0.002	0.003**				
			(-0.59)	(2.36)				
frmbet					0.001	0.002		
					(0.13)	(0.73)		
frmeig							-0.008*	-0.002*
							(-1.68)	(-1.89)
Observations	570	570	570	570	570	570	570	570
R-squared	0.658	0.917	0.655	0.918	0.654	0.916	0.656	0.917
Stkcd/Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1 presents the empirical findings on how institutional investor network centrality impacts related-party transactions, analyzing the scale and number of transactions (lnRelatsum and lnumber)

against centrality measures: frmdeg (degree), frmclo (closeness), frmbet (betweenness), and frmeig (eigenvector). The analyses indicate significant negative correlations between both the scale and number of transactions and degree centrality (models 1 and 2) and eigenvector centrality (models 7 and 8) at the 10% significance level. These results imply that higher centrality in institutional investor networks is linked to fewer related-party transactions, aligning partially with Hypothesis 1.

5.2. Moderation Effect Test

Table 2 focuses on interaction terms between investors' same-province status (dumsamcity) and centrality metrics—degree (frmdeg), closeness (frmclo), and eigenvector (frmeig) centrality. The coefficients for these terms are 0.014, 0.014, and 0.015, significant at the 10%, 1%, and 10% levels, respectively, indicating that geographic proximity enhances the impact of network centrality on the scale of related-party transactions (lnRelatsum). Other interaction term coefficients are not statistically significant. These findings suggest that geographic proximity indeed moderates the centrality-transaction relationship, offering partial support for Hypothesis 2.

Table 2: The Moderating Role of Geographic Distance.

VARIABLES	(1) lnRelatsum	(2) lnumber	(3) lnRelatsum	(4) lnumber	(5) lnRelatsum	(6) lnumber	(7) lnRelatsum	(8) lnumber
frmdeg	-0.011**	-0.001						
	(-2.01)	(-0.94)						
frmdegxdumsamcity	0.014*	-0.002						
	(-1.94)	(-1.17)						
frmclo			-0.007	0.003**				
			(-1.39)	(2.31)				
frmcloxdumsamcity			0.014***	-0.001				
			(5.31)	(-0.81)				
frmbet					0.002	0.004		
					(0.26)	(0.91)		
frmbetxdumsamcity					-0.014	-0.006		
					(-1.04)	(-0.86)		
frmeig							-0.016**	-0.003
							(-1.99)	(-1.43)
frmeigxdumsamcity							0.015*	0.001
							(1.89)	(0.30)
Observations	570	570	570	570	570	570	570	570
R-squared	0.661	0.917	0.665	0.919	0.654	0.917	0.657	0.917
Stkcd/Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 explores how public information influences the relationship between institutional investor network centrality and related-party transactions. For the scale of transactions (lnRelatsum), public information positivity (dumSamrank) interacted with degree (frmdeg) and closeness (frmclo) centrality yields coefficients of 0.023 and 0.011, significant at the 10% level. For the transaction count (lnnumber), the interaction with eigenvector centrality (frmeig) produces a coefficient of 0.006, significant at the 10% level. Other interaction coefficients are not significant. These results suggest that public information positively moderates the link between network centrality and transaction extent, aligning partially with Hypothesis 3.

Table 3: The Moderating Effect of Public Information.

VARIABLES	(1) lnRelatsum	(2) lnumber	(3) lnRelatsum	(4) lnumber	(5) lnRelatsum	(6) lnumber	(7) lnRelatsum	(8) lnumber
frmdeg	-0.024**	-0.003						
	(-2.05)	(-1.54)						
frmdegxdumSamrank	0.023*	0.002						
	(1.85)	(0.94)						
frmclo			-0.008	0.003**				
			(-1.48)	(2.37)				
frmcloxdumSamrank			0.011*	-0.001				
			(1.95)	(-0.62)				
frmbet					0.02	0.03		
					(0.30)	(1.15)		
frmbetxdumSamrank					-0.019	-0.028		
					(-0.29)	(-1.04)		
frmeig							-0.041	-0.007**
							(-1.41)	(-2.52)
frmeigxdumSamrank							0.039	0.006*
							(1.34)	(1.95)
Observations	570	570	570	570	570	570	570	570
R-squared	0.669	0.917	0.664	0.919	0.654	0.917	0.662	0.917
Stkcd/Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6. Conclusion and Discussion

This study explores the influence of institutional investor network positions on related-party transaction levels within companies, examining geographic proximity and public information's moderating effects. Utilizing passive index funds and their holdings from 2013-2018, we apply fixed-effect models for analysis.

Our findings partially confirm the hypotheses: (1) A significant negative association exists between related-party transactions and the degree and eigenvector centrality at the 10% level, indicating that higher centrality within investor networks corresponds with fewer transactions. (2) Geographic proximity enhances this relationship, with significant positive interactions between centrality measures and proximity, suggesting that closer institutional investors are linked to reduced related-party transactions. (3) Positive public information also moderates this relationship positively, with higher centrality associated with fewer transactions when public information is favorable. The nonsignificant results for betweenness centrality, which gauges a fund's role as an informational bridge, suggest that diverse information accessed through structural holes may not directly influence governance of the focal company due to the lack of shared holdings in the same company.

This research contributes to understanding the governance role of institutional investors through the lens of social network theory, highlighting how network structures and connections might influence governance motivations and capabilities. Future research could delve into how different network configurations and connection types affect governance, along with the specific mechanisms through which investor networks influence corporate governance practices.

Data Accessibility

The datasets used during the current study can be directed to the corresponding author.

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