How does Institutional Investor Heterogeneity Affect Corporate Innovation Quality:

The Perspective of Trade Stability and Investment Proactivity

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Abstract. Based on the dual perspectives of institutional investors' trading stability and investment initiative, this paper explores the impact of institutional investors' heterogeneity on the quality of corporate innovation, and examines the moderating effect of the nature of property rights on its impact, and proposes countermeasure suggestions on how to utilize institutional investors to improve the quality of corporate innovation.

Keywords: institutional investors, corporate innovation quality, trading stability, investment proactivity

1 Introduction

Although the number of innovation activities of Chinese enterprises has been increasing in recent years, the quality of innovation has not shown a steady improvement, and the quality of innovation and the scale of innovation have not achieved synergistic development, so it is especially critical for enterprises to effectively improve the quality of innovation.

Many scholars have discussed how to improve the quality of corporate innovation from external factors, such as government subsidies, Internet development, financial technology, and business environment (Huo and Zhang, 2022). [1] With the SFC advocating "vigorous development of long-term institutional investors", institutional investors are emerging in the capital market and showing diversified development trends, and academics are beginning to focus on the impact of institutional investors on corporate innovation.

Institutional investors are institutions that use their own funds or funds raised by the public for specialized investment activities. Not only are institutional investors significantly different from other types of investors, there is also heterogeneity among institutional investors, and this heterogeneity may have an impact on corporate innovation (Aghion, Reenen and Zingales, 2013).[2] However, how the trading stability and investment proactivity of institutional investors affect the quality of corporate innovation is yet to be studied in more depth.

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In this paper, we construct an integrated analytical framework based on the dual perspectives of institutional investors' trading stability and investment initiative (Bushee, 1998[3]; Niu, Wu and Li, 2013[4]; Erickson, 2017[5]), comprehensively examine the impact of institutional investor heterogeneity on corporate innovation quality and the moderating effect of the nature of corporate property rights on its impact. We hypothesize that:

H1: The stronger the trading stability of institutional investors, the more they can contribute to the improvement of corporate innovation quality.

H2: The more proactive of institutional investor's invest, the more they will promote the improvement of corporate innovation quality.

H3: compared with state-owned enterprises, the more stable of institutional investors' transactions has a more significant effect on the improvement of innovation quality of non-state-owned enterprises.

H4: Compared with state-owned enterprises, the stronger the investment proactivity of institutional investors has a more significant effect on the improvement of innovation quality of non-state-owned enterprises.

2 Research Design

2.1 Sample Selection and Data Acquisition

Considering the possible uncertain impact of the new crown pneumonia epidemic on enterprise operation since 2020, we select the data of A-share listed companies from 2010 to 2019 as the research sample. 6022 valid observations were obtained, including corporate governance-related data from CSMAR and corporate innovation-related data from CnOpenDada.

2.2 Definition of Variables

1)Dependent variable. The dependent variable is corporate innovative quality (QUA). Drawing on Li, Chen and Zhang (2019), Li (2020), Li and Zhao (2020)[6], Deng and Feng (2021) [7], etc., and considering the convenience of data acquisition and the rationality of proxy variables, we adopt the natural logarithm of patent citation rate as a proxy variable to measure the innovation quality of listed companies.

2) Independent variables. (1) Trading stability (STA). Institutional investors' turnover rate (CR) is used as an observation. Drawing on the measures of Yan and Zhang (2009) and Li and Lu (2015), we first calculate the total stocks bought and sold by institutions in a year according to equations (1) and (2), respectively, where, $P_{i,t}$, $P_{i,t-1}$ and $\triangle P_{i,t}$ represent the price of stock i and the amount of price change, respectively, and $S_{k,i,t}$ and $S_{k,i,t-1}$ represent the total number of stocks held by institution k.

$$CR\_buy_{k,t} = \sum_{\substack{i=1 \\ S_{k,i,t} > S_{k,i,t-1}}}^{N_k} \left| S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t}\Delta P_{i,t} \right| \tag{1}$$

$$CR\_sell_{k,t} = \sum_{\substack{i=1 \\ S_{k,i,t} > S_{k,i,t-1}}}^{N_k} |S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t}\Delta P_{i,t}| \tag{2}$$

The turnover rate of institutional investors is then calculated from equation (3) as a proxy variable for trading stability:

$$CR_{k,t} = \frac{\min(CR\_buy_{k,t}, CR\_sell_{k,t})}{\sum_{i=1}^{N_k} \frac{S_{k,i,t}P_{i,t} + S_{k,i,t-1}P_{i,t-1}}{2}} \tag{3}$$

As mentioned earlier, the greater the value of $CR_{k,t}$, the less stable the trading of that institutional investor, and conversely, the more stable the trading.

(2) Investment proactivity (PRO). Drawing on the study of Lee (2015), the length of investors' shareholding (T) is used as an observation to measure the investment proactivity of institutional investors. As measured by equation (4):

$$T_{k,i} = \sum_{i=1}^{N_k} H_{k,i,t} \tag{4}$$

Where $H_{k,i,t}$ is a dummy variable that takes the value of 1 when institution k holds shares of listed firm i at time t and 0 vice versa; where N is the number of institutional investors in the firm. $T_{k,t}$ is the length of time that all institutional investors in the firm hold shares at time t. k institutional investor is considered to be more active when the length of time that the institution holds the shares of firm i is longer than the average length of time $\overline{T_k}$ of other holders, and vice versa.

3) Moderator variable. The moderator variable is the nature of ownership (STATE). Drawing on Gao (2013), Zhou, Zheng and Wang (2020), we judge the nature of ownership of listed companies based on the nature of ownership of the actual controller of the listed company. When the actual controller is state-ownership, STATE is 1, otherwise it is 0.

4) Control variables. Drawing on Wen and Feng (2012), Zhou, Zheng and Wang (2020), we select company size (SIZE), asset liability ratio (LEV), concentration of shareholding(TOP), Annual(YEAR), and industry(IND) as control variables.

3 Empirical Analysis

3.1 Descriptive Statistics

The descriptive statistical analysis of the sample data in this paper is shown in Table 1.

Table 1. Descriptive statistics

Variable	Mean	Standard deviation	Minimum	Maximum
QUA	0.391	0.689	0.000	1.573
CR	0.231	0.422	0.004	0.791

T	0.311	7.561	-1.203	2.779
STATE	0.203	0.438	0.000	1.000
SIZE	22.986	1.561	20.114	26.132
LEV	0.452	0.201	0.049	0.547
TOP	0.107	0.211	0.002	0.677

The mean value of enterprise innovation quality (QUA) is 0.391, the maximum value is 1.573, the minimum value is 0, and the standard deviation is 0.689, which indicates that there is a large difference in the overall innovation quality of current listed companies and there is still room for improvement of innovation quality.

3.2 Main Effects Test

1)Testing the effect of institutional investors' trading stability on the quality of corporate innovation. The results of the hypothesis testing in this paper are shown in Table 2. Model 1 data show that the regression coefficient of CR (turnover rate) on QUA (corporate innovation quality) is -0.24 and is significant at the 1% level, indicating that the lower the turnover rate of institutional investors (i.e., the stronger the trading stability of institutional investors), the higher the corporate innovation quality, and H1 is verified.

2)Testing the effect of institutional investors' investment proactivity on the quality of corporate innovation. The data in model 2 of Table 2 shows that the regression coefficient β_1 of the effect of T (length of shareholding) on QUA (quality of corporate innovation) is 0.27 and is significant at the 1% level, indicating that the greater the length of shareholding of institutional investors (i.e., the greater the investment proactivity of institutional investors), the higher the quality of corporate innovation, and H2 is verified.

Table 2. Hypotheses testing data

Hypotheses	H1	H2	H3		H4	
Model (dependent: QUA)	1	2	3(STATE=1)	4(STATE=0)	5(STATE=1)	6(STATE=0)
CR	-0.241*** (-4.891)		-0.334** (-3.977)	-0.417*** (-5.004)		
T		0.277*** (5.798)			0.315** (3.798)	0.391*** (3.021)
SIZE	0.291*** (5.476)	0.388*** (6.042)	0.423*** (6.127)	0.371*** (5.871)	0.312*** (4.752)	0.412*** (6.977)
LEV	-0.676* (-2.11)	-0.682* (-2.34)	-0.749** (-2.892)	-0.698** (-2.578)	-0.563** (-2.113)	-0.71** (-2.847)

TOP	0.295 (0.604)	0.304 (0.659)	0.391 (0.783)	0.308 (0.663)	0.291 (0.464)	0.407 (0.814)
YEAR	Control	Control	Control	Control	Control	Control
IND	Control	Control	Control	Control	Control	Control
ADJ-R2	0.347	0.349	0.367	0.324	0.387	0.398
samples	6022	6022	1945	4077	1012	5010

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% significance levels, respectively, with t-values in parentheses.

3.3 Moderating Effect Test

1)The moderating effect of property rights on the relationship between institutional investors' trading stability and firm innovation quality. The data from model 3 in Table 2 show that the regression coefficient of the effect γ_1 of high group CR (turnover rate) on QUA (quality of corporate innovation) is -0.334 < 0, which is significant at the 5% level, while the data from model 4 show that the regression coefficient γ_1' of the effect of low group CR on QUA is -0.417 < 0, which is significant at the 1% level. We therefore proceeded to conduct a Z-test on the regression coefficients γ_1 and γ_1' to examine whether the estimated coefficients of the two regressions were significantly different (Cohen and Cohen, 1983). The result |Z| = 2.87 > 1.96 indicates that there is a significant difference between γ_1 and γ_1', therefore the nature of property rights has a significant moderating effect on the relationship between institutional investors' turnover rate and the quality of corporate innovation. Also, because $|\gamma_1| < |\gamma_1'|$, it indicates that the nature of property rights negatively moderates the negative effect of turnover rate on the quality of corporate innovation, i.e., the nature of property rights negatively moderates the positive effect of trading stability on the quality of corporate innovation. It can be seen that the stronger trading stability (i.e., lower turnover rate) of institutional investors has a more significant effect on the innovation quality of non-state enterprises compared to state-owned enterprises, and H3 is verified.

2)The moderating effect of property rights on the relationship between institutional investors' investment proactivity and enterprise innovation quality. Similarly, the data from model 5 in Table 2 show that the regression coefficient δ_1 of the effect of high grouping T (length of ownership) on QUA (quality of corporate innovation) is 0.315 > 0, which is significant at the 5% level, while the data from model 6 show that the regression coefficient δ_1' of the effect of low grouping T on QUA is 0.391 > 0, which is significant at the 1% level. Therefore, we proceeded to conduct a Z-test on the regression coefficients δ_1 and δ_1' to examine whether there is a significant difference between the estimated coefficients of the two regressions. The result |Z|=2.96>1.96 indicates

that there is a significant difference between δ_1 and $\delta_1^{'}$, and therefore the nature of property rights has a significant moderating effect on the relationship between the length of institutional investors' shareholding and the quality of corporate innovation. Also, because $|\delta_1| < |\delta_1^{'}|$, it indicates that the nature of property rights inversely moderates the positive effect of the length of shareholding on the quality of corporate innovation. It can be seen that the stronger the investment proactivity of institutional investors (the greater the shareholding length) has a more significant effect on the innovation quality of non-state-owned enterprises compared to state-owned enterprises, and H4 is verified.

4 Conclusions

Institutional investors have the advantage of specialized knowledge, as well as financial convenience and professional resource capacity, which can provide the necessary resource base for invested enterprises to meet the needs of their innovation activities. The governance role of institutional investors can also effectively inhibit the self-interested behavior of corporate executives, promote the sustained financial investment of enterprises in innovative activities, and provide the possibility of high-quality innovative activities for enterprises(Alon, 2008). [8] The study shows that: (1) the stronger the investment initiative of institutional investors, the more it can promote the improvement of enterprise innovation quality. (2) The stronger the investment initiative of institutional investors, the more it can promote the improvement of enterprise innovation quality. (3) Compared with state-owned enterprises, the stronger the trading stability and the stronger the investment initiative of institutional investors, the more obvious the effect on the improvement of innovation quality of non-state-owned enterprises.

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