

Study on Institutional Investors' Impact on Enterprise Green Innovation--- Evidence from Chinese Listed Company

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Abstract: Over the past decade, Chinese institutional investors have grown significantly in both size and volume. However, their role in the capital market remains poorly defined. Therefore, a more in-depth examination of the effect of institutional investors on the performance and development of enterprises in the financial market is essential, particularly regarding enterprises' green innovation capabilities, holds substantial practical significance. To detect the influence brought by institutional investors on the capability of enterprises to innovate green, in the study, from 2010 to 2023, the statistics of Chinese listed companies are gathered and analyzed, and the regression effect model is used to empirically analyze these data, the results show that when more shares are held by institutional investors, the corresponding enterprises have stronger green innovation capability, this paper indicated that institutional investors are expected to contribute to enterprises' green innovation capability, and it also examines the mediating effect of top management incentives on the previous two research objectives. The outcome indicates that top management incentives have a significant and positive mediating effect on this relationship; that is, green innovation capabilities of enterprises probably can be boosted by institutional investors through incentives for top management.

Keywords: institutional investors, green innovation, top management incentive.

1. Introduction

Since moving forward into the New Century, continuous progress and maturation of China's financial market have led to an increasing variety of themes within the market. In recent years, as a major component of capital sources, institutional investors have gradually become an important investment subject. As a special financial institution, for specific goals, it manages investors' savings in a centralized manner and the objective is to maximize investment returns within a risk-acceptable range and a specific period of time [1]. As countries with relatively complete financial system development, such as Britain and the United States, the last two decades of the last century witnessed the easing of lawful constraints on institutional investors' investment, there has been a substantial increase in their number and size, and institutional investors in some developed countries, such as Britain, the shareholder structure of listed companies has been transformed from decentralized to centralized[2]. As latecomers, China's listed companies in financial market are going through this process. This phenomenon means that in the capital market, as quantity of institutional investors holding more and more shares, they will have more discourse power, and it is easy to have a greater impact on the

enterprise. Meanwhile, institutional investors hold a large amount of capital, and their nature is relatively complex. It is crucial to investigate how institutional investors will affect enterprises and what kind of influence they will have. In fact, Institutional investors are the only external funders who can directly and effectively supervise management and boost the information environment for the firm [3].

Meanwhile, China's rapid economic development in recent decades has resulted in significant environmental issues. Concerning it, the Chinese government has changed its development strategy from pursuing rapid development to achieving high-quality growth that is, seeking environment-friendly and sustainable development. At the same time, it encourages the transformation and updating of firms, which in turn leads to better development prospects for them. In fact, the market competitiveness, profitability, and performance of companies can be boosted by green technique innovation [4]. Consequently, the practical value of studying the effect of institutional investors on the ability to innovate green is significant. Considering that senior executives will play a significant role in the decision-making and development of enterprises, this study attempts to disentangle its impact on the two main objects of study in this study. Therefore, this paper chooses top management incentive as the mediating variable and studies the relationship among the three through the mediating effect model.

2. The Theoretical Base and the Process of Developing Hypotheses

2.1. Analysis of How Institutional Investors Affect Green Innovation within Enterprises

The financial market price not only contains the fundamental information of the enterprises, but also affects the business decision of the enterprises and forms the feedback effect between the financial market and the real economy [5]. As mentioned earlier, institutional investors have professional advantages on resource and information, most of their investment aiming for profit, the ability of green innovation of an enterprise is critical in market competition, the competitiveness of an enterprise is significantly upgraded with the ability of an enterprise to innovate green technology [6]. With competitive advantage, enterprise can offer more returns to institutional investors. Hence, institutional investors are motivated and capable of enhancing enterprises' green innovation capabilities. About the management layer in the enterprises, as per the theory of effective supervision, institutional investors can maximize their own expertise to their investing destination, risk management and practical experience to actively enter into corporate administration and decision making, and can contribute to restrain and supervise the short-sighted behavior of management to a certain extent [7].

Therefore, the following hypotheses are proposed:

H1. The green innovation of enterprises is positively impacted by institutional investors.

2.2. The Correlation among Institutional Investors, Top Management Incentives, Enterprises' Green Innovations

According to the central view of modern corporate governance, in the pursuit of short-term profit and personal interests, management sometimes ignores the sustainable development of enterprises leading to the failure to go all out to maximize shareholders' wealth—institutional investors are also included as shareholders—resulting in agency conflict. This conflict arises from the division between ownership and management rights. To effectively mitigate these agency conflicts, principal-agent theory suggests that aligning shareholder and management interests can substantially reduce the adverse effects of ownership-management separation. Top management incentive is an important incentive mechanism, the management will prioritize the sustainable value of enterprises and benefits of stockholder, so as to work more actively to optimize worth of companies. This long-term incentive

system can effectively reconcile the interest differences between shareholders and management and promote the unity of goals of both sides [8]. Therefore, institutional investors are motivated to provide compensation incentives for management. Meanwhile, with a salary incentive, top managers are willing to make efforts to boost the company's performance, as proposed in hypothesis 1, the company can achieve institutional investors' objectives by improving its performance compared with its competitors through green innovation.

Therefore, the following hypotheses are proposed:

H2. Through top management incentives, institutional investors help companies promote their green innovation capabilities.

3. Variable Description and Model Construction

3.1. Data Sources and Sample

The CSMAR database is used to gather relevant research data for the study that selects China's A-share listed companies from 2010 to 2023, enterprises submit green patent requests, which are derived from the CNRDS database. On the purpose of warranting exactness and stability in the study outcome, the original statistics collected were screened and dealt in the following manner:

- (1) Financial and insurance enterprises' observation samples are excluded;
- (2) Excluding observed values of ST and *ST listed enterprises;
- (3) Tick except for the observations of listed companies with missing or abnormal financial data.

After the above screening, 43914 samples are finally obtained. In addition, Excel 16.0 is used to deal the statistics, and Stata 18.0 is used to carry out the empirical analysis steps. On the purpose of alleviate bias caused by extremum, in this study continuous variables are winsorized by 1%.

3.2. Measures

3.2.1. Dependent Variables

In reference to the study conducted by Zou et al., to measure GTI, the natural logarithm of green patent applications filed by listed companies is utilized in this study [9]. Since there are specific cases where the green patent is 0 in the sample, adding 1 to the original data and then taking the logarithm.

3.2.2. Independent Variable

This paper uses institutional investor holdings as independent variable (INST). The method of Wang et al. is referred in this paper, the percentage of institutional investor holdings is measured by dividing the quantity of equity held by them by the whole capital stock at the end of the period, including a series of financial, securities types of subjects [10].

3.2.3. Mediating Variable

This paper uses top management incentive (salary) as mediating variable. Referring to the study of Shen Dayong, to assess the incentive for top management, the paper used the natural logarithm of the whole salary of the top three executives [11].

3.2.4. Control Variables

This study choose these control variables relating the ability of green innovation of enterprises: fixed asset ratio(ppe), ownership concentration(top1)(the evaluation is based on the number of shares held by the largest shareholder divided by the total share capital),board independence(indep)(the

percentage of independent directors in relation to the total number of directors at the conclusion of the year), cash flow ratio(cashflow)(cash flow from operations divided by whole assets).

3.3. Model Setting

3.3.1.Main Regression Model Setting

This research aims to investigate how institutional investors affect enterprises' green innovation capabilities, the study constructs Equation (1) to examine it:

$$GTI_{i,t} = \alpha_0 + \alpha_1 INST + \alpha_2 controls + Industry + Year + \varepsilon \quad (1)$$

3.3.2.Mediating Effect Regression Model Setting

Referring to the mediation model test method of Wen et al., the measurement model's goal is to analyze how top management incentives affect the link between institutional investors' stake and the capacity for green innovation in enterprises [12].

$$Salary_{i,t} = \beta_0 + \beta_1 Inst_{i,t} + \beta_2 Controls_{i,t} + Industry + Year + \varepsilon \quad (2)$$

$$GTI_{i,t} = \theta_0 + \theta_1 Salary_{i,t} + \theta_2 Controls_{i,t} + Industry + Year + \varepsilon \quad (3)$$

4. Empirical Results and Analysis

4.1. Descriptive Statistics

Table 1 reveal the descriptive statistical results of relevant variables. There are 43,914 observed values, among which, taking into account the variables explained, the average value of GTI is 0.4948, and it ranges between 0 and 3.989, with a standard deviation of 0.8819. Institutional investors have a mean shareholding ratio of 43.3155, a standard deviation of 24.8174, a minimum value of 0.3673, and a maximum value of 91.1252, the aspect of explanatory variables, the shareholding ratio of them in China is in the middle, as indicated, the institutional shareholding of different enterprises varies greatly.

Table 1: Descriptive statistics of variables

Variable	N	Mean	SD	Min	Max
GTI	43,914.00	0.4948	0.8819	0	3.989
INST	43,914.00	43.3155	24.8174	0.3673	91.1252
ppe	43,914.00	0.2053	0.1569	0.0017	0.6884
top1	43,914.00	33.8439	14.8177	8.4824	73.9971
indep	43,914.00	37.6684	5.3402	33.33	57.14
cashflow	43,914.00	-0.1196	0.287	-1.0364	0.6966

4.2. Correlation Analysis

According to the results (table 2) of the correlation analysis of the main variables conducted by Stata 18.0, each variable has an absolute correlation coefficient of less than 0.5, and passes the VIF test, it can be concluded that there is no significant multicollinearity between variables.

Table 2: Correlation Analysis

	GTI	INST	ppe	top1	indep	cashflow
GTI	1					
INST	0.1202	1				
ppe	-0.05	0.137	1			
top1	0.0199	0.4907	0.0933	1		
indep	0.0292	-0.0635	-0.0459	0.0371	1	
cashflow	-0.0193	0.0063	0.1455	-0.0103	0.0121	1

4.3. Results

Table 3 shows the results of the benchmark regression. The test requires the use of the fixed-effect model for conducting the benchmark regression. The regression coefficient of GTI and INST is 0.003, this has a significant positive impact at 1%, GTI will be improved and their ability to innovate will be positively impacted by increasing the stake ratio of institutional investors. As mentioned above, the quantity of capital, information, and resources are advantages that institutional investors possess. As a member of shareholders -- one of the owners of the company, for the consideration of their own interests, institutional investors inject their own advantages into the companies they, so as to help enterprises better develop, enhance their green innovation ability, and make them more in line with market demand and time trend. At the same time, the GTI also presents the importance enterprises attach to green innovation technology, which is a very important indicator of enterprise competitiveness, especially under the background of China's even the world's green and sustainable development strategy. After empirical analysis, Hypothesis 1 is supported.

Table 3: Regression results of institutional investors' shareholdings and green innovation ability of enterprises

VARIABLES	GTI
INST	0.003***
	5.17
ppe	-0.064
	(-1.09)
top1	-0.002*
	(-1.65)
indep	0.001
	0.53
cashflow	-0.025**
	(-2.13)
Constant	0.09
	0.73
Observations	43,914
Number of ID	5,182
R-squared	0.114
Industry FE	Yes
Year FE	Yes
Robust t-statistics in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

4.4. Mediation Effect of Top Management Incentive

Table 4 presents the outcomes of the mediating effect test and show that top management incentives (salary) mediate the link between INST and GTI. The second column explains how institutional investors' shareholding ratio affects the incentive for top management, a significant increase in institutional investors' shareholding (INST) to 1% indicates that companies that have a larger institutional shareholding ratio are more likely to offer higher incentives to their top management, to encourage executives to work harder and promote green innovation strategy. In the third column, it can be seen that the regression coefficient for executive compensation incentive (Salary) is positively significant at the level of 1%, suggesting that top management compensation incentive has an obvious positive effect on GTI. The intermediary function of top management compensation incentive is to connect institutional investors' shareholding with companies' ecological innovation, hypothesis 2 is supported. When investors are involved in internal administration of shareholding companies, they can improve the level of top management compensation incentive, alleviate the agency problem, and enhance the work willingness of senior executives, to help enterprises improve their green innovation capabilities and increase their market value.

Table 4: Results of the mediation effect test.

VARIABLES	(path c)	(path a)	(path b&c')
	GTI	salary	GTI
salary			0.278***
			48.3
INST	0.006***	0.008***	0.003***
	28.78	48.63	17.85
ppe	-0.355***	-0.716***	-0.156***
	(-13.10)	(-32.74)	(-5.82)
top1	-0.003***	-0.006***	-0.001***
	(-9.74)	(-24.49)	(-4.32)
indep	0.006***	0.004***	0.005***
	8.08	5.96	6.92
cashflow	-0.037**	0.092***	-0.063***
	(-2.54)	7.81	(-4.40)
Constant	0.189***	14.421***	-3.824***
	5.92	559.03	(-43.10)
Observations	43,914	43914	43914
R-squared	0.02	0.07	0.07
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
t-statistics in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

5. Conclusion

Institutional investors' shareholding is strongly linked to enterprises' green innovation capabilities, which indicates that with the shareholding ratio of institutional investors increases, enterprises' green innovation capabilities are likely to improve correspondingly. By providing financial support, institutional investors can enhance the professional knowledge and skills of enterprises in green

innovation, as indicated, meanwhile expanding the information channel of enterprises, and incentive of corporate executive compensation. The green innovation capabilities of enterprises will be strengthened by these methods.

Analysis of the mediating effect reveals that institutional investors' shareholding and top management incentive levels are significantly positively correlated, as are top management incentive levels and enterprises' green innovation capabilities. This finding suggests that as institutional investors' shareholding ratios increase, top management incentive levels are likely to rise, thereby enhancing enterprises' green innovation capabilities. Top management incentive plays a positive intermediary role as an intermediate mechanism between institutional investors and the capability of green innovation of corporate.

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