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The Influence of Equity Incentive and its Concentration Degree on Enterprise Investment Efficiency

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Abstract. As an important part of China's modern industrial system, high-tech industry has long-term inefficient investment problems due to the characteristics of high investment demand, high risk and long cycle. As an incentive and constraint mechanism based on the principal-agent theory, equity incentive can effectively reduce the agency cost and improve the investment efficiency of enterprises. Based on the different perspective of equity incentive between senior executives and core technical personnel, this paper takes the sample of equity incentive in 2018-2022 to test the impact of equity incentive on the investment efficiency of enterprises. The results show that equity incentive can effectively improve the investment efficiency, alleviate the investment shortage and restrain the excessive investment; equity concentration plays a negative effect on the relationship between equity incentive and enterprise investment efficiency; compared with executive equity incentives, core technical personnel equity incentives have a more significant effect on improving investment efficiency, Therefore, enterprises should pay attention to improving the level of equity incentive; focus on the influence of equity structure on the utility of equity incentive and prevent excessive equity concentration; when designing equity incentive plans, focus on incentivizing core technical personnel.

Keywords: Executive Equity Incentive; Core Technical Personnel Equity Incentive; Investment Efficiency; Equity Concentration.

1. Introduction

High-tech enterprises are an important part of China's modern industrial system and the key engine to achieve high-quality development. According to the traditional financial theory, there is no inefficient investment in the perfect capital market [1], and the enterprise investment is all determined by the investment opportunities. However, in real life, due to the characteristics of high investment demand, long cycle and high risk [2], information asymmetry [3], two rights separation [1] and other principal-agent problems exist widely, the actual investment scale of enterprises often deviates from the optimal level. As an incentive and constraint mechanism based on the principal-agent theory [4], equity incentive can align the interests of all levels of the enterprise, reduce the agency cost, and effectively improve the investment efficiency.

The selection of equity incentive object is an important part of equity incentive design. It is very important to distinguish different incentive objects to deeply investigate the governance effect of equity incentive. From the existing literature, the research on the relationship between equity incentive and enterprise investment efficiency mostly focuses on the perspective of executive equity incentive [5,6], or do not distinguish the incentive object, the equity incentive as a whole test [7,8]. However, the research on the incentive effect of another important incentive object, employees, especially the core technical personnel, is relatively scarce.

Therefore, the contribution of this paper is mainly reflected in the following three aspects: firstly, the representative high-tech enterprises are used to examine the influence of equity incentive on the investment efficiency; secondly, the influence of the executive incentive on the difference in the investment efficiency, which fills the gap in the current research on the equity incentive of core technical personnel; finally, further discusses the regulating effect of equity concentration on the utility of equity incentive, and expands the empirical literature in this field.

2. Theoretical Analysis and Research Hypotheses

The implementation of equity incentive establishes a reasonable and effective incentive system for the management investment decision making. The core idea is to transform the pursuit of maximizing personal interests into the interests of the company, make the managers maximize the management potential, strengthen the internal cooperation of the enterprise[9], alleviate agency problems and effectively improve the investment efficiency; meanwhile, equity incentive can effectively enhance the work enthusiasm of employees[10], attract and retain outstanding talents, improve the corporate governance structure and enhance the investment level.

The existing literature mostly divides non-efficiency investment into overinvestment and underinvestment [11,12]. When making business decisions, enterprise managers tend to ignore some investment projects conducive to the long-term development of enterprises for the purpose of high return on current investment and expanding their own control right. This short-sighted behavior will lead to excessive investment of enterprises. The implementation of equity incentive can make the interests of all classes within the enterprise become consistent, play the effect of "interest convergence"[13], encourage managers to find projects that can still bring profits for the enterprise investment in the future, and effectively curb excessive investment. In addition, in order to maintain their own reputation and avoid risks, managers will reduce the investment in uncertain investment projects, resulting in insufficient investment of enterprises. The introduction of equity incentive makes the future incremental income of managers directly related to the company's performance, which helps managers to overcome the risk avoidance psychology, make full use of investment opportunities, and alleviate the problem of insufficient investment. Therefore, the following assumptions are made:

Hypothesis 1: Equity incentive can improve the investment efficiency of enterprises.

Hypothesis 2: Equity incentive can alleviate the non-efficient investment of enterprises, that is, improve the underinvestment and restrain the excessive investment.

Equity incentive can be divided into executive equity incentive and core technical personnel equity incentive according to its objects. The implementation of the executive equity incentive weakens the short-term behavior of the senior executives, reduces the phenomenon of the enterprise value damage caused by the internal conflicts of interest, and improves the investment decisions. As the key to the core competitiveness of enterprises, the implementation of equity incentive can strengthen the loyalty and enthusiasm of core employees, maintain the stability of enterprise operation, and then improve the investment efficiency. However, relevant studies show that [14], under the condition of high equity concentration, the correct decisions made by senior executives may not be implemented or inefficient; meanwhile, due to the existence of professional barriers, high R & D cost and spillover risk of innovation results, major shareholders tend to avoid risk due to large personal risks[15], inhibiting technological innovation and efficiency improvement of enterprises. In conclusion, the following assumptions are proposed:

Hypothesis 3: Executive equity incentive can improve the investment efficiency of enterprises, and the equity concentration degree has a negative adjustment effect on the relationship between executive equity incentive and the investment efficiency of enterprises.

Hypothesis 4: The equity incentive of core technical personnel can improve the investment efficiency of enterprises, and the equity concentration degree plays a negative role in regulating the relationship between the equity incentive of core technical personnel and the investment efficiency of enterprises.

The senior executive equity incentive improves the investment efficiency by reducing the internal interest conflict, and acts on the decision-making and management level of the whole enterprise. However, some studies have found that the impact of executive equity incentive on the investment efficiency of enterprises is not significant [16], and the self-interest behavior of senior executives and the hollowing behavior of collusion with major shareholders will play a certain inhibitory effect on their utility [17], and even worsen the problem of corporate agency [18].The main object of the equity

incentive for the core technical personnel is the core technical employees as the backbone of the company, which plays a more direct and significant role in improving the efficiency of high-tech enterprises. At the same time, by granting the core technical personnel certain equity incentive to make them become shareholders, it will give them stronger motivation and ability to strengthen the supervision of the management, effectively reduce the management's interest encroachment behavior and opportunistic [11], and improve the investment efficiency. In addition, equity incentive can also improve the self-identity and sense of responsibility of the core technical personnel to the enterprise, alleviate the agency problem between "shareholders-employees" [19], and improve the investment level of the enterprise. Therefore, the following assumptions are proposed:

Hypothesis 5: In high-tech enterprises, the impact of equity incentive of core technical personnel on the improvement of enterprise investment efficiency is more significant than that of executive equity incentive.

3. Research Design

3.1. Sample Selection and Data Source

This paper takes a-share listed companies from 2018 to 2022 as the initial sample, referring to the high-tech industry classification (2017) released by the state, and takes the data of high-tech industries such as computer and office equipment manufacturing, aerospace and equipment manufacturing, and chemical manufacturing as the final research object. On this basis, eliminate the listed companies listed by ST, * ST or PT at the end of the year; eliminate the company samples already delisted; eliminate the company samples with missing values. Finally, 112 high-tech enterprises were obtained, with a total of 560 observations.

3.2. Variable Setting

3.2.1. Explained Variable

Enterprise investment efficiency: according to Richardson (2006) [20] and Chen (2011) [21] research, build the following model to measure the enterprise investment efficiency, specific practice is as follows: Calculated according to model (1), the difference between the actual investment level and the estimated value as residual ε, ε> 0 means excessive investment (OverInv), ε <0 means insufficient investment (UnderInv).

$$\begin{aligned}\mathrm{Inv}_{i,t} = {} & \delta_0 + \delta_1 \mathrm{Growth}_{i,t-1} + \delta_2 \mathrm{Lev}_{i,t-1} + \delta_3 \mathrm{Cash}_{i,t-1} + \delta_4 \mathrm{Age}_{i,t-1} + \delta_5 \mathrm{Size}_{i,t-1} + \\ & \delta_6 \mathrm{Return}_{i,t-1} + \delta_7 \mathrm{Inv}_{i,t-1} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Where, $\mathrm{Inv}_{i,t}$ For the explained variable, it represents the actual investment level of company i in year t. Since the investment level of the company in the current period is mainly determined by the operation situation of the previous period, the explanatory variables of the model are all variables that lag behind the first phase, and the specific calculation method is listed in Table 1.

3.2.2. Explanatory Variable

Taking the intensity of equity incentive as the main explanatory variable, the number of equity incentive issued in the current year is calculated by the proportion of the total share capital.

In order to study the influence of executive equity incentive and core technician equity incentive on the investment efficiency of enterprises, this paper further divides the equity incentive index into two indexes: executive equity incentive (MI) and core technician equity incentive (TI).

3.2.3. Regulated Variable

Equity concentration degree (Contl) is selected as the adjustment variable, and the shareholding ratio of the largest shareholder is taken as the measurement index to investigate its regulating effect on the relationship between equity incentive and enterprise investment efficiency.

3.2.4. Controlled Variable

Considering the existing literature comprehensively, multiple control variables are included in this paper, and the detailed definitions are shown in Table 1.

Table 1. Variable names and definition instructions

property	symbol	variable-definition
explained variable	Inv	Enterprise investment expenditure =(Cash paid for purchase and construction of fixed assets intangible assets and other long-term assets-net cash recovered from disposal of fixed assets intangible assets and other long-term assets) / total assets at the beginning of the period
	InvEff	The absolute value of investment expenditure residual, the closer to zero, the higher the investment efficiency
	OverInv	Residual <0
	UnderInv	Residual> 0
explanatory variable	EI	Equity incentive level = number of equity incentive / total equity capital
	MI	Executive equity incentive level = executive equity incentive number / total equity capital
	TI	Equity incentive level of core technical personnel = number of equity incentive level of core technical personnel / total equity capital
regulated variable	Contl	Equity concentration degree = the shareholding ratio of the largest shareholder
controlled variable	Growth	Growth level = the growth rate of the main business revenue
	Lev	Asset-to-liability ratio = liabilities / total assets
	Cash	Cash holdings = monetary funds / total assets
	Age	Enterprise listing years =The difference between the year and the year of listing plus 1
	Size	Enterprise size = the natural logarithm of the total assets
	Return	Stock yield = annual return on individual stocks considering cash dividend reinvestment
	Idp	The portion of independent directors = number of independent directors / total number of directors
	Dual	In one, if the chairman and the general manager are the same person, take 1, otherwise take 0
	CF	Cash flow = net cash flow from operating activities / total assets
	Industry	Industry control variables are calculated according to the 2012 industry classification standard of CSRC, manufacturing industry is classified by second-level industry classification, and others are calculated by first-level classification
	Year	Annual control variable, takes 1 for that year, otherwise takes 0

3.3. Model Specification

3.3.1. Benchmark Model Setting

In order to preliminarily test the impact of the equity incentive plan on the investment efficiency of listed companies, the following measurement model is constructed:

$$\mathrm{InvEff}_{i,t} = \alpha_0 + \alpha_1 \mathrm{EI}_{i,t} + \alpha_2 \mathrm{Growth}_{i,t} + \alpha_3 \mathrm{CF}_{i,t} + \alpha_4 \mathrm{Lev}_{i,t} + \alpha_5 \mathrm{Idp}_{i,t} + \alpha_6 \mathrm{Dual}_{i,t} + \alpha_7 \mathrm{Age}_{i,t} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \quad (2)$$

$$\mathrm{InvEff}_{i,t} = \alpha_{0+} \alpha_1 \mathrm{EI}_{i,t} + \alpha_2 \mathrm{Growth}_{i,t} + \alpha_3 \mathrm{CF}_{i,t} + \alpha_4 \mathrm{Lev}_{i,t} + \alpha_5 \mathrm{Idp}_{i,t} + \alpha_6 \mathrm{Dual}_{i,t} + \alpha_7 \mathrm{Age}_{i,t} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \quad (3)$$

Among them, the InvEffIt is the explained variable and represents the investment efficiency of the enterprise. The absolute value of the residual is measured by model (1). The smaller the value indicates, the higher the investment efficiency, the residual is greater than 0 means the excessive

investment (OverInv), and less than 0 means the insufficient investment (UnderInv). The EI is the explanatory variable, the other variables are control variables, and the specific definitions and measures are shown in Table 1. In addition, industry and year fixed effects were added in the model.

3.3.2. Research Technique

Construct model (4), (5) test the impact of executive equity incentive and core technical personnel equity incentive on the investment efficiency of enterprises.

$$\mathrm{InvEff}_{i,t} = \beta_0 + \beta_1 \mathrm{MI}_{i,t} + \beta_2 \mathrm{Growth}_{i,t} + \beta_3 \mathrm{Cash}_{i,t} + \beta_4 \mathrm{Contl}_{i,t} + \beta_5 \mathrm{Idp}_{i,t} + \beta_6 \mathrm{Dual}_{i,t} + \beta_7 \mathrm{Size}_{i,t} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \quad (4)$$

$$\mathrm{InvEff}_{i,t} = \beta_0 + \beta_1 \mathrm{TI} + \beta_2 \mathrm{Growth}_{i,t} + \beta_3 \mathrm{Cash}_{i,t} + \beta_4 \mathrm{Contl}_{i,t} + \beta_5 \mathrm{Idp}_{i,t} + \beta_6 \mathrm{Dual}_{i,t} + \beta_7 \mathrm{Size}_{i,t} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \quad (5)$$

On the basis of model (5), the cross item of executive equity incentive and equity concentration is added to construct model (6) to test the moderating effect of equity concentration.

$$\mathrm{InvEff}_{i,t} = \beta_0 + \beta_1 \mathrm{MI}_{i,t} + \beta_2 \mathrm{MI}_{i,t}\mathrm{Contl}_{i,t} + \beta_3 \mathrm{Growth}_{i,t} + \beta_4 \mathrm{CF}_{i,t} + \beta_5 \mathrm{Lev}_{i,t} + \beta_6 \mathrm{Dual}_{i,t} + \beta_7 \mathrm{Size}_{i,t} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \quad (6)$$

On the basis of model (5), the cross items of equity incentive and equity concentration of core technicians are added to construct model (7) to test the moderating effect of equity concentration.

$$\mathrm{InvEff}_{i,t} = \beta_0 + \beta_1 \mathrm{TI}_{i,t} + \beta_2 \mathrm{TI}_{i,t}\mathrm{Contl}_{i,t} + \beta_3 \mathrm{Growth}_{i,t} + \beta_4 \mathrm{CF}_{i,t} + \beta_5 \mathrm{Lev}_{i,t} + \beta_6 \mathrm{Dual}_{i,t} + \beta_7 \mathrm{Size}_{i,t} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \quad (7)$$

4. Summary

4.1. Descriptive Statistics

Table 2 shows the descriptive statistics of the sample.

Table 2. Descriptive statistics for the main variables

		observed value	least value	crest value	average value	standard deviation
explained variable	InvEff	560	0.0001	0.2224	0.0237	0.0284
	OverInv	249	0.0001	0.2224	0.0298	0.0362
	UnderInv	311	0.0001	0.1794	0.0190	0.0187
explanatory variable	EI	560	0	0.4378	0.0171	0.0266
	MI	560	0.0003	0.6138	0.0750	0.0613
	TI	560	0	0.1328	0.0145	0.0168
controlled variable	Contl	560	0.0418	0.6312	0.2855	0.1374
	Cash	560	0.0094	0.6754	0.1999	0.1170
	Lev	560	0.0842	0.9077	0.3939	0.1674
	CF	560	-0.1092	0.3669	0.0659	0.0595
	Idp	560	0.3	0.6667	0.3886	0.0583
	Dual	560	0	1	0.4286	0.4953
	Size	560	20.2231	28.6067	22.7486	13404
	Age	560	1.0986	3.4012	2.2851	0.5409
	Growth	560	-0.6933	1.6926	0.1791	0.2634

The VIF was tested and showed that there was no multicollinearity problem among the variables. In this paper, the hypotheses are tested by further regression analysis of the sample.

4.2. The Impact of Equity Incentive on the Company's Investment Efficiency

The Richardson regression model was used to test whether the implementation of equity incentive can reduce the non-efficiency investment, and Table 3 presents the regression results.

From the regression results of the benchmark model, the equity incentive coefficient is significantly negative at the significance level of 1%, indicating that the equity incentive can effectively improve the investment efficiency of enterprises, which verifies hypothesis 1. Further analysis shows that in the excessive investment sample and underinvestment in the sample, the equity incentive coefficient was significantly negative, indicating that the equity incentive effectively suppressed the non-efficiency investment of enterprises, and verified hypothesis 2.

Table 3. Results of the impact of equity incentives on non-efficiency investments

explanatory variable	InvEff 3-1	OverInv 3-2	UnderInv 3-3
EI	-0.1353*** (-3.07)	-0.1277* (-1.94)	-0.1136** (-2.10)
Growth	0.0080* (1.72)	0.0170* (1.88)	0.0025 (0.61)
CF	-0.0025 (-0.12)	-0.0159 (-0.45)	-0.0260 (-1.21)
Lev	-0.0003 (-0.04)	0.0034 (0.19)	-0.0023 (-0.30)
Idp	0.0456* (1.86)	0.0236 (0.56)	0.0831*** (3.53)
Dual	0.0033 (1.31)	0.0039 (0.86)	-0.0014 (-0.59)
Age	-0.0092*** (-3.04)	-0.0095* (-1.65)	-0.0076 (-2.80)
Industry, annual variables	control	control	control
R^2	0.2024	0.3337	0.1949
observed value	560	560	560

Note: *, * * and * * * indicate significance at 10%, 5% and 1% respectively (two-tailed t-test), the same below.

4.3. Test of the Effect of Equity Incentive of Senior Executives and Core Technical Personnel And the Adjustment Effect of Equity Concentration

The absolute value and significance of the equity incentive coefficient of core technical personnel are greater than that of the executive equity incentive, indicating that in high-tech enterprises, the equity incentive of core technical personnel is more significant in improving the investment efficiency of enterprises than the equity incentive of senior executives, which proves hypothesis 5.

4.4. Robustness Test

Table 4. Regression results of the influence of equity incentive on senior executives and core technicians and the moderating effect of equity concentration

	model (4) 4-1	model (5) 4-2	model (6) 4-3	model (7) 4-4
MI	-0.0494** (-2.44)		-0.0573*** (-2.82)	
TI		-0.2692*** (-3.71)		-0.3028*** (-4.16)
Contl	0.0153 (1.31)	0.0139 (1.18)		
MI*Contl			-0.3079* (-1.85)	
TI*Contl				-1.3256** (-2.15)
Growth	0.0104** (2.25)	0.0094** (2.03)	0.0087* (1.88)	0.0089* (1.93)
Cash	-0.0058 (-0.51)	-0.0068 (-0.59)	-0.0035 (-0.30)	-0.0048 (-0.43)
Idp	0.0315 (1.26)	0.0317 (1.27)	0.0377 (1.53)	0.0345 (1.42)
Dual	0.0053** (2.09)	0.0047* (1.86)	0.0057** (2.23)	0.0044* (1.75)
Size	-0.0014 (-1.10)	-0.0012 (-0.95)	-0.0010 (-0.87)	-0.0008 (-0.67)
Industry, annual variables	control	control	control	control
R^2	0.1834	0.1936	0.1871	0.2010
observed value	560	560	560	560

In this paper, we conduct the robustness test of the benchmark conclusions by replacing the variables. by referring to relevant research [22,23], the ratio of capital expenditure and capital stock at the end of the previous period is selected to recalculate the investment level of the enterprise, and Tobin Q is selected to measure the growth level of the enterprise, the ratio of cash and its equivalent holdings and total assets to measure the cash holdings of the enterprise.

The results of the recalculation and regression based on the above surrogate variables are shown in the table 4. The coefficients of the main explanatory variables are significantly positive, indicating that the equity incentive can improve the investment level of enterprises, which verifies the robustness of the model.

Table 5. Robustness test of the impact of equity incentive on investment efficiency

explanatory variable	model (2) 5-1	model (4) 5-2	model (5) 5-3
EI	0.2176*** (3.10)		
MI		0.0764** (2.05)	
TI			0.3768*** (3.02)
Growth	0.0124 (1.62)	0.0112 (1.46)	0.0118 (1.55)
CF	-0.0277 (-0.69)	-0.0243 (-0.61)	-0.237 (-0.60)
Lev	0.0248 (1.06)	0.0325 (1.39)	0.0248 (1.06)
Idp	0.0939* (1.82)	0.0949* (1.83)	0.0930* (1.81)
Dual	0.0110* (1.89)	0.0097* (1.67)	0.0107* (1.86)
Age	-0.0409*** (-4.21)	-0.0416*** (-4.21)	-0.0420*** (-4.27)
Industry, annual variables	control	control	control
R^2	0.2387	0.2430	0.2268
observed value	414	414	414

4.5. Endogeneity Test

Table 6. Shows the endogeneity test

	model (2)	model (4)	model (5)	model (6)	model (7)
Avg_EI	-0.2302* (-1.65)				
Avg_MI		-0.5898* (-1.70)			
Avg_TI			-0.2198* (-1.69)		
Avg_MI*Contl				-0.4649 (-1.62)	
Avg_TI*Contl					-1.6231* (-1.84)
_cons	-0.1076	-0.7623	0.1572	-0.1384	-0.8536
The first stage F value	192.21	71.09	115.43	12.67	11.92
R2	0.6455	0.5000	0.5162	0.1755	0.1755
controlled variable	YES	YES	YES	YES	YES
Industry, annual variables	control	control	control	control	control
observed value	560	560	560	560	560

This paper may have the problem of endogeneity due to reverse causality. To this end, according to the research of Li Lianwei et al. (2023) [12], the industry annual averages Avg_EI, Avg_MI, and Avg_TI were re-examined as instrumental variables. The results are shown in Table 6. The average equity incentive intensity of the industry is related to the endogenous explanatory variables, and will not directly improve the investment efficiency of enterprises, which meets the requirements of instrumental variables.

The test results are basically consistent with the previous article, indicating that the conclusion of the study remained robust after controlling the endogeneity problem. Moreover, because the selected instrumental variables are consistent with the number of endogenous variables, there is no over-identification problem and no Hansen test is required.

5. Conclusion and Policy Recommendations

This paper takes the listed companies implementing equity incentive in the high-tech industry in 2018-2022, empirically examines the relationship between equity incentive, equity concentration and enterprise investment efficiency, and draws the following conclusions: First, Equity incentive can effectively improve the investment efficiency of enterprises, alleviate the lack of investment, and curb excessive investment. Second, equity incentive for senior executives and core technical personnel can improve the investment efficiency of enterprises, and equity concentration plays a negative role in regulating the relationship between the two and the investment efficiency of enterprises. In addition, compared with the executive equity incentive, the equity incentive of core technical personnel is more effective on improving the investment efficiency of enterprises.

This paper has an important guiding significance for guiding the practice of equity incentive system and optimizing the design of equity incentive scheme in China. First, enterprises should fully evaluate the feasibility of the scheme when designing the equity incentive, pay attention to the long-term value of the enterprise rather than the short-term benefits, and establish a reasonable exercise period and exit mechanism to make it fit with their own development strategy. In addition, we should pay attention to the tracking and supervision of incentive behavior, so that it can be truly implemented and effectively implemented, and effectively improve the incentive level. Second, enterprises should pay attention to the possible impact of their own equity structure on the incentive effect, prevent excessive equity concentration and market manipulation by strengthening the supervision of equity transactions, introducing third-party investment, and issuing restricted stock to employees, and make appropriate adjustments to the equity incentive plan according to their own equity situation. Third, when determining the incentive objects, enterprises should focus on the core talents who meet the strategic needs, expand the scope and intensity of the equity incentive for the core employees under feasible conditions, timely publicize and communicate the goals and effects of the incentive plan, and strengthen the sense of identity and belonging of the employees to the incentive plan. At the same time, establish a sound feedback and communication mechanism, according to the opinions and needs to improve the incentive plan of employees.

References

[1] JC Stein, et al. Agency, Information and Corporate Investment. Handbook of the Economics of Finance. (2003) p. 111-165.

[2] Youtang Zhang, Yuming Chang, et al. Empirical test of the impact of digital finance on the investment efficiency of science and technology enterprises. Statistics and Decision-making. Vol. 36(2020) No. 16, p. 179-183.

[3] Myers, S.C.& Majluf, N.S, et al. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics. Vol. 13(1984) No. 2, p. 187-221.

[4] Fuyan Luo, Zhonghua Shen, et al. Equity incentive, agency cost and enterprise investment efficiency. Finance and Trade Research. Vol. 24(2013) No. 02, p. 146-156.

[5] Fubi Luo, Maosheng Ran, Jiating Du, et al. Empirical research on the relationship between equity incentive and investment decision-making for senior executives. Accounting Research. (2008) No. 8, p. 69-76.

[6] Yingjiang Jie, Shuo Yang, et al. Study on the impact of executive equity incentive on corporate investment level -- An evidence from listed companies in the high-tech industry. Science and Technology Management Research. Vol. 32(2012) No. 20, p.148-152.

[7] Changjiang Lv, Haiping Zhang, et al. The impact of the equity incentive plan on the company's investment behavior. Management World. (2011) No. 11, p. 118-126.

[8] Zhanxia Wu, et al. Analysis on the influence of equity incentive system on investment efficiency of listed companies in China. Productivity Research. (2006) No. 08, p. 209-211.

[9] Oxley, J.& Pandher, G, et al. Equity-based incentives and collaboration in the modern multibusiness firm. Strategic Management Journal. Vol.37(2016) No. 7, p. 1379-1394.

[10] Lianwei Li, Zhuo Lu, Yuanyuan Guo, et al. Equity incentive and governance efficiency of Listed Companies—Based on the perspective of human capital. System engineering. (2023), p. 1-15.

[11] Jensen, M. C, Meckling, W. H, et al. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics. Vol. 3(1976) No. 4, p. 305-360.

[12] Tzioumis, K, et al. Why do firms adopt CEO stock options? Evidence from the United States. Journal of Economic Behavior & Organization. Vol. 68(2008) No. 1, p. 100-111.

[13] Jian Wang, Yu Lu, Zhen Zhao, et al. Do equity incentives lead to overinvestment? Empirical evidence from the listed companies in the small and medium-sized board manufacturing industry. New birth. (2013) No. 11, p.13.

[14] Luping Wang, YinZhuan Bai, Yintian Wang, et al. The impact of equity incentive on investment efficiency—Based on the empirical analysis of listed family enterprises. Systems Engineering. Vol. 36(2018) No. 8, p. 37-50.

[15] Li Li, Peifeng Huang, Jing Cui, et al. The impact of equity incentive and its concentration on R & D expenditure—Based on the different perspective of senior executive incentive and core technical personnel incentive in the information technology industry. Research on Technical Economics and Management. (2020) No. 2, p. 18-22.

[16] Xiangyi Xu, Ning Xu, et al. A Study on the dual effect of equity incentive under the Pyramid structure of Xu Ning—The empirical evidence from listed companies in China. Economic Management. (2010) No. 9, p. 59-65.

[17] Yuhui Wu, Shinong Wu, et al. Research on the self-interest behavior of corporate executives and its influencing factors --Based on the evidence of the draft equity incentive of Listed Companies in China. Management World. (2010) No. 5, p. 141-149.

[18] Shoufu Xu, Mingmao Deng, et al. Management equity incentive and stock mispricing of listed companies. Nankai Economic Research. (2020) No. 2, p. 179-202.

[19] Shufang Xiao, Wei Fu, et al. Equity incentive can retain the talent? --Based on the re-announcement perspective. Journal of Beijing Institute of Technology (Social Science Edition). (2016) No. 1, p. 73-81.

[20] Richardson, S, et al. Over-investment of free cash flow. Review of Accounting Studies. Vol. 11(2006) No. 23, p. 159-189.

[21] Feng Chen Ole-Kristian Hope, Qingyuan Li, Xin Wang, et al. financial reporting quality and investment efficiency of private firms in emerging markets. The Accounting Review. Vol. 86(2011) No. 4, p. 1255-1288.

[22] Guanchun Liu, Jun Zhang, Yongwei Ye, et al. The investment governance effect of the bank loan andits ownership structure. Finance and trade and economy. Vol. 43(2022) No. 6, p. 64-79.

[23] Long Jin, Zhiguo Ding, Yuanzhu Ding, et al. Will debt defaults in geo-based networks increase corporate underinvestment?. Journal of entral University of Finance and Economics. (2022) No. 4, p. 50-62+118.