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Original Paper

Research on the Impact of Executives' Innovation Awareness Intensity on Corporate Innovation Efficiency

Caiyun Zhang[1]

[1] Business school, Shandong University of Technology, Zibo, 255000, China

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Abstract

In the process of high-speed corporate innovation, there is a situation where the number of innovations is pursued while the efficiency of innovation is ignored, and the characteristics of the senior management team will determine its strategic choices, and through its strategic choices, the performance of the enterprise is determined . Therefore, this paper uses the panel data of Shenzhen and Shanghai listed companies from 2010 to 2022 to test how the intensity of executives' innovation awareness affects innovation efficiency. The study found that the intensity of executives' innovation awareness has a positive impact on innovation efficiency, and has passed a series of robustness tests to further verify the reliability of the results; through heterogeneity analysis, it is found that the intensity of executives' innovation awareness in non-high-tech enterprises has a greater impact on innovation efficiency than that in high-tech enterprises, and the intensity of executives' innovation awareness in state-owned enterprises has a greater impact on innovation efficiency than non-state-owned enterprises. Based on the above conclusions, relevant suggestions are put forward, which provide a certain degree of guiding significance for the high-quality development of enterprises.

Keywords

executive characteristics, executive innovation intensity, innovation efficiency, high-tech enterprises, state-owned enterprises

1. Introduction

Since China implemented the innovation-driven development strategy, enterprise innovation has become one of the most important activities of market entities, making irreplaceable and important contributions to the development of social economy and the improvement of people's quality of life. Enterprise innovation is an important driving force for China to achieve high-quality development goals and promote Chinese-style modernization (Wang & Liu, 2025). However, in the process of rapid

development of enterprise innovation, there is a situation of pursuing innovation quantity while ignoring innovation efficiency. Enterprise innovation efficiency is the ability to maximize the benefits of innovation output under given input resources. Enterprise innovation will be troubled by lack of technical knowledge, insufficient resource input and market volatility risks, which makes it difficult for enterprises to efficiently transform innovation input into output, and the improvement of innovation efficiency is hindered. Existing research focuses on the characteristics of enterprises themselves (Chen, Sun, & Wang, 2021). Enterprise innovation will be troubled by lack of technical knowledge, insufficient resource input and market volatility risks, which makes it difficult for enterprises to efficiently transform innovation input into output, and the improvement of innovation efficiency is hindered (Lü, Hu, & Yang, 2025; Xie, Wang, & Tang, 2020). Few studies have been conducted from the perspective of enterprise human resources. Therefore, this paper proposes to study the impact of executive innovation awareness intensity on innovation efficiency, which to a certain extent broadens the perspective of studying enterprise innovation efficiency.

In addition to explaining that the objective environment faced by the organization will reflect the characteristics of the top management team (in addition to the psychological cognitive basis and values, the characteristics of the top management team will affect the performance of the enterprise (profitability, etc.), and the characteristics of the top management team will determine its strategic choices, and through its strategic choices, determine the performance of the enterprise (Huang & Shao, 2017). These studies mainly focus on financial experience, disaster experience, military experience, etc. (Quan, Cu, & Yin, 2019; GENNARO, B., VINEET, B. P., & RAGHAVENDRA, R. 2017). Therefore, this paper proposes to study the impact of the intensity of executives' innovation awareness on the innovation efficiency of the enterprise, and further explore the impact of the characteristics of the top management team on the enterprise.

2. Study Design

2.1 Data Source and Processing

This paper uses the panel data of Shenzhen and Shanghai listed companies from 2010 to 2022 to test how the executive innovation awareness intensity (GIN) affects the innovation efficiency (InnoEff1). The basic data of enterprises comes from the Guotai An Database (CSMAR), and the patent data comes from IncoPat. The sample data is processed as follows: samples in ST and *ST status are eliminated; financial industry enterprises are eliminated; missing values are eliminated; continuous variables are winsorized at the 1% and 99% levels.

2.2 Variable Definition

Explained variable, innovation efficiency (InnoEff1). Based on the analysis of existing literature, this paper uses the ratio of the number of patents to R&D expenditure as the measurement variable of innovation efficiency (Wang, Wei, Cao et al., 2020). The specific formula is:

$$InnoEff1 = \frac{The\ natural\ logarithm\ of\ the\ total\ number\ of\ invention\ patents,\ utility\ model\ patents\ and\ design\ patent\ applications\ plus\ 1}{\ln(1+R\&D\ expenditure)} \quad (1)$$

Explanatory variable, executive innovation consciousness intensity (GIN). This paper measures the executive innovation consciousness intensity (GIN) by analyzing the text of the board report section in the annual report of listed companies that reflects the main spirit of the company's senior management team (Huang & Shao, 2017). The specific formula is as follows:

$$\text{GIN} = \frac{\text{Total number of keywords reflecting executives' innovative awareness 数}}{\text{Total number of words in the directors' report section of the annual report}} \quad (2)$$

Control variables. Based on the existing literature, the research used variables such as enterprise size (Size), debt-to-asset ratio (Lev), net profit on assets (ROA), intangible assets (Intangible), growth capability (Growth), equity balance (TOP10), and enterprise age (FirmAge) as control variables (Chen, Sun, & Wang, 2021; Wang, Wei, Cao et al., 2020).

Table 1. Variable Definition Table

Variable Types	Variable Name	Variable Symbols	Variable Definition
Explained variable	Innovation efficiency	InnoEff1	See formula (1)
Explanatory variables	Intensity of innovation awareness among senior executives	GIN	See formula (2)
	Enterprise scale	Size	Logarithm of total assets
	Debt-to-asset ratio	Lev	Debt-to-asset ratio
	Net profit from assets	ROA	Net profit margin of total assets
	Intangible assets	Intangible	Intangible assets ratio
Control variables	Growth Capacity	Growth	Operating income growth rate
	Equity Balance	TOP10	Number of shares held by the top ten shareholders/total number of shares
	Company age	FirmAge	Years of Establishment

2.3 Model Design

This paper uses the panel data of A-share listed companies in Shenzhen and Shanghai to study the impact of executive innovation awareness intensity (GIN) on innovation efficiency (InnoEff1). This paper selects a fixed effect model, and the specific model settings are as follows

$$\mathrm{InnoEff1}_{it} = \alpha_0 + \alpha_1 \mathrm{GIN}_{it} + \delta X_{it} + \lambda_j + \mu_t + \varepsilon_{it} \quad (3)$$

In the above model, i and t in the following table represent the enterprise and year respectively; X is the control variable; λ_j is the industry fixed effect, j is the industry to which enterprise i belongs; μ_t is the year fixed effect; ε_{it} is the random disturbance term, and robust standard errors are used to solve the heteroskedasticity problem.

3. Empirical Analysis

3.1 Descriptive Analysis

Table 2 Descriptive analysis is the descriptive statistical results of the explanatory variable executive innovation consciousness intensity (GIN) and the explained variable innovation efficiency (InnoEff1) and the control variables, which include observation values, mean values, standard deviations, minimum values and maximum values. From the descriptive analysis results in Table 2, it can be seen that the explained variable innovation efficiency (InnoEff1) has a mean value of 0.167, a standard deviation of 0.0818, a minimum value of 0, and a maximum value of 0.341. By comparison, it can be seen that the overall level of innovation efficiency (InnoEff1) is low, and the standard deviation of the sample data is relatively small, which is relatively stable; the explanatory variable executive innovation consciousness intensity (GIN) has a mean value of 0.0122, a standard deviation of 0.00554, a minimum value of 0.000634 , and a maximum value of 0.0358. By comparison, it can be seen that the overall level of executive innovation consciousness intensity (GIN) is low, and the standard deviation of the sample data is also relatively small, which is relatively stable. For details of other variables, see Table 2 Descriptive Analysis.

Table 2. Descriptive Analysis

Variable	Obs	Mean	Std.	Min	Max
InnoEff1	29,449	0.167	0.0818	0	0.341
GIN	29,449	0.0122	0.00554	0.000634	0.0358
Size	29,449	22.21	1.261	19.76	26.45
Lev	29,449	0.413	0.198	0.0319	0.896
ROA	29,449	0.0401	0.0676	-0.373	0.247
Intangible	29,449	0.0453	0.0433	0	0.306
Growth	29,449	0.165	0.370	-0.579	3.596
TOP10	29,449	57.89	15.00	20.84	90.91

FirmAge	29,449	2.907	0.334	1.386	3.611

3.2 Correlation Analysis

Table 3 Correlation analysis is the result of correlation statistics between explanatory variables, explained variables, and control variables, including the correlation coefficients and significance between each variable. From the results of the correlation analysis in Table 3, we can know that the correlation coefficient between executive innovation awareness intensity (GIN) and explained variable innovation efficiency (InnoEff1) is 0.135, which is significant at the 1% level, preliminarily proving that executive innovation awareness intensity (GIN) and explained variable innovation efficiency (InnoEff1) are positively correlated; in addition, most of the statistical significance results of the correlation between the explanatory variables, explained variables, and control variables are significant, indicating that the selection of control variables is reasonable. Analyzing the contents of the correlation analysis in Table 3 again, it is found that the correlation coefficients between the variables are less than 0.5, indicating that there is no multicollinearity between the sample data, which provides a preliminary guarantee for the reliability of the results obtained from the sample data analysis.

Table 3. Correlation Analysis

	|InnoEff1	GIN	Size	Lev	ROA	Intangible	Growth	TOP10	FirmAge
InnoEff1	1								
GIN	0.135***	1							
Size	0.334***	-0.170***	1						
Lev	0.154***	-0.210***	0.499***	1					
ROA	0.055***	0.075***	0.022***	-0.345***	1				
Intangible	-0.00800	-0.078***	0.055***	0.045***	-0.058***	1			
Growth	0.025***	-0.00700	0.039***	0.016***	0.300***	-0.014**	1		
TOP10	0.029*	-0.029*	0.097*	-0.105*	0.240**	0.010*	0.093**	1	

	**	**	**	**	*		*		
FirmAge	0.069**	0.098**	0.205**	0.150**	-0.091**	0.00600	-0.086**	-0.181**	1

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

3.3 Benchmark Regression Analysis

Table 4 shows the regression results of the explanatory variable executive innovation awareness intensity (GIN) and the explained variable innovation efficiency (InnoEff1). Before the regression analysis, a Hausman test was performed to select fixed effects or random effects for the regression model. The result of Hausman's test was chi2(8)=493.53, Prob > chi2 = 0.0000, so the fixed effects model was selected when performing the regression analysis. In the benchmark regression analysis of Table 4, column (1) shows the results without adding control lightening and fixed effects; column (2) shows the results without adding control lightening and fixed effects; column (3) shows the results without adding control lightening and fixed effects; column (4) shows the results with adding control lightening and fixed effects. From the results of the benchmark regression analysis in Table 4, it can be seen that the explanatory variable executive innovation awareness intensity (GIN) has a positive impact on the explained variable innovation efficiency (InnoEff1), and both are significant at the 1% level, proving that the higher the executive innovation awareness intensity (GIN), the higher the innovation efficiency (InnoEff1).

Table 4. Benchmark Regression Analysis

	(1) InnoEff1	(2) InnoEff1	(3) InnoEff1	(4) InnoEff1
GIN	1.9955***	2.9775***	0.6360***	1.5613***
	(23.3786)	(36.0807)	(6.7113)	(17.7913)
Size		0.0231***		0.0287***
		(53.9560)		(71.0377)
Lev		0.0155***		0.0027
		(5.3949)		(0.9731)
ROA		0.0553***		0.0523***
		(7.2059)		(7.3074)
Intangible		-0.0205**		0.0422***
		(-2.0113)		(3.9631)
Growth		-0.0008		-0.0018
		(-0.6030)		(-1.4522)
TOP10		-0.0001**		-0.0000

		(-2.0839)		(-1.1487)
FirmAge		-0.0068***		-0.0051 ***
		(-4.9103)		(-3.6694)
_cons	0.1428 ***	-0.3663 ***	0.1595 ***	-0.4770 ***
	(124.5857)	(-40.1570)	(126.2931)	(-50.6225)
N	29449	29449	29423	29423
adj. R^2	0.018	0.152	0.210	0.358

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.4 Robustness Analysis

In order to ensure the reliability of the sample data results, it is necessary to conduct a robustness test on the reliability of the sample data and results. This paper uses the replacement variable method, the control variable addition method, the one-period lag method and the special sample deletion method to conduct a robustness test. Table 5 shows the robustness analysis results of the above four methods.

Since different measurement methods may have different degrees of impact on the results, if the results of different measurement methods are consistent, it means that the results are reliable and robust. The first column of the robustness analysis in Table 5 is the result of the replacement variable method, which changes the original measurement method of (the total number of applications for invention patents, utility models and design patents plus the natural logarithm of 1)/ln(1+R&D expenditure) to (the total number of applications for invention patents, utility models and design patents plus the natural logarithm of 1, and the weights of the three types of patents are taken as 3:2:1)/ln(1+R&D expenditure). Its regression coefficient is 1.9335, which is significant at the 1% level and is positively significant with the benchmark regression results, which preliminarily proves the robustness of the sample data analysis results.

The analysis results may be different due to the influence of control variables. Therefore, if the control variables are increased or decreased and the results are consistent, it means that the results are reliable and robust. The second column of the robustness analysis in Table 5 shows the results of adding control variables, adding three control variables: capital occupation of major shareholders (Occupy), management expense ratio (Mfee) and Tobin Q value (TobinQ). Its regression coefficient is 1.5086, which is significant at the 1% level and is positively significant with the benchmark regression results, further proving the robustness of the sample data analysis results.

In real enterprise management, the impact of the improvement of executives' innovation awareness (GIN) on enterprise innovation efficiency (InnoEff1) may be lagged. For example, the improvement of executives' innovation awareness (GIN) in the current year will change the decision-making of enterprise management, and certain process verification and other behaviors will lead to the improvement of enterprise innovation efficiency (InnoEff1) in the next period. Therefore, the one-period lagged method is used for robustness analysis. If the analysis results are consistent, it means

that the results are reliable and robust. The third column of the robustness analysis in Table 5 is the result of the one-period lagged method. Its regression coefficient is 1.5723, which is significant at the 1% level. It is positively significant with the benchmark regression results, which once again proves the robustness of the sample data analysis results.

Special samples, affected by their particularity, will produce certain deviations in their results. Therefore, the method of deleting special samples is used to conduct robustness tests. China's four municipalities are subject to special objective factors such as policies and status. The enterprises in the sample data have certain particularities in the four municipalities. Therefore, the method of deleting special samples is used, that is, deleting the four municipalities for robustness analysis. If the analysis results are consistent, it means that the results are reliable and robust. The fourth column of the robustness analysis in Table 5 is the result of the method of deleting special samples. Its regression coefficient is 1.5743, which is significant at the 1% level. It is positively significant with the benchmark regression results, which proves the robustness of the sample data analysis results.

Table 5. Robustness Analysis

	(1)	(2)	(3)	(4)
	InnoEff2	InnoEff1	InnoEff1	InnoEff1
GIN	1.9335 ***	1.5086 ***		1.5743 ***
	(19.2521)	(17.0758)		(16.2231)
L.GIN			1.5723 ***	
			(16.0527)	
Size	0.0304 ***	0.0286 ***	0.0286 ***	0.0277 ***
	(65.3199)	(67.4888)	(65.9724)	(58.8791)
Lev	0.0011	0.0048 *	0.0029	0.0043
	(0.3352)	(1.6982)	(0.9625)	(1.4053)
ROA	0.0550***	0.0628***	0.0516***	0.0577***
	(6.6328)	(8.1081)	(6.8534)	(7.2673)
Intangible	0.0486***	0.0380***	0.0408***	0.0376***
	(3.9857)	(3.5110)	(3.5869)	(3.0707)
Growth	-0.0019	-0.0012	-0.0017	-0.0006
	(-1.3306)	(-0.9752)	(-1.2628)	(-0.4500)
TOP10	-0.0001**	-0.0000	-0.0000	-0.0001**
	(-2.0760)	(-1.1593)	(-0.3179)	(-2.1433)
FirmAge	-0.0056***	-0.0050***	-0.0044***	-0.0032**
	(-3.5196)	(-3.5454)	(-2.8010)	(-2.0408)
Occupy		-0.0311		

		(-1.4504)		
Mfee		0.0349***		
		(4.1015)		
TobinQ		-0.0012***		
		(-3.4002)		
_cons	-0.4762***	-0.4748***	-0.4761***	-0.4576***
	(-43.8255)	(-46.5107)	(-46.8170)	(-42.4059)
N	29423	28973	24564	23969
adj. R^2	0.334	0.358	0.356	0.346

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.5 Heterogeneity Analysis

In order to explore the results of different enterprises and provide some guidance for enterprises to make more reasonable decisions according to their own circumstances, Table 6 shows the results of heterogeneity analysis of whether it is a high-tech enterprise and the nature of equity. According to the content of heterogeneity analysis in Table 6, the analysis is carried out. The regression coefficient of high-tech enterprises is 1.3256, which is significant at the 1% level; the regression coefficient of non-high-tech enterprises is 2.3503, which is significant at the 1% level. Through the comparison of the results, it is found that the impact of the innovation consciousness intensity (GIN) of executives in non-high-tech enterprises on innovation efficiency (InnoEff1) is greater than that of high-tech enterprises. The results of heterogeneity analysis in Table 6 (3) and (4) are the analysis results of state-owned enterprises and non-state-owned enterprises. The regression coefficient of state-owned enterprises is 1.7974, which is significant at the 1% level; the regression coefficient of non-state-owned enterprises is 1.4118, which is significant at the 1% level. By comparing the results, it is found that the impact of the innovation awareness intensity (GIN) of executives in state-owned enterprises on innovation efficiency (InnoEff1) is greater than that in non-state-owned enterprises.

Table 6. Heterogeneity Analysis

	(1)	(2)	(3)	(4)
	InnoEff1	InnoEff1	InnoEff1	InnoEff1
GIN	1.3256 ***	2.3503 ***	1.7974 ***	1.4118 ***
	(13.4453)	(12.7494)	(10.3987)	(13.4040)
Size	0.0296 ***	0.0273 ***	0.0297 ***	0.0267 ***
	(62.6742)	(35.7849)	(42.2357)	(46.5263)
Lev	0.0115***	-0.0169***	-0.0171***	0.0092***
	(3.6189)	(-3.1665)	(-3.4016)	(2.6501)

ROA	0.0674***	0.0265*	0.0566***	0.0486***
	(8.1662)	(1.8747)	(3.7054)	(5.8153)
Intangible	0.0811***	0.0046	0.0643***	0.0256*
	(5.8396)	(0.2837)	(3.8434)	(1.8262)
Growth	-0.0035**	0.0009	0.0047**	-0.0034**
	(-2.4174)	(0.4101)	(2.2674)	(-2.3027)
TOP10	0.0000	-0.0000	-0.0001**	-0.0000
	(0.0345)	(-0.6392)	(-2.0135)	(-0.3926)
FirmAge	-0.0060***	-0.0046*	-0.0030	-0.0077***
	(-3.7584)	(-1.6846)	(-1.0543)	(-4.5437)
_cons	-0.4871***	-0.4681***	-0.5055***	-0.4239***
	(-44.5180)	(-25.9755)	(-29.4499)	(-31.4322)
N	19859	9560	9164	19612
adj. R^2	0.360	0.323	0.436	0.318

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4. Conclusions and Suggestions

How does the strength of executive innovation consciousness (GIN) affect innovation efficiency (InnoEff1)? Exploring its influence can effectively help enterprises provide a certain degree of guidance on improving the innovation efficiency of enterprises from the perspective of executives, thereby promoting the high-quality innovation and development of enterprises. This paper uses the panel data of Shenzhen and Shanghai listed companies from 2010 to 2022 to test how the strength of executive innovation consciousness (GIN) affects innovation efficiency (InnoEff1). The study found that: ① The explanatory variable executive innovation consciousness intensity (GIN) has a positive impact on the explained variable innovation efficiency (InnoEff1), and both are significant at the 1% level, proving that the higher the strength of executive innovation consciousness (GIN), the higher the innovation efficiency (InnoEff1). And through a series of robustness tests such as replacement variable method, adding control variable method, lagged one period method and deleting special sample method, the reliability of the results was further verified. ②Through heterogeneity analysis and comparison of results, it is found that the impact of the innovation consciousness intensity (GIN) of executives in non-high-tech enterprises on innovation efficiency (InnoEff1) is greater than that of high-tech enterprises; the impact of the innovation consciousness intensity (GIN) of executives in state-owned enterprises on innovation efficiency (InnoEff1) is greater than that of non-state-owned enterprises. Based on the above conclusions, the following suggestions are put forward:

⑴ Make enhancing the innovation awareness of senior executives a core strategic measure. The board of directors and management of the company should deeply understand the extreme importance of the innovation awareness, investment and behavior of senior executives, and regard them as the core

driving force for improving innovation efficiency. "Enhancing the innovation awareness of senior executives" can be clearly written into the company's strategic plan, and corresponding resources and mechanisms can be allocated to ensure it. Avoid viewing innovation as the responsibility of the R&D department or grassroots employees only, and emphasize the leadership, decision-making and resource allocation role of senior executives in the innovation process.

⑵ Strengthen the innovation cognition and behavior investment of senior executives. At the cognitive level, strengthen the innovation concept training for senior executives, so that they can deeply understand the strategic significance of innovation to the long-term survival of the enterprise, the construction of competitive advantages and high-quality development, and establish a strong sense of mission and urgency for innovation. Encourage senior executives to actively learn cutting-edge technologies, gain insights into industry trends and changes in market demand. At the behavioral level, encourage senior executives to devote more time and energy to strategic thinking, opportunity identification, cross-departmental coordination, acquisition of key resources (such as funds, talents) and innovation culture building related to innovation. Establish a mechanism to ensure that senior executives can regularly go deep into the front line of R&D or the forefront of the market to obtain first-hand innovation information. Include the substantive participation of senior executives in innovation activities (such as hosting innovation projects and participating in technical reviews) in their responsibilities.

⑶ Attach great importance to the improvement of the innovation awareness of executives in non-high-tech enterprises and state-owned enterprises: For non-high-tech enterprises, executives in traditional industries or non-high-tech enterprises often face stronger path dependence and transformation resistance. The research conclusions strongly suggest that executives of these enterprises need to play a leading role in innovation to overcome inertia and drive efficiency improvement. It is recommended that non-high-tech enterprises regard the intensity of executive innovation awareness as the core grasping force to achieve transformation and upgrading and break through growth bottlenecks. Provide executives with more opportunities to understand how emerging technologies (such as digitalization and intelligence) empower the industry and stimulate their willingness to innovate. For state-owned enterprises, the research results reveal the special importance of the role of senior executives in state-owned enterprises in innovation-driven development. It is recommended that state-owned enterprises strengthen the selection and appointment of innovation-oriented cadres, and use innovation awareness, ability and past achievements in promoting innovation as one of the core criteria when selecting, evaluating and promoting executives.

References

Wang, T., & Liu, D. W. (2025). The impact of financing constraints on enterprise innovation efficiency: based on the moderating effect of digital finance and internal control. *Science and Technology Management Research*, *45*(07), 77-85. (in chinese)

Chen, D. Q., Sun, Y., & Wang, D. (2021). Relationship network embeddedness, joint venture investment and enterprise innovation efficiency. *Economic Research*, *56*(11), 67-83. (in chinese)

Lü, J. L., Hu, B., & Yang, K. (2025). Collaborative innovation network and enterprise innovation efficiency: from the perspective of network content and structure. *Enterprise Economy*, (06), 73-84. (in chinese)

Xie, X. M., Wang, H. W., & Tang, H. Y. (2020). The relationship between innovation ecological strategy and innovation efficiency: Based on the perspective of innovation ecological network. *Journal of Systems Management*, *29*(06), 1065-1077. (in chinese)

Huang, S. S., & Shao, Y. H. (2017). Executive innovation awareness, corporate innovation investment and innovation performance: An empirical study based on China's GEM listed companies. *East China Economic Management*, *31*(02), 151-157. (in chinese)

Quan, X. F., Cu, W. H., & Yin, H. Y. (2019). Senior executives' military experience, management style and corporate innovation. *Nankai Management Review*, *22*(06), 140-151. (in chinese)

GENNARO, B., VINEET, B., & P. RAGHAVENDRA RAU. (2017). What Doesn't Kill You Will Only Make You More Risk-Loving: Early-Life Disasters and CEO Behavior. *The Journal of Finance*, *72*, 167-206. https://doi.org/10.1111/jofi.12432

Jiang, F. X., & Huang, J. C. (2013). CEO financial experience and capital structure decision. *Accounting Researc*h, (05), 27-34, 95. (in chinese)

Paul, A., Griffin, H. A., & Hong, J. W. R. (2018). Corporate innovative efficiency: Evidence of effects on credit ratings. *Journal of Corporate Finance*, *51*, 352-373. https://doi.org/10.1016/j.jcorpfin.2018.06.007

Wang, H., Wei, X. T., Cao, Q. Z. et al. (2020). "Business tax to VAT" and enterprise innovation efficiency: Evidence from a quasi-natural experiment. *Accounting Research*, (10), 150-163. (in chinese)