

Director and Executive Liability Insurance and New Quality Productivity: "Empowering" or "Negative"

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Abstract: This article takes the fault-tolerance mechanism of new quality productivity as the entry point, selects Shanghai and Shenzhen A-share listed companies from 2011 to 2022 as samples, and examines the impact of directors' and senior executives' liability insurance (D&O Insurance) on new quality productivity. Empirical findings show that the subscription of D&O Insurance empowers new quality productivity by increasing innovation output and improving the efficiency of resource allocation, and the conclusion still holds after the robustness test. This research not only provides theoretical support for the fault-tolerance effect of D&O Insurance, but also offers practical references for enterprises to cultivate and enhance new quality productivity.

1. Introduction

Under the Fourth Industrial Revolution, digital and intelligent technologies have been upgraded. The Third Plenary Session of the 20th Central Committee of the Communist Party of China proposed to improve the institutional mechanisms for developing new quality productivity in accordance with local conditions, which has sparked a wave of theoretical discussions on new quality productivity in the academic circle. Most of the existing literature focuses on its theoretical connotation [1], implementation path [2], level measurement [3], etc., but neglects the in-depth exploration of the unpredictability and uncertainty in its cultivation and improvement. This increases the risk of accountability for enterprises. Based on the loss aversion hypothesis, the willingness of enterprises to develop new quality productivity decreases, and the demand for fault tolerance becomes prominent. The fault-tolerant mechanism can provide "tolerance space" for innovators and reformers, reduce losses, help enterprises introduce insurance factors and strengthen risk management [4], and give them more confidence to develop new quality productivity. Therefore, how to construct a fault-tolerant mechanism for improving the quality of new quality productivity and effectively exert its fault-tolerant effect has become an important and urgent research topic.

Directors' and senior executives' liability insurance is a type of insurance that assumes the economic losses of the company or third parties (shareholders) caused by the improper behavior of directors and senior executives when they perform their duties normally. It can serve as a risk transfer and rights protection mechanism for listed companies [5], providing a "margin for error". However,

few studies have explored whether it can contribute to the development of new quality productivity. The new Company Law of 2023 has added new regulations, providing legal protection for the exertion and promotion of the effects of D&O Insurance. Most of the existing studies are conducted from two aspects: opportunistic tendencies and corporate governance effects. Among them, from the perspective of corporate governance effects, the purchase of D&O Insurance is conducive to improving the internal control level of enterprises, reducing agency costs [6], etc., enhancing the risk-bearing capacity of enterprises [7], attracting talents [8], improving innovation capabilities [9], and increasing enterprise value. From the perspective of opportunistic tendencies, senior executives may be more wantonly in violation of regulations under the exemption protection of D&O Insurance [10], weaken litigation supervision [11], pursue personal interests at the detriment of the company, generate internal control deficiencies, distort decision-making, restrict competitiveness [12], and miss development opportunities. In fact, the essence of the subscription of D&O Insurance is the introduction of a fault-tolerant mechanism by enterprises, which has the attributes of both exemption and control guarantee system. However, the existing literature neglects its analysis, and there are few studies on how it affects new quality productivity. Based on this, from the perspective of establishing a new fault-tolerant mechanism, this paper explores whether D&O Insurance can serve as an effective fault-tolerant tool to encourage enterprises to enhance the level of new quality productivity. The marginal contribution of this article lies in the following: First, it analyzes the impact effect of D&O Insurance from a new perspective of the fault-tolerant mechanism, subdivides the attributes of the exemption and control guarantee system, and deeply explores its fault-tolerant role in promoting the development of new quality productivity, providing a new reference path for improving the efficiency of corporate governance. Second, in response to the uncertainties in the development of new quality productivity, by embedding a new perspective of fault-tolerance mechanisms, it breaks through the limitations of traditional research, providing new ideas for optimizing the enterprise risk management mechanism and making the exploration of new quality productivity more comprehensive.

2. Theoretical analysis and hypothesis formulation

2.1. Fault-tolerant mechanism from the perspective of control guarantee system

The perspective of the control and guarantee system holds that the fault tolerance mechanism of D&O Insurance is essentially a control and guarantee mechanism. It stimulates the intrinsic motivation of workers through moderate fault tolerance and follows up with control to promote the optimization and integration of labor materials and the improvement of the quality and efficiency of labor objects, providing strong support for the development of new quality productive forces.

The fault-tolerance mechanism of D&O Insurance takes the senior executives of enterprises as the objects of protection, which can motivate their enthusiasm and help deal with the uncertainties in the development of new quality productivity. The theory of new quality productivity emphasizes the crucial role of talents, and D&O Insurance provides conditions for the growth of strategic talents. Studies show that purchasing D&O Insurance can attract outstanding talents, and the high liability limit can further stimulate the innovative spirit of senior executives, which is conducive to retaining talents[8]. According to the theory of leader influence, outstanding managers can drive team innovation and unleash the effect of knowledge and technology. The introduction of D&O Insurance is conducive to optimizing the allocation of human resources and promoting the development of new quality productive forces. Secondly, the fault-tolerance mechanism of D&O has the functions of error identification and analysis, deeply integrated with labor data, and collaborates with the system to identify potential risks, thus building a solid defense line for the development of new quality productivity. Relying on its technological advantages in risk management, combined with intelligent practices in the digital age, and supported by computing power and data, it has strengthened the

application orientation of scenarios and given birth to a brand-new risk management technology. This technology innovatively addresses complex challenges, accurately predicts risk losses and their distribution, and promotes a new leap in the means of labor. Finally, the core of the D&O Insurance tolerance mechanism lies in control and error correction, which can help economic entities adjust their strategies in a timely manner, engage in industrial upgrading and transformation, and act on the objects of labor to promote the development of new quality productive forces. Taking out D&O Insurance means introducing professional insurance institutions. As a third party, insurance companies will continuously supervise and regularly assess their operations based on their own interests. They will form a market-oriented evaluation system through dynamic adjustment of premiums, forcing enterprises to optimize and upgrade, promoting industrial transformation and structural optimization, and achieving a new leap in the labor force. Therefore, based on the above analysis, this paper proposes the following competitive hypotheses:

H1a: D&O Insurance plays an enabling role in the development of new quality productivity.

2.2. Fault-tolerant mechanism from the perspective of exemption system

The perspective of the exemption system simply equates the fault-tolerance mechanism of D&O Insurance with the post-event handling mechanism, believing that its risk-covering feature creates opportunities for the behaviors of management that deviate from the enterprise's goals, increases risk exposure, and is detrimental to the development of new quality productivity. The research finds that the bottom-line effect of D&O is prone to over-protect the management, reducing their prudence and diligence [13], causing them to neglect the long-term development of the company and focus on short-term interests. This may trigger moral hazard and opportunistic consequences, hindering the improvement of the quality of workers and the development of new quality productivity. Furthermore, the subscription of D&O also weakens the punitive effect of litigation [11], reduces the risk perception of the management, prompts them to make risky investments, increases the strategic aggressiveness [14], causes resource misallocation, increases operational risks, and inhibits the development of new quality productive forces. Based on this, this paper proposes the following hypotheses:

H1b: D&O Insurance plays a negative role in the development of new quality productivity.

3. Research design

3.1. Sample Selection and data source

Based on the availability of data, this paper selects the data of Shanghai and Shenzhen A-share listed companies from 2011 to 2022 as the research samples and processes them, ultimately obtaining 33,802 samples. The data are derived from the CSMAR and WIND databases.

3.2. Empirical model

To study the impact of D&O Insurance on the development of new quality productivity, the main model is set as follows:

$$Npro_{i,t} = \lambda_0 + \lambda_1 Doi_{i,t} + \lambda_2 \Sigma CONTROL_{i,t} + \Sigma IND + \Sigma YEAR + \varepsilon_{i,t} \quad (1)$$

In Eq. (1), i, t represents the company and the year, respectively; $Npro_{i,t}$ represents the level of new quality productivity, $Doi_{i,t}$ indicates whether the company has taken out directors' and officers' liability insurance; $CONTROL_{i,t}$ is the control variable, including the company's employee size, asset-liability ratio, return on equity, and other factors that may affect new quality productivity; IND and $YEAR$ denote the industry fixed effect and the year fixed effect; and $\varepsilon_{i,t}$ is the error term.

3.3. Variable measurement

3.3.1. New quality productivity

Drawing on the research of Song Jia et al. [3], an index system of new quality productivity of enterprises is constructed from four dimensions: laborers, objects of labor, labor materials and the optimal combination of their elements, and the entropy method is used to measure the new quality productivity of enterprises. Meanwhile, the sample is expanded by 1000 times.

3.3.2. Director and Executive Liability Insurance

Drawing on the research of Hu Guoliu et al. [15] and YUAN [6] et al., a dummy variable (Doi) is set to measure whether to purchase D&O Insurance. That is, if the enterprise announcement contains relevant information of D&O insurance during the research period, it is considered that the company has taken out insurance and assigned a Doi of 1; otherwise, it is 0.

4. Empirical result

4.1. Baseline regressions

Table 1 presents the empirical results of D&O Insurance and new quality productivity. Column (1) conducts regression analysis by controlling only annual and industry factors. The results show that the regression coefficient of Doi on Npro is significantly positive. The benchmark regression in column (2) remained significant after controlling for other influencing factors. These results support H1a and indicate that Doi, as a fault-tolerant mechanism under the control insurance system, can effectively exert the fault-tolerant effect and promote the improvement of new quality productivity.

Table 1: Baseline regressions.

	Npro	
	(1)	(2)
Doi	0.518***	0.322***
	(5.20)	(3.22)
CONSTANT	5.066***	1.860**
	(159.33)	(2.33)
CONTROLS	NO	YES
Observations	33,802	33,802
IND & YEAR	YES	YES
Adj-R ²	0.200	0.223

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

4.2. Robustness tests

4.2.1. Instrumental variable method

Drawing on the research of Yuan Rongli et al. [16], the overseas background of directors (IV) was selected as the instrumental variable. The rationality lies in that directors with overseas backgrounds are more familiar with the governance models of developed countries, are more likely to use D&O Insurance to reduce risks, and there is no obvious evidence indicating that their overseas working background will affect the development of new quality productivity, meeting the requirements of relevance and exogeneity. The first-stage regression of columns (1) and (2) in Table 2 shows that the instrumental variable is significant at the 1% confidence level and has good explanatory power. The

second-stage regression shows that the estimated coefficient of Doi is significant at the 1% confidence level, indicating that after controlling for endogeneity, Doi remains significantly positively correlated with Npro, which is consistent with the benchmark regression results. This suggests that the previous estimated results are robust and further supports H1a.

4.2.2. Heckman two-stage model

This article focuses on the development of new quality productivity of enterprises from the perspective of D&O Insurance. Due to the significant differences in the nature of enterprises with and without D&O Insurance, there exist endogenous problems caused by sample selection bias. To this end, drawing on previous studies [16], the Heckman two-stage model was adopted to mitigate its potential impact on the basic conclusions. The specific approach is to select all the control variables mentioned earlier to construct a Probit model for regression to obtain the inverse Mills ratio (IMR), and then bring the IMR into the original model (1) for re-regression analysis to test and adjust the sample selection bias. The test results are shown in columns (3) and (4) of Table 2. After considering the self-selection problem, the Doi estimation coefficient remains positive, verifying the robustness of the benchmark estimation, and the main conclusion remains unchanged.

4.2.3. Replace the measurement method of new quality productivity

Given the diverse measurement methods of the core explained variable, this paper refers to the study of Xiao Youzhi et al. [17] to test the robustness of the basic conclusion. Specifically, the Npro variable in regression formula (1) was replaced with Nprochange, and the results are shown in columns (5) of Table 2. Compared with the basic regression, the coefficient is still significantly positive at this time. This indicates that after changing the variable measurement method, the conclusion that insuring Doi can promote the development of new quality productivity still holds.

Table 2: Robustness tests

	(1)	(2)	(3)	(4)	(5)	
	Doi	Npro	Doi	Npro	Nprochange	
IV	0.040***		0.215***			
	(14.58)		(15.36)			
Doi		3.727***		0.289***	0.012***	0.004**
		(6.94)		(5.99)	(6.40)	(2.40)
IMR				-1.553***		
				(-3.23)		
CONSTANT	-1.042***	4.410***	-7.204***	2.678***	0.055***	-0.187***
	(-20.67)	(6.01)	(-24.97)	(3.45)	(104.54)	(-11.71)
CONTROL	YES	YES	YES	YES	NO	YES
IND & YEAR	YES	YES	YES	YES	YES	YES
Observations	32,451	32,451	32,437	32,437	27,395	27,395
Adj-R ²	0.118	0.081	0.258	0.333	0.238	0.347

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

4.3. Mechanism analysis

4.3.1. Innovation

The risk aversion hypothesis suggests that managers tend to make conservative decisions for short-term interests, while the fault-tolerance mechanism of D&O Insurance can provide senior executives with "trial and error" and "tolerance" guarantees, encouraging them to focus on the long term and

pursue innovation, and driving enterprises to enhance new quality productivity. Given that innovation output has a practical role in the development of new quality productive forces, this paper defines innovation from the perspective of innovation output, draws on the achievements of He Yubing et al. [18], and measures it by multiplying the month-on-month growth rate of innovation output by the current scale. The formula is as follows:

$$OIP_t = \ln \left[\frac{(OIN_t + OIN_{t-1})}{(OIN_{t-1} + OIN_{t-2})} \cdot (OIN_t + OIN_{t-1}) + 1 \right] \quad (2)$$

Among them, OIN represents the number of independently applied patents. The larger the OIP value is, the higher the innovation level will be. Table 3 shows the regression results of the mechanism test. Column (1) shows that Doi is significantly positively correlated with OIP. In column (2), the estimated coefficients of Doi and OIP are both significant at the 1% confidence level. Therefore, this paper holds that enterprises' insurance purchase of D&O Insurance can promote innovation and thereby drive the development of new quality productive forces.

4.3.2. Resource allocation efficiency

In the capital market, Doi plays a role in control and error correction. Experienced insurance companies can efficiently identify internal control deficiencies, optimize resource allocation, rationally allocate production factors, promote enterprise production, and accelerate the improvement of new quality productivity. Drawing on the research of Jiang Ting et al. [19], the standard deviation of industry-city total factor productivity (TFP) is used to measure the efficiency of resource allocation. The lower the value of TFP dispersion is, the greater the efficiency of resource allocation becomes.

Table 3 reports the results of the mechanism analysis. Column (3) The coefficient of Doi is significantly negative, indicating that D&O Insurance can significantly optimize resource allocation; In Column (4), the coefficient of Doi is significantly positive, and the coefficient of TFP dispersion is significantly negative. It can be seen that enterprises' purchase of D&O Insurance can promote the improvement of new quality productivity levels by enhancing the efficiency of resource allocation.

Table 3: Mechanism analysis

	(1)	(2)	(3)	(4)
	OIP	Npro	TFP dispersion	Npro
Doi	0.111*** (3.68)	0.259*** (5.49)	-0.022*** (-3.70)	0.290*** (6.55)
OIP		0.217*** (21.25)		
TFP dispersion				-0.290*** (-6.31)
CONSTANT	-11.952 (-0.00)	3.590 (0.00)	-0.278*** (-4.27)	2.064*** (4.31)
CONTROL	YES	YES	YES	YES
IND & YEAR	YES	YES	YES	YES
Observations	23,596	23,596	25,760	25,760
Adj-R ²	0.418	0.227	0.048	0.212

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

5. Conclusions

Based on the data of China's A-share listed companies from 2011 to 2022, this article deeply explores the impact and mechanism of D&O Insurance on new quality productivity. Empirical evidence shows that insuring D&O Insurance can exert a fault-tolerance effect, promote the

development of new quality productive forces, and this effect is effectively transmitted through enterprise innovation and the optimization of resource allocation. Based on this, this paper gains the following inspirations: Enterprises should attach importance to the positive role of D&O Insurance in the development of new quality productivity, improve risk management and corporate governance, and rationally utilize risk management tools; Relevant departments can formulate policies to encourage enterprises to purchase D&O Insurance, establish a fault-tolerance mechanism and introduce financial tools to ensure enterprise innovation.

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