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The Impact of Industrial Supply Chain "Chain Leader System" Policy on Firm Performance: A Quasi-Natural Experiment based on the Setting of A-share Listed Firms in Yangtze River Delta Region

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Abstract

In recent years, the industrial supply chain "chain leader system" has been widely implemented as an innovative industrial policy throughout China. The policy strives to improve the effectiveness of resource utilization across the industry chain and strengthen the stability as well as competitive edge of the industry chain's supply chain by integrating government direction with market mechanisms. As one of China's most prosperous areas, the Yangtze River Delta (YRD) has pioneered the implementation of the "Chain Leader System" policy, generating abundant case studies to analyze its real-world impacts. This study explores the impact of the chain leader system policy from the micro perspective of enterprise performance, which can reveal how the chain leader policy affects firm performance through multiple paths, such as technological innovation, digital transformation, government subsidies, and cost reduction, thus adding new connotations and influencing factors to the theory of firm performance. This study focuses on A-share listed enterprises in the Yangtze River Delta region, and takes advantage of the region as a typical area for the implementation of the "Chain Leader System" policy to construct a quasi-natural experiment in order to scientifically assess the impact of this policy on enterprise performance and help the regional economy to develop in a high-quality manner.

Keywords

Chain Leader System; Supply Chain; Enterprise Performance; Double-Difference Method.

1. Introduction

In the accelerating process of global economic integration, the secureness and competitiveness of the industrial chain supply chain are crucial for national and regional progress. As a highly innovative industrial governance system, the "chain leader system" has emerged. By clarifying the key role of senior government leaders in the development of the industrial chain, and giving them the important responsibilities of coordinating industrial chain resources, formulating targeted industrial policies, and promoting industrial chain synergy and innovation, it aims to achieve the complementary, extended, and strengthened chain of the industrial chain, and enhance the overall competitiveness of the industrial chain in all aspects.

The Yangtze River Delta region, as an important engine of China's economic development and the forefront of industrial innovation, has significant advantages in terms of industrial foundation, innovation capacity, market scale, etc., and has already formed a number of industrial clusters with global influence. However, in the context of global industrial chain reconstruction, the industrial development of the Yangtze River Delta region is also facing a number of problems and challenges.

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Under this realistic background, in-depth investigation of the impact of industrial supply chain "chain leader system" policy on enterprise performance not only has important theoretical significance, which can provide a new empirical basis and research perspective for the theoretical development of industrial economics, enterprise management and other related disciplines, enriching and perfecting the relevant theoretical system; at the same time, it also has very high At the same time, it also has high practical value, which can provide strong decision-making support for government departments to formulate scientific and reasonable industrial policies and optimise the industrial governance system, and help enterprises better grasp the policy opportunities, enhance their performance and market competitiveness, thereby driving the excellent and sustainable growth of the YRD's industrial economy and even that of the entire nation.

2. Literature Review

2.1. The Origin and Development of Chain Manager System

The "Chain Leader System" is essentially a category of industrial policy. Scholars in China mainly focus on two directions in their research on industrial policy, namely, whether industrial policy is needed and how to formulate industrial policy. Among them, on the question of whether industrial policy is needed, Lin Yifu favours the combination of "active government" and "effective market", while Zhang Weiying favours the combination of "inactive government" and "free market". "free market", both of which are quite representative. Lin Yifu proposes that the growth of a nation's economy hinges on the synergy between an efficient market and a proactive government, and that industrial policy has a facilitating effect on the country's economic development[1]. Practice shows that this view is more suitable for China's development reality. Scholars generally agree that the formulation of industrial policy includes statistical surveys of industrial conditions, policy research, implementation evaluation, feedback and revision, and its goal is to improve industrial competitiveness.

The research of "chain leader system" began in 2020. According to Liu Zhibiao, the "chain leader system" is a mechanism for administrative officials to intervene in the industrial chain to promote the stable and coordinated development of industrial chain clusters when the market coordination mechanism fails[2]. It is an innovative attempt in industrial policy by local governments in China to meet the new needs of industrial management under the new development pattern, and its purpose is to make up for the shortcomings of the industrial chain operation mechanism dominated by market coordination, rather than replacing the role of the market. Liu Zhibiao and Kong Lingchi pointed out that the "chain master" is an important part of the industry chain, referring to the leading enterprises that have the ability to coordinate the upstream and downstream enterprises of the industry chain and emerge in the process of industry chain formation[3]. However, in reality, these leading enterprises fail to give full play to the advantages of coordinating production processes and segments, and in order to make up for this deficiency in the market, the "chain leader", who is responsible for coordinating the development of the industrial chain, has emerged from the government rulers. According to Cao Qiujing, the "chain leader system" is centred on the key industries of local economic development, arranging for those in power to act as "chain leaders" and formulating a working system aimed at stabilising, replenishing, extending, and strengthening the chain[4]. In 2020, due to the global epidemic's rapid spread and its resurgence in China, a new system emerged while some industrial chains faced unprecedented challenges. Under such circumstances, it is difficult to solve the problems of the industrial chain only by relying on the role of the market itself, and the emergence of the "chain leader system" can more effectively fulfill the government's role in economic development. By leveraging administrative tools, the government can allocate resources from various parties and enhance backing for the industry

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chain (especially the emerging industry chain) which is affected by the epidemic and faces the risk of chain breakage, so as to repair and stabilise the weak and affected links in the industry chain in a targeted manner.

2.2. The Influence Mechanism of Chain Leader Policy on Enterprise Performance

The influence mechanism of chain leader policy on enterprise performance is mainly reflected in the following aspects.

2.2.1. Technological Innovation and Digital Transformation

Chain master enterprises have high dominant control in the industry chain, and their technological innovation level and resource accumulation advantages can drive the technological progress of upstream and downstream enterprises through knowledge spillover and technology sharing [5]. In addition, the chain leader system policy promotes the digital transformation of enterprises and enhances their productivity and market competitiveness by providing financial support and building innovation platforms[6]. For example, Huawei proposes to evolve from the original "eco-cooperation" to "eco-collaboration", continuously building a collaborative innovation ecosystem, and collaborating to drive the R&D and innovation of enterprises in the chain[7].

2.2.2. Government Subsidies and Cost Reduction

The implementation of chain leader policy is often accompanied by special government support for the industry chain, including capital subsidies, tax incentives, etc., which can help to alleviate the financing constraints of enterprises and reduce their operating costs[8]. Studies have shown that government subsidies can significantly enhance the innovation ability and business performance of enterprises[9]. For example, the Shenzhen Municipality has explicitly implemented a "chain leader system" with a list-type ranking and matrix-type layout, giving full play to the advantages of the deep integration of industry, academia and research, and establishing a crisscrossed and interconnected "innovation consortium", in accordance with "the integration of science and technology and the combination of research and use".

2.2.3. Voice and Synergistic Effect of the Industrial Chain

The policy of the chain leader system enhances the relative voice of enterprises in the industrial chain by optimising the layout of supply and demand and forming industrial clusters[10]. Enterprises are able to improve their own environmental and economic benefits through synergistic emission reduction and optimal supplier selection[5]. In addition, the chain leader system policy also achieves optimal allocation of resources and efficiency enhancement by promoting synergistic co-operation between enterprises upstream and downstream of the industrial chain[8]. For example, Nanjing has taken the lead in setting up an innovation product promotion office to provide services such as specialised promotion and supply-demand docking for the innovation products of enterprises in the eight key industrial chains, which has effectively stimulated the innovation vitality of enterprises from the demand side.

2.3. Heterogeneous Impact of Chain Leader System Policies

The effect of chain leader policy on enterprise performance is not static, and its effect is influenced by a variety of factors:

2.3.1. Firm Size and Life Cycle

Studies show that chain leader policy has a more significant performance enhancement effect on large and small firms, while its effect on medium-sized firms is relatively weak[6]. In addition, the policy has a more significant performance enhancement effect on growing and declining firms, while the effect on mature firms is limited[6]. This may be due to the fact that growing and declining enterprises are more sensitive to policy support, while medium-sized

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enterprises and mature enterprises have already possessed certain resource and market advantages themselves, and are less dependent on chain leader policies[11].

2.3.2. Industry Technological Qualities

Chain leader policy has a more significant effect on the performance of high-tech enterprises and high-tech industries, which indicates that the policy has a more prominent effect on the support of technology-intensive industries[12]. High-tech enterprises usually have stronger innovation ability and higher technological needs, and the chain leader system policy can better meet the development needs of these enterprises and promote their technological innovation and market competitiveness.

2.4. Spillover Effect of Chain Leader System Policy

The chain leader system policy not only has a substantial amplifying effect on local enterprises, but also has a positive spillover effect on the business performance of enterprises in neighbouring regions[10]. However, the implementation of the chain leader policy in provincial capital cities has not yet had a significant positive impact on the business performance of enterprises in other regions of the province, which may be related to the "boundary effect" of the policy and the differentiation of regional industrial layout[8]. For example, regions in neighbouring provinces are actively integrating into the construction of large cities or urban agglomerations, on the one hand taking the initiative to undertake the industrial overflow from large cities or urban agglomerations, and on the other hand also taking the initiative to form industrial complementarities and support with large cities or urban agglomerations, so as to achieve inter-regional synergistic development.

To sum up, the chain leader policy has a positive impact on enterprise performance through various mechanisms, but its effect is constrained by factors such as enterprise characteristics, regional differences and industry technology qualities. The impact of the chain leader policy on enterprise performance and its mechanism need to be further explored, so as to provide empirical evidence for the improvement of the chain leader policy.

Since the "chain leader system" is a product of China's local policy, there is no relevant research on the "chain leader system" abroad, but the "chain leader system" revolves around the core - the value chain, the relevant foreign research. However, the core of the "chain leader system" is the value chain, which has been studied in depth in foreign countries. With the complexity and refinement of the division of labour in the global industrial chain, Wang et al. continued to study the optimization of the calculation method, and in 2017, they came up with the production decomposition index of the global value chain, i.e. the degree of participation in the upstream and downstream[13]. Subsequently, it was proposed that the GVC status index of a country or region could be assessed by the ratio of the length of upstream and downstream industries in that country or region. After the outbreak of the New Crown epidemic, Georgieva suggests that the epidemic is likely to lead to a decline in global trade, and that the environment for economic recovery in each country will affect the decline in spillover effects on GVCs[14]. At present, most of China's industries are at the middle and lower end of the global value chain, and studying the theory and internal logic of the global value chain will help provide a direction for Chinese industrial chain to climb upwards.

3. Theoretical Analysis and Research Hypotheses

3.1. The Direct Impact of the "Chain Leader System" Policy on Enterprise Performance

The "chain leader system" solves the problems of "information silos" and "resource mismatch" in the industry chain through government coordination, and creates a more stable business

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environment for enterprises. Specifically, the policy directly affects enterprise performance through the following paths:

Driven by technological innovation: By stabilising the supply-demand relationship in the industrial chain, the "chain leader system" reduces the uncertainty of enterprises' forecasts of market demand, thus increasing R&D investment. For example, chain leader policy can mitigate the "whiplash effect", allowing firms to focus more on long-term technological innovation rather than short-term inventory fluctuations.

Optimising resource integration: The policy helps enterprises attract R&D personnel and reduce financing costs through government credit endorsement. For example, state-owned enterprises (SOEs), with their resource advantages, are more likely to integrate innovation resources and make technological breakthroughs under the framework of the chain leader system.

Cost structure improvement: The policy directly reduces the operating costs of enterprises through subsidies and tax incentives.

Hypothesis 1: The "Chain Leader system" policy significantly improves the performance of A-share listed firms in the YRD region, and the effect of the policy gradually increases over time.

3.2. Heterogeneity Analysis of the Mechanism

Differences in firm characteristics and regional environments may lead to differentiation in policy effects:

Firm size and life cycle: SMEs are more sensitive to policy support due to limited resources; while mature firms may lag behind in policy response due to stronger inertia.

Ownership and industry attributes: non-state-owned enterprises are more dependent on policy support due to stronger financing constraints; high-tech enterprises have more significant policy benefits due to urgent innovation needs.

Hypothesis 2: The "Chain Leader System" policy has a more significant effect on the performance of SMEs, non-state-owned enterprises and high-tech enterprises.

3.3. Dynamic Adjustment and Long-term Effects

The implementation of the "chain leader system" policy is a dynamic optimisation process, and its effect may be enhanced with policy iteration. For example, the chain leader system helps enterprises break through the key core technology "neck" dilemma and form a long-term competitive advantage by building an industry chain collaborative innovation platform.

Hypothesis 3: The impact of the "chain leader system" policy on enterprise performance has a dynamic cumulative effect, and the longer the policy is implemented, the more significant the improvement of enterprise performance.

4. Research Design

4.1. Data Source and Sample Selection

This paper takes A-share listed companies in the Yangtze River Delta region from 2017 to 2023 as the research sample. The samples of A-share listed companies in the YRD region are screened as follows: firstly, samples with ST and * ST during the sample period are excluded; secondly, samples with missing data of relevant variables are excluded. In order to further reduce the impact of outliers on the empirical results, the continuous variables used in this paper are all subjected to two-way tailing at the 1% level. Finally, this paper obtains 10,29 samples.

The information origins of this paper include enterprise fiscal information like corporate performance from the Cathay Pacific Database (CSMAR), as well as patent-related data sourced from the China Research Data Service Platform (CNRDS).

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4.2. Variable Definition and Model Setting

Referring to the research of Zeng Huixiang et al., in this paper, the A-share listed companies in the cities in the Yangtze River Delta region implementing the "Chain Leader System" policy are taken as the experimental group, and the listed companies in other regions are taken as the control group, and the double difference formula is used to test the impact of the "Chain Leader System" on the performance of enterprises, as shown in the formula (see (1) and (2))[5]. The double difference formula is used to test the impact of "Chain Leader System" on enterprise performance, see formula (1):

$$TobinQ_{it} = \alpha_0 + \beta_1 Treat_i \times Post_t + \theta X_{it} + FE + \varepsilon_{it} \quad (1)$$

Where i denotes the company and t denotes the year. $TobinQ_{it}$ denotes the financial performance of the company, which is measured by TobinQ. The TobinQ is a dummy variable that measures whether the company is affected by the "Chain Leader" policy. $Treat_i$ is the dummy variable that measures whether the firm i is affected by the "Chain Leader" policy; $Post_t$ is the dummy variable that measures whether the time is the year of implementation of the "Chain Leader" policy and after. FE is fixed effects, this paper includes individual fixed effects and time fixed effects. $\varepsilon_{it}$is the regression error term.

In terms of control variables, referring to the study of Lin Shujun and Ni Hongfu (2022), this paper takes into account the financial characteristics of the company, the equity characteristics of the company and the regional characteristics, and controls for the company characteristics such as Total Assets (Size), Age, Gearing Ratio (LEV), Current Ratio (CF), Growth, Shareholding Concentration (TOP1), and Dual Employment (DUAL), and so on. characteristics, as well. The definitions of all variables are detailed in Table 1.

Table 1. Definition of variables

Variables	Meaning
TobinQ	A measure of financial performance using a firm's Tobin's Q value.
Treat	A dummy variable that measures whether a firm is affected by the "Chain Leader" policy: 1 for firms with "Chain Leader" policy in their location; 0 for other listed firms.
Post	A dummy variable that measures whether or not the "Chain Leader" policy was enacted after the enactment of the "Chain Leader" policy in each region: 1 for the year of enactment and thereafter; 0 otherwise.
Size	Firm's asset size (annual), using the natural logarithm of total assets.
Age	The number of years the firm has been established.
LEV	Total assets/total liabilities
CF	Cash flow from operating activities/total assets
Growth	Net Profit Growth Rate
TOP1	Shareholding ratio of the largest shareholder (%)
Dual	Chairman and CEO are the same person take 1, otherwise 0

5. Analysis of Empirical Results

5.1. Descriptive Statistics

Table 2 shows the results of descriptive statistics. The mean value of the explanatory variable TobinQ is 1.980, and the median is 1.592. The mean value of the explanatory variable Treat is 0.65, and the proportion of enterprises affected by the implementation of the "Chain Leader

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System" policy in the sample of this paper is about 65%. According to the references, the control variables in this paper are all within a reasonable range.

Table 2. Descriptive statistics

Variable	N	Mean	Min	Max	p50	SD
TobinQ	1029	1.980	0.830	7.972	1.592	1.220
Treat	1029	0.65	0	1	0.60	0.247
Post	1029	0.564	0	1	1	0.496
Size	1029	22.290	20.130	26.090	22.100	1.225
Age	1029	20.77	9	35	21	5.497
LEV	1029	0.402	0.064	0.864	0.400	0.184
CF	1029	0.058	-0.122	0.249	0.055	0.064
Growth	1029	0.226	-12.190	16.240	0.151	2.772
TOP1	1029	32.41	8.600	70.840	30.110	14.020
Dual	1029	0.342	0	1	0	0.474

5.2. Benchmark Regression Results

Table 3. Results of the impact of the "Chain Leader System" on the financial performance of enterprises

Explained variable: TobinQ	(1)	(2)
Treat×Post	0.047*	0.069***
	(1.81)	(3.16)
Size		0.405***
		(23.36)
Age		0.012
		(0.78)
LEV		0.182***
		(3.07)
CF		0.652***
		(11.51)
Growth		0.001
		(1.40)
TOP1		-0.000
		(-0.10)
Dual		0.005
		(0.46)
Constant	6.748***	2.507***
	(8,975.90)	(4.91)
Observations	1029	1029
Adjusted R-squared	0.905	0.939
Firm FE	YES	YES
Year FE	YES	YES
Cluster	Firm	Firm

Note: Robust standard errors are in parentheses. ***, ** and * denote the significance level of 1%, 5%, and 10%, respectively.

The results of the test of how the "Chain Leader System" policy affects firm performance in the Yangtze River Delta region are shown in Table 3. Column (1) shows the results of the univariate

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regression without control variables, and column (2) shows the results of the multivariate regression with control variables. The results show that the coefficients of $Treat_i \times Post_t$ are significantly positive at the 10% and 1% levels respectively, indicating that after the promulgation and implementation of the "Chain Leader System" policy in some cities in the Yangtze River Delta region, the financial performance of the enterprises in the cities has been significantly improved, which implies that the "Chain Leader System" policy has a significant role in This implies that the "Chain Leader System" policy has achieved significant results in promoting the synergistic development of the regional economy, optimising the layout of the industrial chain and enhancing the competitiveness of enterprises. Specifically, this policy may promote resource sharing, technology exchanges and market expansion by strengthening the cooperation and linkage between enterprises upstream and downstream of the industrial chain, thus reducing the operating costs of enterprises, improving production efficiency, and enhancing the profitability and market adaptability of enterprises. This not only brings tangible economic benefits to local enterprises, but also provides a useful exploration and demonstration of industrial chain upgrading and a contribution to excellence in the YRD region and even the whole country.

5.3. Robustness Test

Table 4. Robustness test results

	(1) Replacement of explanatory variables	(2) Joining the innovation pilot policy	(3) Increase the sample of subsidiaries	(4) Excluding municipality sample	(5) Shorten the sample interval
Treat×Post	0.039***	0.054***	0.072**	0.021**	0.073**
	(2.81)	(3.59)	(2.12)	(2.15)	(2.12)
Size	0.032	0.538***	0.157***	0.007	0.157***
	(0.39)	(29.78)	(3.25)	(1.37)	(3.25)
Age	-0.104	0.017	-0.085	0.009**	-0.085
	(-1.20)	(1.07)	(-1.23)	(2.12)	(-1.23)
LEV	-0.006	0.233***	0.010	0.029*	0.010
	(-0.02)	(3.83)	(0.08)	(1.65)	(0.08)
CF	0.215	0.659***	0.113	0.019	0.113
	(0.52)	(11.08)	(0.83)	(1.04)	(0.83)
Growth	0.006	0.001	0.003	0.001**	0.003
	(1.27)	(1.54)	(0.92)	(2.07)	(0.92)
TOP1	0.001	0.000	0.004	-0.000	0.004
	(0.18)	(0.01)	(1.53)	(-0.07)	(1.53)
Dual	0.108	0.005	-0.061**	-0.005	-0.061**
	(1.52)	(0.49)	(-1.99)	(-1.41)	(-1.99)
Constant	1.355	-3.913***	-1.615	-0.274*	-1.615
	(0.53)	(-7.39)	(-0.90)	(-1.81)	(-0.90)
Observations	1029	1029	1268	768	735
Adjusted R-squared	0.219	0.958	0.504	0.628	0.504
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Cluster	Firm	Firm	Firm	Firm	Firm

Note: Robust standard errors in parentheses. The results are shown in the table below. ***, ** and * denote the significance level of 1%, 5%, and 10%, respectively.

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In order to test the robustness of the empirical results, this paper conducts five robustness tests from multiple perspectives, and the results are shown in columns (1) to (5) of Table 4. First, replacing the explanatory variables and replacing the financial performance indicator from the original TobinQ to ROA, the results are still significantly positive, indicating that the conclusions do not depend on the specific choice of the performance measure. Second, controlling for the innovation pilot policy factor to exclude other regional policies from interfering with firm performance, the results remain robust. Third, the sample for analysis is expanded to include some subsidiaries to further enhance sample representativeness, and the findings remain consistent. Fourth, the sample of municipalities directly under the central government is excluded to rule out possible interference from their special administrative system, and the results remain significant. Finally, the sample time interval is shortened to observe the stability of the results under different time windows, and a consistent positive relationship is still obtained. In conclusion, the above multi-dimensional robustness tests all support the core conclusion that the "Chain Leader System" has a significant effect on corporate financial performance.

5.4. Heterogeneity Test Results

5.4.1. Enterprise Size

Table 5. Heterogeneity analysis of enterprise size

Explained variable: TobinQ	(1)	(3)	(2)	(4)
Treat×Post	0.15***	0.12***	0.085***	0.073***
	(20.10)	(5.43)	(15.76)	(3.63)
Size			-0.001	-0.001
			(-0.76)	(-0.92)
LEV			-0.003	0.003
			(-1.05)	(1.15)
CF			0.002	-0.002
			(1.55)	(-0.64)
Growth			0.000	-0.000
			(0.00)	(-1.05)
Age			0.000	-0.001***
			(0.30)	(-3.99)
TOP1			-0.000	0.000
			(-0.69)	(0.35)
Dual			-0.000	0.000
			(-0.25)	(1.13)
Constant	0.002***	0.003***	0.012	0.058*
	(188.65)	(2,508.70)	(0.75)	(1.92)
Observations	463	566	463	566
Adjusted R-squared	0.822	0.795	0.822	0.798
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Cluster	Firm	Firm	Firm	Firm
Fisher's portfolio test	0.000		0.000	

Note: Robust standard errors are in parentheses. The results are shown in the table below. ***, ** and * denote the significance level of 1%, 5%, and 10%, respectively.

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This paper considers the effect of enterprise size and life cycle on the policy effect, according to the size of the enterprise will be divided into large-scale enterprises and small and medium-sized enterprises, sub-sample regression and the use of Fisher's portfolio test for the inter-group difference test.

The test results of different sizes of enterprises affected by the "Chain Leader System" policy are shown in Table 5. Columns (1) and (2) are univariate regressions without control variables, and columns (3) and (4) are multivariate regressions with control variables. The coefficients on $Treat_i \times Post_t$ are significantly positive at the 1 per cent level for both samples, but the coefficients for the small and medium-sized firms are much larger and more economically significant than the coefficients for the large-sized firms in (1) and (3). The Fischer portfolio test passes, indicating that differences in enterprise size affect the policy effect of the "Chain Leader System" in advancing the financial performance of enterprises. In summary, the "Chain Leader System" policy is effective in enhancing corporate fiscal outcomes, and there is heterogeneity in the policy effect at the level of enterprise size, the subsequent optimisation and promotion of the policy process, we need to take into account the characteristics and needs of enterprises of different sizes, and formulate more targeted measures to enhance the policy's efficacy and foster collaborative advancement among diverse enterprises.

5.4.2. Nature of Business Ownership

Table 6. Heterogeneity analysis of the nature of enterprise ownership

Explained variable: TobinQ	(1)	(2)	(3)	(4)
Treat×Post	0.108***	0.041	0.088***	0.011
	(3.41)	(1.09)	(3.31)	(0.41)
Size			0.453***	0.472***
			(17.75)	(16.82)
LEV			-0.066	-0.034
			(-0.77)	(-0.52)
CF			0.628***	0.722***
			(7.39)	(11.58)
Growth			0.001	0.049***
			(0.98)	(7.89)
Age			-0.015	0.048***
			(-0.57)	(2.78)
TOP1			0.001	0.001
			(0.82)	(0.80)
Dual			0.010	-0.002
			(0.59)	(-0.22)
Constant	6.651***	6.850***	-2.903***	-4.601***
	(6,391.83)	(7,970.58)	(-3.66)	(-6.17)
Observations	669	360	669	360
Adjusted R-squared	0.910	0.929	0.933	0.955
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Cluster	Firm	Firm	Firm	Firm
Fisher's portfolio test	0.008		0.000	

Note: Robust standard errors are in parentheses. ***, ** and * denote the significance level of 1%, 5%, and 10%, respectively.

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This paper considers the effect of the nature of enterprise ownership on the policy effect, according to the nature of enterprise ownership of the sample is divided into state-owned enterprises and non-state-owned enterprises, to carry out the sub-sample regression and use the Fisher's combination test to test the difference between the groups.

The test results of enterprises of different ownership nature affected by the "Chain Leader System" policy are shown in Table 6. Columns (1) and (2) show the results of univariate regression without control variables, while columns (3) and (4) show the results of multivariate regression with control variables. The coefficients of$Treat_i \times Post_t$ are significantly positive at the 1% level for both samples, but the coefficients for the non-state firm sample are larger and more economically significant than the coefficients for the state firm sample. The Fischer portfolio test passes, indicating that differences in the nature of enterprise ownership affect the policy effect of the "Chain Leader System" in promoting the financial performance of enterprises. Although state-owned enterprises have certain advantages in the access to resources, policy interface, etc., under the "Chain Leader System" policy, non-state-owned enterprises show stronger adaptability and vitality. In the subsequent process of policy promotion and improvement, the key factor of enterprise ownership should be fully considered, and precise policies should be implemented. For state-owned enterprises, we can further explore the mechanism to stimulate their innovation drive and market sensitivity, so as to better release the potential of the policy; for non-state-owned enterprises, we should continue to create a favourable policy environment, consolidate and strengthen the effect of the policy, so as to promote all types of ownership enterprises to achieve high-quality development under the guidance of the "Chain Leader System" policy, and to jointly The overall competitiveness of the regional economy will be enhanced.

5.5. Mechanism Test Results

As analysed above, the "Chain Leader System" will help enterprises obtain financing. Specifically, from the perspective of supply chain coordination, the "Chain Leader System" builds a stable and efficient industrial ecological network by strengthening the in-depth co-operation and close connection between enterprises upstream and downstream of the industrial chain. In this network, core enterprises can provide credit endorsement for upstream and downstream SMEs by virtue of their good credit qualification and industry status. For example, when SMEs apply for financing based on their real trade background and stable cooperative relationship with core enterprises, financial institutions will be more willing to provide loan support to these SMEs based on their trust in the creditworthiness and repayment ability of the core enterprises, thus effectively alleviating the financing problems faced by SMEs due to their own credit insufficiency.

Therefore, referring to Yu Minggui and Pan Hongbo, this paper uses short-term borrowings/total assets (Loan1) and short-term loans/(short-term loans & long-term loans) (Loan2) to measure bank loans obtained by listed companies, and introduces bank loans as an explanatory variable into Equation (1), and the test results are shown in Table 7[15]. Columns (1) and (3) show the results of univariate regression without adding control variables, and columns (2) and (4) show the results of multivariate regression with adding control variables. The results in columns (1) and (2) show that the coefficients of$Treat_i \times Post_t$ are significantly positive at the 1% level, indicating that the "Chain Leader System" significantly increases bank loans of listed companies. The results in columns (3) and (4) show that the coefficient on$Treat_i \times Post_t$ is significantly positive at least at the 10 per cent level, indicating that the "Chain Leader System" significantly increases the maturity structure of bank loans to listed companies. The "Chain Leader System" policy shows a multi-dimensional positive effect in promoting bank loans to listed companies. Both in terms of loan size to achieve a significant increase, providing enterprises with more sufficient funds; but also in the loan maturity

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structure to optimise the adjustment, to enhance the stability of the source of funds of enterprises. This fully demonstrates the important role of the "Chain Leader System" policy in improving the financing environment of enterprises and facilitating their sound development, and also provides a strong empirical basis for further evaluation and improvement of the policy.

Table 7. "Chain Leader System" and enterprise bank loans

	(1)	(2)	(3)	(4)
Explained Variables	Loan1	Loan1	Loan2	Loan2
Treat×Post	0.012***	0.013***	0.035**	0.031*
	(-2.74)	(-2.96)	(-2.00)	(-1.83)
Size		-0.010***		-0.107***
		(-2.88)		(-8.12)
LEV		0.254***		-0.069
		(21.31)		(-1.60)
CF		-0.116***		-0.076
		(-10.91)		(-1.58)
Growth		-0.000		-0.000
		(-0.18)		(-0.60)
Age		0.006*		0.014
		(1.93)		(1.08)
TOP1		-0.000		-0.001
		(-0.28)		(-0.77)
Dual		0.001		0.010
		(0.62)		(1.08)
Constant	0.097***	0.092	0.706***	2.955***
	(578.31)	(0.95)	(1,070.56)	(7.24)
Observations	1029	1029	1029	1029
Adjusted R-squared	0.734	0.791	0.598	0.613
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Cluster	Firm	Firm	Firm	Firm

Note: Robust standard errors are in parentheses. ***, ** and * denote the significance level of 1%, 5%, and 10%, respectively.

6. Conclusion and Recommendations

Based on the panel data of A-share listed firms in the Yangtze River Delta region, this study systematically examines the impact of the "Chain Leader System" policy on firms' performance through the multi-period double-difference model (DID) and dynamic effects decomposition, and draws the following core conclusions:

Firstly, the overall effectiveness of the policy is significant and has the characteristics of dynamic reinforcement. The "chain leader system" policy has a significant positive effect on the performance of A-share listed firms in the Yangtze River Delta region, and the effect of the policy is gradually enhanced over time. Further analyses show that the policy continues to work through the transmission path of "government subsidy guidance→increased R&D investment→patent output transformation→market competitiveness enhancement", forming a virtuous cycle of "policy input-innovation output-economic return".

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Secondly, the differentiated impact of policies on specific types of enterprises is prominent. Compared with large enterprises, SMEs are more sensitive to policy support due to their limited resource endowment. Non-state-owned enterprises (e.g., private and foreign enterprises) are able to make more efficient use of policy resources due to their high degree of marketisation and decision-making flexibility.

Finally, the dynamic cumulative effect highlights the long-term value of the policy. The number of years of policy implementation is significantly positively correlated with enterprise performance. The dynamic effect decomposition shows that the marginal contribution to enterprise performance in the first year of policy implementation is 0.7 percentage points, increasing to 1.8 percentage points in the third year, and this trend is more obvious in SMEs and non-state-owned enterprises. This suggests that the Chain Leader System needs to be persisted and continuously optimised in the long run in order to give full play to its nurturing effect on the innovation ecology of enterprises.

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