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Research on the Impact of the Specialized, Refined, Unique, and Innovative "Little Giant" Policy on the Small and Medium Enterprises' Innovation

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Abstract: Using data from Chinese A-share listed companies and companies listed on the New Third Board from 2018 to 2022, this study evaluates the causal effect of the "Little Giant" policy on innovation in small and medium-sized enterprises through a staggered difference-in-difference model. Research has found that the "little giant" policy of specialization, refinement, and innovation has significantly promoted innovation in small and medium-sized enterprises. The robustness test found that the policy significantly promoted the level of innovation input and innovation output, with the innovation output level specifically manifested as a significant increase in the number of invention patents. Mechanism analysis confirms that the "Little Giant" policy of specialization, refinement, and innovation has significantly promoted enterprise innovation through three mechanisms: alleviating financing constraints, providing government subsidies, and promoting market competition. Heterogeneity analysis found that enterprises in key areas of policy implementation and those related to "bottleneck" technology are significantly more affected by the causal effect of the policy on promoting innovation.

Keywords: Small and Medium Enterprises' Innovation; Staggered Difference-in-difference; The Specialized, Refined, Unique, and Innovative "Little Giant" Policy.

1. Introduction

Wu Chaopeng and Yan Zehao (2023) pointed out that in the innovation ecosystem, innovative small and medium-sized enterprises have higher innovation efficiency and focus in the field of segmented industries, breakthroughs can often be made in a key core sub technology of the industry chain, such as key components, key materials, and key processes, thereby driving the overall innovation ecosystem to achieve breakthroughs in key core technologies. Given the increasing importance of small and medium-sized enterprises in the process of breakthroughs in key core technologies, the Chinese government has continuously increased its policy support in recent years [1].

In this context, the "Little Giant" policy of specialization, refinement, and innovation has been one of the industrial policies implemented by the government in recent years for small and medium-sized enterprises. The work goal of the "Little Giant" policy of specialization, refinement, and innovation is to focus on improving the level of advanced industrial foundation and modernization of industrial chains, combining the cultivation of excellent enterprises with the strengthening of industries, adhering to innovation driven, market driven, up and down linkage and continuous promotion, focusing on policy benefits for enterprises, service assistance for enterprises, and environmental revitalization. It aims to cultivate a group of "specialization, refinement, refinement, and innovation" small and medium-sized enterprises in a hierarchical manner, classify and promote enterprises to become more refined, strong, and large, Accelerate the improvement of the high-quality enterprise gradient cultivation system, laying a solid foundation for cultivating millions of innovative small and medium-sized enterprises, 100000 provincial-level "specialized, refined, and innovative" small and medium-sized enterprises, and tens of thousands of specialized, refined, and innovative "small giant" enterprises during the 14th Five Year Plan period, and providing strong support for promoting high-quality economic development and building a new development pattern. In 2019, the first batch of specialized, refined, and new "Little Giant" enterprises were officially announced, followed by the second to fourth batches of specialized, refined, and new "Little Giant" enterprises in 2020, 2021, and 2022, respectively. As of 2022, China has cultivated 8997 specialized and innovative "little giant" enterprises, 848 manufacturing champion enterprises, and more than 50000 provincial-level specialized and innovative small and medium-sized enterprises. The innovation, competitiveness, and specialization level of small and medium-sized enterprises have significantly improved.

This article uses data from A-share listed companies and "New Third Board" companies from 2018 to 2022 to identify the causal effects of the "Little Giant" policy on innovation in small and medium-sized enterprises through an interleaved double difference model. The possible marginal contribution lies in providing new empirical evidence for studying the short-term impact of industrial policies on corporate innovation. Existing literature mostly focuses on the long-term impact of industrial policies on corporate innovation, with little empirical evidence on the short-term impact on corporate innovation; This provides new empirical evidence for studying the impact of industrial policies on innovation in small and medium-sized enterprises. Existing literature mostly focuses on studying the impact of industrial policies on innovation in enterprises of various scales, with little empirical evidence on the impact on innovation in small and medium-sized enterprises.

2. Literature Review

In recent years, there has been a wealth of research on industrial policies. Criscuolo et al. (2019) argue that the Great Recession has led to a resurgence of industrial policies, with

governments around the world providing huge subsidies to private enterprises through industrial policies[2].

In domestic research on the impact of industrial policies on corporate innovation, Li Wenjing and Zheng Manni (2016) used patent data from A-share listed companies in Shanghai and Shenzhen from 2001 to 2010. The study found that companies incentivized by industrial policies significantly increased their patent applications[3]. Li Linlin and Wang Chong (2017) used annual report data from "New Third Board" enterprises from 2005 to 2015 and found that an increase in tax burden would reduce the innovation ability of enterprises[4]. Liu Shiyuan et al. (2020) used data from Chinese listed companies from 2007 to 2016 and found that tax incentives significantly promote R&D investment in enterprises[5]. Zheng Shilin and Zhang Guoguo (2022) used data from manufacturing enterprises of Chinese A-share listed companies from 2009 to 2019, and found that the development strategy of the manufacturing industry significantly improved the R&D intensity and patent output of enterprises [6]. Wu Chaopeng and Yan Zehao (2023) found, based on Chinese enterprise data from 2000 to 2017, that government guided funds significantly increased the number and quality of invention patents for enterprises in key core technology fields[1].

In foreign research on the impact of industrial policies on corporate innovation, Howell (2017) used high-tech enterprise data from 1983 to 2013 and found that the SBIR project significantly promoted the number of patents and profits of enterprises [7]. Dai and Wang (2019) used data from Chinese high-tech enterprises from 2006 to 2016 and found that high-tech enterprise projects significantly promoted the R&D intensity and productivity of enterprises [8]. Liu and Li (2021) used enterprise and city level data from 2003 to 2016 and found that the policy of integrating informatization and industrialization in the pilot zone significantly promoted enterprise and regional innovation [9]. Mao et al. (2021) found through data from the Chinese government document information system database from 2000 to 2012 that China's industrial and technological policies contribute more to the productivity growth of emerging high-tech industries than domestic catch-up and mature industries [10].

In summary, this article believes that existing literature mostly focuses on evaluating the long-term impact of industrial policies on corporate innovation, while the short-term impact assessment of industrial policies on corporate innovation is relatively rare. The specialized and innovative "little giant" policy provides new empirical evidence for identifying the short-term causal effects of industrial policies on corporate innovation; At the same time, research on the impact of innovation in small and medium-sized enterprises is also relatively rare. Existing literature mostly focuses on the innovation of enterprises of various sizes, while the "little giant" policy of specialization, refinement, and novelty provides new empirical evidence for identifying the causal effect of industrial policies on innovation in small and medium-sized enterprises.

3. Theoretical Hypothesis

3.1. Corporate Financing Constraint Mechanism

Bloom et al. (2019) pointed out that since innovation is intangible, it is very difficult for companies to borrow money on the grounds of innovation if they do not have collateral to guarantee when raising funds from banks. Therefore, this current situation suggests that equity may be a better source for companies to raise innovation investment funds. But equity also faces challenges brought about by information asymmetry. For example, before a company obtains a patent or applies it to the market, the essential confidentiality of innovative technology forces the company to conceal detailed information, which also prevents potential investors from fully providing funding. If enterprises disclose innovative technologies in detail, they will face the risk of technology theft or theft[11].

In terms of the impact of financial frictions, eliminating restrictions on the development of active early financial markets, such as angel financing or venture capital, may be a reasonable policy focus. Many existing literature focuses on traditional investment cash flow models, with a focus on the relationship between financial constraints and corporate R&D investment. This is where the financial support provided by industrial policies, such as subsidies and tax credits, plays a role. In short, fiscal support reduces marginal costs, and reducing or partially converting costs into output prices will lead to price declines, while the markup for each product will not decrease at least.

Industrial policies can reduce the risk of R&D failure for enterprises, reduce uncertainty, information asymmetry, and agency costs, and alleviate the external financing shortage faced by enterprises. Based on this, this article proposes a hypothesis about the "little giant" policy of specialization, refinement, novelty:

Hypothesis 1: The "Little Giant" policy of specialization, refinement, and innovation significantly promotes innovation in small and medium-sized enterprises by alleviating financing constraints.

3.2. Government Subsidy Mechanism

The design of the R&D subsidy program is in line with government policies that highlight emerging technology fields and development directions. Research and development subsidy programs typically provide general resources, usually financial support, for promising companies, but limited professional resources are available for exploratory innovation. However, universal financial resources can be used to exchange external professional resources, such as recruiting R&D talents with implicit knowledge and the ability to absorb new knowledge, in order to alleviate the resource constraints of enterprises (Gao et al., 2021) [12].

As a commonly used policy tool to promote innovation, public R&D subsidies can help enterprises buffer resource constraints and provide additional resources during the innovation process. R&D subsidies can also improve the risk tolerance of enterprises and encourage exploratory R&D activities. Based on this, this article proposes a hypothesis about the "little giant" policy of specialization, refinement, novelty:

Hypothesis 2: The "Little Giant" policy of specialization, refinement, and innovation significantly promotes innovation in small and medium-sized enterprises by providing government subsidies.

3.3. Market Competition Mechanism

Aghion et al. (2015) argue that well managed industrial policies, especially those that are conducive to competition, can improve productivity and productivity growth. If there is no industrial policy, innovative enterprises may choose to

operate in different sectors to face lower competition in the product market, resulting in high sector concentration and low innovation motivation, due to the "monopoly substitution effect". In this case, encouraging enterprises to be active in the same sector through industrial policies such as tax breaks or other tax subsidy programs will reduce concentration in the target industry and enhance incentives for enterprise innovation. Therefore, in promoting innovation and productivity growth, competition and appropriately designed industrial policies can complement each other [13].

Industrial policies, through rational design, are more conducive to competition, thereby promoting growth. Appropriate selection criteria and good guidance supported by management can have a significant impact on growth and innovation performance. Based on this, this article proposes a hypothesis about the "little giant" policy of specialization, refinement, novelty:

Hypothesis 3: The "Little Giant" policy of specialization, refinement, and innovation significantly promotes innovation in small and medium-sized enterprises by promoting market competition.

4. Models and Data

4.1. Empirical Model

In 2019, the Ministry of Industry and Information Technology officially announced the first batch of specialized, refined, and innovative "little giant" enterprises. Subsequently, the second to fifth batches of specialized, refined, and innovative "little giant" enterprises were announced from 2020 to 2023. The identification period used in this article is from 2018 to 2022, so the fifth batch of enterprises announced in 2023 will be used as the control group not affected by the policy, and the first to fourth batches of enterprises will be used as the processing group. Finally, the following interleaved double difference model is constructed:

$$Innovation_{it} = \alpha_1 + \beta_1 D_{it} + X'\Gamma + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Among them, the dependent variable measures the innovation level of the enterprise, including R&D level, number of technical personnel, and number of invention patents. The core explanatory variable represents whether the company was a specialized, refined, and innovative "little giant" enterprise in that year, which is 1, otherwise it is 0. X is series of control variables that affect the innovation level of enterprises. μ_i is the Fixed effects for individuals, λ_t is the fixed effects for time, and ε_{it} is residual term. Due to the possible clustering correlation between the innovation level of enterprises in various provinces and cities under the influence of the policy of specialized, refined, and innovative "little giant" enterprises, this article adopts the robust clustering standard error at the provincial level. Finally, it can be considered that the coefficients identified in this article are the causal effects of the "Little Giant" policy on the innovation level of enterprises.

4.2. Data Sources

The data used in this article is from 2018 to 2022 for Chinese A-share listed companies and specialized, refined, and new "Little Giant" enterprises in the National Equities Exchange and Quotations (NEEQ). The list of specialized, refined, and new "Little Giant" enterprises in the official documents of the Ministry of Industry and Information Technology is matched with the list of A-share and NEEQ enterprises. Finally, all specialized, refined, refined, and new "Little Giant" enterprises are obtained in the WIND database. After removing some missing data, 1544 companies were ultimately obtained. Among them, there are 54 companies in the first batch, 295 companies in the second batch, 382 companies in the third batch, 508 companies in the fourth batch, and 305 companies in the fifth batch. The reason for adding data on "New Third Board" enterprises is because the "Little Giant" policy mainly targets small and medium-sized enterprises, and most of the "New Third Board" enterprises are small and medium-sized enterprises, while A-share listed companies have enterprises of various sizes.

The main variables of this article are as follows:

(1) The dependent variable. This article uses R&D level, which is the ratio of R&D expenditure to operating revenue, as a measure of a company's innovation capability, as well as the proportion of technical personnel and the number of invention patents as alternative variables for robustness testing.

(2) Core explanatory variables. The core explanatory variable of this article is whether the company was a specialized, refined, and innovative "little giant" enterprise in that year. If so, it is 1, otherwise it is 0.

(3) Control variables. The control variables selected in this article related to enterprise innovation are enterprise size, enterprise age, asset liability ratio, fixed asset ratio, board independence, and current ratio. The specific calculation method is shown in the table below.

(4) Mechanism variables. This article analyzes the impact mechanism from three perspectives: financing constraints, government subsidies, and market competition.

Table 1. Definition of Main Variables

Variable	Symbol	Definition
R&D level	*RD*	R&D expenses/operating income
The proportion of technical personnel	*Tech*	Take the natural logarithm of the number of technical personnel
Number of invention patents	*InvPat*	Number of invention patents
Enterprise scale	*Size*	Take the natural logarithm of the number of employees
Enterprise age	*Age*	Subtract the observed year from the established year and then take the natural logarithm
Asset liability ratio	*Lev*	Total liabilities/total assets
Fixed asset ratio	*PPE*	Fixed assets/total assets
Independence of the Board of Directors	*Indep*	Number of independent directors/total number of directors
Current ratio	*Liquid*	Current assets/current liabilities
Financing constraints	*FinCons*	Net working capital/total assets
Government subsidies	*Subsidy*	Government subsidies (in millions)/number of employees
Market competition (Lerner index)	*Lerner*	Operating profit/operating cost

The main variables in this article are summarized in the table below. In order to avoid the influence of extreme values,

all continuous variables are truncated at the 1% and 99% levels.

4.3. Descriptive Statistics

The descriptive statistical results of the main variables are shown in Table 2.

Table 2. Descriptive statistics

Variable	Observations	Mean
RD	7,720	8.286051
Size	7,720	559.8543
Lev	7,720	37.2404
Liquid	7,719	3.111091
Indep	7,445	0.196773
Age	7,720	16.21308
InvPat	7,630	6.97536
Tech	7,096	4.35034
FinCons	6,172	0.2510969
Subsidy	7,518	0.0102662
Lerner	7,715	0.8996972

5. Empirical Results

5.1. Benchmark Regression

The regression results of the staggered difference-in-difference model are shown in the first column of the table, indicating that the "little giant" policy of specialization, refinement, novelty has a significant promoting effect on innovation in small and medium-sized enterprises. After adopting the robust clustering standard error at the provincial level, the "Little Giant" policy of specialization, refinement, and innovation still significantly promoted innovation in small and medium-sized enterprises at a significance level of 1%.

Table 3. Benchmark regression results

	(1)
Variable	*RD*
D_{it}	0.6415***
	(0.1045)
Controls	Yes
Year fixed effect	Yes
Firm fixed effects	Yes
Observation	7,441
R-squared	0.8379

Note: Clustering robustness standard error is indicated in parentheses, where * * * p<0.01, * * p<0.05, * p<0.1

5.2. Heterogeneity of Treatment Effects

In the staggered double difference model, due to the policy of multiple batches being intertwined, the earlier and later treatment groups will be used to estimate causal effects. However, if the group receiving treatment earlier is used as the control group for the group receiving treatment later, it will cause estimation bias. Goodman Bacon (2021) found through decomposition of the double difference model that the interleaved double difference model using a bidirectional fixed effects model can be decomposed into the variance weighted average of estimated results from multiple periods, sometimes with negative weights. When the processing effect does not change over time, the double difference estimator of bidirectional fixed effects produces a cross group weighted average of the variance except for interest, and all weights are positive. Negative weight, also known as heterogeneity of treatment effects, only occurs when the average treatment effect changes over time [14]. Baker et al. (2022) and Liu Chong et al. (2022) reviewed various foreign literature on addressing the heterogeneity of this treatment effect [15,16]. Considering the use of robust clustering standard errors at the provincial level and the presence of time-varying control variables in this article, the heterogeneity robust estimator proposed by Sun and Abraham (2021) and Callaway and Sant'Anna (2021) was selected to correct for the heterogeneity of processing effects [17,18]. The revised regression results are shown in the Table 3. It can be seen that the heterogeneity of treatment effects leads to the baseline regression underestimating the causal effect of the "little giant" policy on innovation in small and medium-sized enterprises. The conclusion that the "Little Giant" policy promotes innovation in small and medium-sized enterprises is still robust.

Table 4. Dealing with heterogeneity of treatment effects

	(1)	(2)
Variable	Sun and Abraham (2021)	Callaway and Sant'Anna (2021)
D_{it}	0.8428***	0.6787***
	(0.1759)	(0.1093)
Controls	Yes	Yes
Year fixed effect	Yes	Yes
Firm fixed effects	Yes	Yes
Observation	7,392	7,441
R-squared	No	0.8381

Note: Clustering robustness standard error is indicated in parentheses, where * * * p<0.01, * * p<0.05, * p<0.1

5.3. Parallel Trend Test

When using the staggered difference-in-difference model, the parallel trend assumption must be satisfied. In order to verify that the "Little Giant" policy of specialization, refinement, and innovation did not have an impact on innovation in small and medium-sized enterprises before the event, this article uses a dynamic two-way fixed effects model to test the parallel trend hypothesis:

$$Innovation_{it} = \alpha_1 + \sum_{\substack{r\neq -1 \\ -4\le r\le 3}} 1[R_{it} = r]\beta_r + X'\Gamma + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Similar to equation (1), $Innovation_{it}$ measuring a company's innovation level, X is a series of control variables, μ_i representing individual fixed effects, λ_t representing time fixed effects, ε_{it} is the residual term. $\sum_{\substack{r\neq -1 \\ -4\le r\le 3}} 1[R_{it} = r]$ is an indicative function, if there are still r stages between the t-th stage and the processing period for individual i, then it is 1; otherwise, it is 0. Meanwhile, remove the "-1" period as the base period to avoid multicollinearity. As shown in the figure below, after inspection, β_r was found that there was no significant difference with zero in the period before policy implementation, which can be considered as meeting the assumption of parallel trends. At the same time, during the implementation of policies, β_r were significantly positive, indicating that policies have a significant positive impact on corporate innovation. At the same time, the robust estimator

of dynamic heterogeneity, which takes into account the heterogeneity of treatment effects, was tested together with the bidirectional fixed effects estimator. It was ultimately found that the parallel trend assumption was still satisfied in the estimators of Callaway and Sant'Anna, Sun, and Abraham. Among them, Callaway and Sant'Anna's estimators use a "-4" period as the base period, while Sun and Abraham's and bidirectional fixed effects estimators use a "-1" period as the base period.

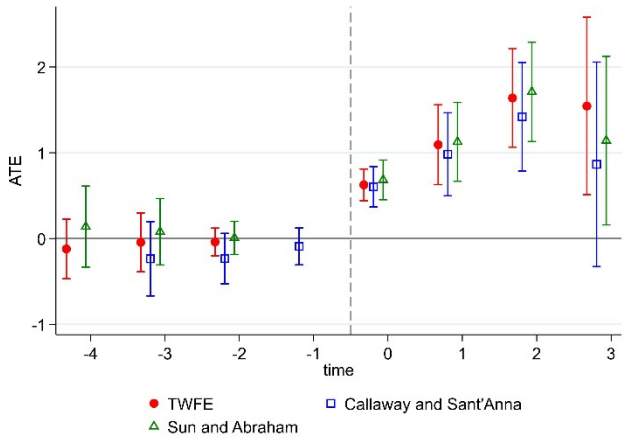

Figure 1. Parallel trend test

6. Robust Test

6.1. Dependent Variable Test

Table 5. Dependent variable test

	(1)	(2)
Variable	*Tech*	*InvPat*
D_{it}	0.0143*	0.1247**
	(0.0071)	(0.0621)
Controls	Yes	Yes
Year fixed effect	Yes	Yes
Firm fixed effects	Yes	Yes
Observation	7,056	7,290
R-squared	0.9677	0.603(Pseudo R^2)

Note: Clustering robustness standard error is indicated in parentheses, where * * * p<0.01, * * p<0.05, * p<0.1

To test the robustness of the empirical results, this article first tests the dependent variable. Referring to existing literature, this article selects the number of technical personnel as a proxy variable for the innovation level of enterprises. At the same time, this article also tests enterprise innovation from the perspective of innovation output level. Due to the fact that invention patents have the highest technological content among the three types of patents (invention patents, utility model patents, and design patents), this article only uses invention patents to measure enterprise innovation output. Select the number of invention patents as the proxy variable for enterprise innovation. Considering that the number of invention patents is countable data, using the common practice of adding 1 to the countable data and then taking the natural logarithm for linear regression will result in estimates without natural explanations, which may have incorrect expected symbols (Cohn et al., 2022) [19]. This article uses a panel Poisson model to test whether the "Little Giant" policy of specialization, refinement, novelty has significantly promoted the increase in the number of invention patents. The regression results of testing the number of technical personnel is located in the first column of the table, and the results of testing the number of invention patents are located in the second column. It can be seen that the "little giant" policy of specialization, refinement, novelty, and innovation has significantly promoted enterprise innovation investment and output at a significance level of 10%, and the benchmark regression results are still robust.

6.2. Control Variable Test

In order to verify the rationality and robustness of the control variables selected in this article, the robustness of the control variables was tested by lagging the control variables by one period and incorporating their polynomial form into the regression model. The regression results of the two testing methods are located in the first and second columns of the table, respectively. It can be seen that the "Little Giant" policy of specialization, refinement, and innovation still significantly promotes innovation in small and medium-sized enterprises. The conclusion of the benchmark regression in this article is still robust:

Table 6. Control variable test

	(1)	(2)
Variable	*RD*	*RD*
D_{it}	0.5908***	0.5316***
	(0.1041)	(0.1029)
$Controls_{t-1}$	No	Yes
$Controls^3$	Yes	No
Year fixed effect	Yes	Yes
Firm fixed effects	Yes	Yes
Observation	7,441	5,887
R-squared	0.8406	0.8592

Note: Clustering robustness standard error is indicated in parentheses, where * * * p<0.01, * * p<0.05, * p<0.1

6.3. Placebo Test

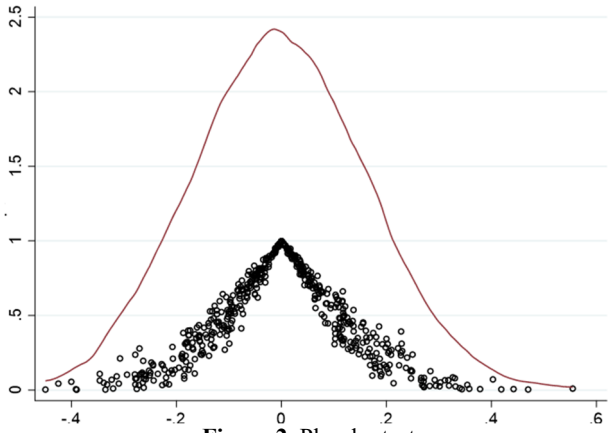

Figure 2. Placebo test

In order to further eliminate the impact of other confounding factors on the estimation in this article, a placebo test was also conducted. Referring to Bai Junhong et al. (2022), theoretically incorrect estimates were generated by randomly assigning processing and control groups to each batch of specialized and innovative "little giant" enterprises. Repeat the generated erroneous estimate 500 times to obtain the kernel density map of the erroneous estimate. It can be seen that the coefficients are all concentrated around 0 and are not significant. It can be considered that there are no other confounding factors affecting the estimation of the causal

effects of the "Little Giant" policy in this article, and the benchmark regression results of this article are still robust.

7. Mechanism Verification

7.1. Corporate Financing Constraint Mechanism

Based on the analysis of the theoretical hypotheses mentioned earlier, this article believes that the "little giant" policy of specialization, refinement, novelty, and innovation can promote corporate innovation by alleviating the mechanism of corporate financing constraints. In the notice issued by the Ministry of Industry and Information Technology, it is explicitly stated that "we will strengthen financing services, broaden financing channels for small and medium-sized enterprises, and cultivate high-quality enterprises such as specialized, refined, and innovative small and medium-sized enterprises for listing. We will strengthen innovation services, implement the" Hand in Hand Action "for the integration and innovation of large, medium, and small enterprises, and the special action for digital empowerment of small and medium-sized enterprises. We will also extensively carry out management consulting, talent training, and other services.", To provide strong support for the specialized, refined, and innovative development of small and medium-sized enterprises. Referring to Gu Xiaming et al. (2018), this article uses the ratio of net working capital to total assets of enterprises as a measure of the degree of financing constraints faced by enterprises. The smaller the financing constraints faced by enterprises, the greater the ratio of net working capital to total assets, which reflects the better capital situation of enterprises [21].

The indicators reflecting the degree of corporate financing constraints were replaced with corporate innovation, and the regression results are shown in the first column of the table below. The "Little Giant" policy of specialization, refinement, and innovation significantly alleviated the financing constraints faced by enterprises, verifying that industrial policies promote corporate innovation through the mechanism of alleviating corporate financing constraints. Finally, hypothesis 1 proposed in this article was validated.

7.2. Government Subsidy Mechanism

The "Little Giant" policy of specialization and innovation also promotes enterprise innovation by providing government subsidies. In the same notice from the Ministry of Industry and Information Technology, it is explicitly stated that "around the implementation of the" List of Practical Tasks for "Specialized, Refined, Special, and New" Small and Medium sized Enterprises, we will improve the support policies for specialized, refined, special, and new small and medium-sized enterprises and specialized, refined, special, and new "small giant" enterprises, and establish a working mechanism for departmental coordination and joint promotion. ". Based on local conditions, we will focus on providing strong support to small and medium-sized enterprises in areas such as funding, talent, innovation, and digital and green transformation. This means that small and medium-sized enterprises with expertise, expertise, and innovation will receive government assistance in terms of funding, talent, and other factors, and the government will provide assistance to promote enterprise innovation.

Replacing government subsidies with corporate innovation, the regression results are shown in the second column of the table below. The "Little Giant" policy of specialization, refinement, and innovation significantly promoted government subsidies, verifying that industrial policies significantly promoted corporate innovation through the mechanism of providing government subsidies. Finally, hypothesis 2 proposed in this article was validated.

7.3. Market Competition Mechanism

In the cultivation measures of the "Little Giant" policy of specialization, refinement, novelty, and innovation, it is also explicitly proposed to promote market competition. With the cultivation of high-quality small and medium-sized enterprises as the starting point, we will deepen the reform of "streamlining administration, delegating powers, and improving services", minimize the entry threshold for small and medium-sized enterprises, and create a fair competition environment. Considering the integration of optimization and relief, we will simultaneously increase efforts to prevent and resolve outstanding payments to small and medium-sized enterprises, and safeguard their legitimate rights and interests. Promote the integration and innovation of large, medium, and small enterprises, as well as the collaborative innovation of industry, academia, and research, to deepen their development, and continuously improve the innovation ecosystem of small and medium-sized enterprises. Carefully summarize the experience and practices of cultivating specialized, refined, and innovative "little giant" enterprises, pay attention to their exemplary and leading role, and guide the majority of small and medium-sized enterprises to follow the path of specialized, refined, distinctive, and innovative development.

Table 7. Mechanism analysis

	(1)	(2)	(3)
Variable	*FinCons*	*Subsidy*	*Lerner*
D_{it}	0.0109**	0.0011**	0.0255***
	(0.0033)	(0.0004)	(0.0046)
Controls	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observation	6,072	7,331	7,441
R-squared	0.7588	0.6220	0.6315

Note: Clustering robustness standard error is indicated in parentheses, where * * * p<0.01, * * p<0.05, * p<0.1

In order to measure the degree of market competition, this article adopts the calculation method of Chen Aizhen and Zhang Pengfei (2019), and uses the proportion of operating profit to operating revenue as the Lerner Index [22]. In perfect competition, excess profit should be less than or equal to the cost of capital, so the Lerner index should be equal to zero. Since the Lerner index is an inverse measure of competition, this article redefines the indicator of competition degree as 1 minus the Lerner index. Therefore, in perfect competition, it should be equal to 1. 1 represents perfect competition, while below 1 represents a certain degree of market power. If the "Little Giant" policy of specialization and innovation significantly promotes an increase in competition indicators, it indicates that it has promoted market competition. Replacing the market competition index with enterprise innovation, the results are shown in the third column of the table below. The "Little Giant" policy of specialization, refinement, and innovation significantly promoted market competition, verifying that industrial policies significantly

promoted enterprise innovation through the mechanism of promoting market competition. Finally, hypothesis 3 proposed in this article was validated.

8. Heterogeneity Analysis

To further strengthen the demonstration of the key implementation areas of this policy, heterogeneity analysis needs to be conducted on enterprises related to key areas and "bottleneck" technologies. If the main products of an enterprise are related to key areas and "bottleneck" technologies, and are influenced by the "little giant" policy of specialization, refinement, novelty, and innovation, it has a significant positive regulatory effect on enterprise innovation. This indicates that the causal effect of the policy on related enterprises is greater, thus demonstrating that the policy has a key implementation area.

Considering that the "Little Giant" policy of specialization, refinement, and innovation has clearly listed the key areas for implementation, such as the key areas listed in the "Four Foundations" Development Catalogue of Industry, the "Top Ten Key Industrial Areas of the Manufacturing Strong Country Strategy," "filling gaps," "forging strengths," and so on. Referring to the approach of Zheng Shilin and Zhang Guoguo (2022), this article believes that in the "Little Giant" policy of specialization, refinement, novelty, and innovation, enterprises involved in the ten key industrial areas of the manufacturing power strategy and the "bottleneck" technology will have significantly greater innovation investment promoted by the policy. Therefore, this article will match the 35 key core technologies listed in the Science and Technology Daily, as well as keywords related to the top ten key industries of the manufacturing power strategy, with the names of the main products of the enterprises. Then, relevant enterprises will be manually selected as specialized and innovative "little giant" enterprises related to policy implementation key areas and "bottleneck" technologies.

By adding the interaction term between the processing variable and the moderating variable to the model, the regression results in the first column of Table 8 show that enterprises related to "bottleneck" technology and key areas have a significant positive moderating effect. This indicates that the causal effect of this policy on innovation in small and medium-sized enterprises does have significant differences in whether it is related to enterprises, and enterprises related to key areas and "bottleneck" technology are more affected by the policy's causal effect.

Table 8. Heterogeneity analysis

	(1)
Variable	*RD*
D_{it}	0.0109**
	(0.0033)
$D_{it} \times Bottleneck$	0.7877*
	(0.3926)
Controls	Yes
Year fixed effect	Yes
Firm fixed effects	Yes
Observation	7,441
R-squared	0.8382

Note: Clustering robustness standard error is indicated in parentheses, where * * * p<0.01, * * p<0.05, * p<0.1

At the same time, it is noted in Table 7 that if it is not related to key areas and "bottleneck" technology enterprises (with a moderating variable of 0), the "little giant" policy of specialization, refinement, and innovation still has a significant causal effect, which is also in line with theoretical expectations. Because unrelated enterprises are still affected by policies and have significant causal effects, this demonstrates the rationality of classifying enterprises related to key areas and "bottleneck" technologies. In the study by Zheng Shilin and Zhang Guoguo (2022), the development strategy of the manufacturing industry has a positive but not significant impact on the R&D intensity of enterprises in the key core technology areas of "bottleneck", but has a significant positive impact on the R&D investment intensity in non bottleneck technology areas. They believe that the development strategy of the manufacturing industry is not enough to incentivize the innovation level in key core technology areas, and there is an urgent need to concentrate efforts on tackling breakthroughs in order to gradually change the situation where key core technologies are subject to human control. The specialized, refined, and innovative "little giant" policy studied in this article is an industrial policy with clear focus areas. Unlike the development strategy of the manufacturing industry, the policy implementation targets are concentrated on small and medium-sized enterprises, and the incentives for key areas and "bottleneck" technology related enterprises are significantly greater.

9. Conclusion and Recommendations

This article uses data from A-share listed companies and "New Third Board" listed companies from 2018 to 2022, and identifies the causal effects of the "Little Giant" policy on small and medium-sized enterprises through an interleaved double difference model. It also verifies that the "Little Giant" policy significantly promotes innovation in small and medium-sized enterprises by alleviating financing constraints, providing government subsidies, and promoting market competition. The "Little Giant" policy provides new empirical evidence for identifying the short-term impact of industrial policies on corporate innovation, as well as for identifying the impact of industrial policies on innovation in small and medium-sized enterprises.

After verifying the mechanism of the "Little Giant" policy, this article proposes the following policy implications:

Firstly, the "Little Giant" policy of specialization, refinement, and innovation has significantly promoted corporate innovation by alleviating financing constraints. The policy is guided by central fiscal funds to promote linkage between upper and lower levels, combining the optimization of small and medium-sized enterprises with the strengthening of industries, accelerating the cultivation of a group of specialized, refined, and new "little giant" enterprises that focus on segmented markets, main businesses, strong innovation capabilities, and good growth potential, promoting the improvement of the number and quality of specialized, refined, and new "little giant" enterprises, and helping the real economy, especially the manufacturing industry, to become stronger and better, enhancing the industrial chain Supply chain stability and competitiveness.

Secondly, the "Little Giant" policy of specialization, refinement, and innovation has significantly promoted corporate innovation by providing government subsidies. Policies will increase financial, tax, and financial support, give full play to the guiding and supportive role of special

funds and funds at all levels and types to support the development of small and medium-sized enterprises, increase support for technological progress and transformation of small and medium-sized enterprises, focus on supporting "specialized, refined, unique, and new" technologies and products, and cultivate "specialized, refined, unique, and new" small and medium-sized enterprises. Implement incentive policies to support the innovation and development of small and medium-sized enterprises, such as pre tax deduction of R&D expenses and accelerated depreciation of eligible fixed assets. Expand financing channels to support technological innovation in small and medium-sized enterprises, build financing service platforms, and promote project docking between banks and "specialized, refined, unique, and new" enterprises. Encourage banking and financial institutions to innovate financial products and services, and support "specialized, refined, unique, and new" small and medium-sized enterprises to adopt various financing methods such as credit loans, intellectual property pledge, and warehouse receipt pledge. Encourage eligible "specialized, refined, and innovative" small and medium-sized enterprises to go public for financing and issue bonds.

Thirdly, the "Little Giant" policy of specialization, refinement, and innovation has significantly promoted enterprise innovation by promoting market competition. Strengthen the cultivation and promotion of policies. The competent departments of small and medium-sized enterprises in various regions should actively promote the development of "specialized, refined, unique, and new" small and medium-sized enterprises based on the actual economic development, industrial layout, and small and medium-sized enterprise development in their respective regions. They should standardize identification standards, improve promotion measures, explore cultivation methods, refine work objectives, support the research and industrialization of "specialized, refined, unique, and new" products and technologies, and cultivate and identify a group of "specialized, refined, unique, and new" small and medium-sized enterprises. By guiding more small and medium-sized enterprises to take the path of "specialization, refinement, uniqueness, and innovation" development, further improving the industrial chain, enhancing industrial competitiveness, and promoting coordinated regional economic and social development.

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