Timely Policy Exit: Reducing Over-Investment and Driving High-Quality Firm Performance

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Abstract: *Using data from the 11th to 14th Five-Year Plan periods (2006-2025), this study applies a Difference-in-Differences (DID) approach to assess the impact of industrial policy withdrawal. Industries that have faced policy withdrawal for over a decade are categorized as the treatment group, while consistently supported industries form the control group. The analysis examines how withdrawal affects firm total factor productivity (TFP) and investment behavior. The results show that policy withdrawal boosts firm TFP by reducing over-investment and improving the efficiency of R&D spending. This effect is particularly evident in industries with strong, competitive leading firms. Additionally, in regions with lower levels of marketization, timely policy withdrawal plays a key role in curbing over-investment. This study also highlights a dual effect of policy withdrawal: while it fosters corporate social responsibility, it may also encourage financial speculation. These findings suggest that the implementation of industrial policy should provide "timely assistance" over a limited timeframe rather than long-term support to well-established industries. As industries mature, policy support should be gradually reduced or phased out to avoid over-investment and enhance firm efficiency.*

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1. Introduction

The 20th National Congress of the Communist Party of China emphasized the importance of "promoting high-quality development" as a central theme, highlighting the need to accelerate the construction of a modern economic system, focus on improving total factor productivity (TFP), and ensure the effective improvement of quality alongside reasonable growth in economic quantity. To optimize resource allocation, it is necessary to enhance efficiency at both the industry and firm levels. This is a central concern of industrial policy. Since China's reform and opening up in 1978, industrial policies have been instrumental in optimizing industrial structure and enhancing competitiveness. However, these policies are dynamic, adapting to evolving economic conditions and gradually withdrawing support from mature industries. For example, while the 10th Five-Year Plan (2001-2005) emphasized developing large-scale metallurgical, fertilizer, and petrochemical equipment and promoting

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the construction industry (including new building materials), the 12th Five-Year Plan (2011-2015) prioritized domestic demand and strict control of expansion in the metallurgical and building materials sectors. This shift demonstrates the adaptive nature of China's industrial policy. China's Five-Year Plans provide a macroeconomic framework. Like the introduction of industrial policies, their gradual withdrawal significantly affects firm behavior. Therefore, research on China's industrial policy should encompass both policy implementation and withdrawal, the latter of which remains understudied.

In practice, the withdrawal of industrial policies is a common phenomenon and an inherent part of the policy lifecycle, as these policies are designed as temporary support measures for specific industries, not permanent fixtures. Through analysis of relevant data from the National Five-Year Plans, we find that since 2006, approximately 43% of industries that had previously received support have experienced policy withdrawal for ten years or more. Specifically, industries such as oil and gas extraction, real estate, civil engineering, and retail ceased receiving support after 2011, while agriculture, forestry, animal husbandry, and furniture manufacturing saw support withdrawn after 2016. The scale of these withdrawals is substantial, impacting a significant number of firms; roughly 10% of listed companies in China experienced national industrial policy withdrawal in both 2011 and 2016. Despite this prevalence, existing literature often overlooks the dynamic nature of industrial policy and insufficiently explores the impact of withdrawal, highlighting a need for further research.

Based on theory and practice, we argue that on the one hand, industrial policy should primarily support struggling industries, not those already thriving. Emerging industries of strategic importance to the national economy and people's livelihoods often lack competitiveness and operate in immature markets, making them unlikely to develop solely through market forces. In these cases, government intervention via industrial policy is necessary to guide, support, and promote their growth, transformation, and upgrading, thereby enhancing national competitiveness. On the other hand, industrial policies should be temporary, not permanent interventions. Once supported industries mature and markets become competitive, these policies should be phased out, allowing market forces to drive firm behavior, competitiveness, and resource allocation efficiency. The State's role should then transition to enabling market competition, not direct intervention. While much of the existing literature focuses on the rationale for and impact of industrial policies - proponents emphasize their role in nurturing new industries and technologies (Lin et al., 1999; Hausmann and Rodrik, 2003), the critical issue of policy withdrawal remains under-explored. Critics often highlight the market distortions induced by prolonged intervention (Yu et al., 2010; Beason and Weinstein, 1993), yet there is a notable gap in the literature regarding the timing, mechanisms, and broader consequences of exiting such policies. Empirically, and at the firm level, crucial questions persist: Has withdrawing industrial policies boosted Chinese firms' TFP? How has it affected their investment? At what stage of an industry's development is withdrawal most effective? Answering these questions is vital to understanding the full life-cycle of industrial policy and its lasting impact.

To answer these questions, this paper treats industrial-policy withdrawal as a quasi-natural experiment. Using data from China's 11th to 14th Five-Year Plan periods (2006-2025), it identifies industries where support ended a decade or more ago, comparing them with consistently supported sectors. Analyzing data on A-share listed companies from 2006 to 2020 using a DID approach, we examine the impact of withdrawal on firm TFP and investment. We also explore whether industry concentration and regional market development affect the optimal timing of policy exit.

Empirical results reveal the following: First, during the sample period, the withdrawal of industrial policies has promoted TFP improvement among firms within the relevant industries and mitigated the problem of corporate over-investment. This finding has passed multiple robustness tests. Second, for industries with high concentration (i.e., industries where leading firms are well-developed), the withdrawal of industrial policies can effectively improve firm TFP and reduce corporate over-investment. In regions with less developed marketization, the withdrawal of industrial policies leads to a more significant reduction in corporate over-investment, suggesting that the withdrawal of industrial policies should be implemented in a timely and context-specific manner, adapting to local conditions. Third, the transmission mechanisms through which industrial policy withdrawal affects firm TFP and investment behavior include: prompting firms to focus on improving R&D efficiency, increasing the capitalization ratio of R&D investment, increasing the number of R&D personnel, and enhancing corporate innovation capabilities (thus promoting TFP); and a reduction in external resources available to firms, such as subsidies and tax breaks (thus reducing over-investment). Fourth, while the withdrawal of industrial policies alleviates corporate over-investment within industries, it may also lead to a shift away from real economy investment to financial speculation, diverting funds to areas prone to “bubbles”, such as investment in real estate. Furthermore, the withdrawal of industrial policies may also incentivize firms to engage in philanthropic activities for tax avoidance purposes, thereby indirectly enhancing corporate social responsibility.

This paper makes the following key contributions: First, this study is the first to investigate the impact of industrial policy withdrawal on firm-level TFP and investment behavior. Both the implementation and withdrawal of industrial policies are crucial components of national industrial planning. Existing research has predominantly focused on the effects of industrial policy implementation on firms, with a lack of attention paid to the withdrawal of such policies and their consequences. Second, this paper analyzes the appropriate timing for effective policy withdrawal by considering factors such as industry development and the level of regional marketization. Specifically, industrial policies should not be used to support already thriving industries; rather, they should be withdrawn when industries enter a normal operating trajectory, thereby allowing market competition mechanisms to fully exert their advantages in resource allocation efficiency. This study provides empirical evidence for the importance of implementing policy withdrawal in a timely and context-specific manner.

2. Literature Review

2.1 Industrial Policy Effectiveness

Academic circles have long debated the effectiveness of industrial policies. Supporting views mainly include: (1) Industrial policies can correct “market failures” and promote the development of new industries and technologies (Lin et al., 1999); (2) Industrial policies can facilitate cooperation among firms in related industries (Hausmann and Rodrik, 2003); (3) Industrial policies can enhance firms’ ability to integrate technology with the local development environment (Greenwald and Stiglitz, 1986). Conversely, opposing views argue that: (1) Industrial policies may lead to homogenization of industrial structures among local jurisdictions (Jiang et al., 2012); (2) Industrial policies may disrupt market order and hinder normal market competition (Yu and Regina, 2011; Chen et al., 2023); (3) Information asymmetry and rent-seeking problems exist in the implementation of industrial policies, and strategic behavior of companies can reduce the implementation efficiency of industrial policies (Li and Zheng, 2016; Yang and Rui, 2020).

Aghion et al. (2015) point out that “rather than debating whether industrial policies are effective or whether they should exist at all, a more worthwhile focus is on how to design and implement industrial policies more effectively”. Some scholars have explored the boundary conditions for effective industrial policies. Yang and Hou (2019) suggest that one such condition is that government industrial policies should not adopt a “one-size-fits-all” approach but should be tailored to local conditions. Some research indicates that another condition for effective industrial policies is the ability to promote competition within related industries (Lichtenberg, 1988; Aghion et al., 2015; Yu et al., 2016; Dai and Cheng, 2019). Furthermore, factors such as media monitoring and reporting (Yang and Zhang, 2021) and effective intellectual property protection systems (Li et al., 2021; Sampat and Williams, 2019) can also enhance the effectiveness of industrial policies.

A key insight for assessing industrial policy effectiveness is that "such policies must foster competition" (Aghion et al., 2015). Market efficiency is driven by the "creative destruction" of inefficient firms through competitive pressures, necessitating a robust exit mechanism. Just as market competition relies on firm exit, "creative destruction" can enhance the effectiveness of local industrial policies. Understanding the effects of policy withdrawal, therefore, is essential for a comprehensive assessment of industrial policy effectiveness. While much of the existing literature concentrates on the impacts and limitations of active policies, the consequences of their removal have been notably under-explored. This paper seeks to expand the understanding of industrial policy effectiveness by focusing on the withdrawal aspect.

2.2 Industrial Policy Adoption and Firm TFP

The effectiveness of industrial policy in boosting targeted firms' total factor productivity (TFP) remains a point of contention. Some studies suggest positive impacts, identifying several underlying mechanisms: (1) improved access to finance and greater investment in innovation (Dai and Cheng, 2019; Yin and Wang, 2020); (2) enhanced market competition and increased firm competitiveness (Aghion et al., 2015; Wang et al., 2022); and (3) resource reallocation, whereby more efficient, previously under-supported firms expand into new sectors, raising average productivity within targeted industries (Yang et al., 2018).

Other research, however, argues that industrial policies can distort resource allocation and hinder firm TFP growth. These studies identify three key mechanisms: (1) the diversion of resources from non-priority to priority sectors, leading to over-investment and subsequent TFP declines in supported firms (Zhang et al., 2019); (2) a reduction in firms' responsiveness to market-based investment opportunities (Qian et al., 2018); and (3) the increased likelihood of state intervention, including greater state ownership, in supported private firms, resulting in inflated employment and wages and ultimately lower TFP (Li and Shao, 2016).

The author argues that differing conclusions on this issue arise not only from variations in the selected industrial policies and samples but also from two other potential reasons. First, existing literature, when employing the DID method to identify the effects of industrial policy implementation, mostly selects supported industries as the treatment group and other industries as the control group. This approach may include industries where support policies have already been withdrawn into the control group, conflating "industries that have never received support" with "industries where policies have exited", leading to bias in causal effect estimation. Second, according to the research of Hong et al. (2021), industrial policies stimulate firms' investment in key resources such as labor, capital, and technology in the short term, exacerbating cost stickiness. This cost stickiness cannot be absorbed and utilized by firms in the short term, thus reducing short-term TFP. However, in the long run, it lays the resource foundation for firm development, which is conducive to future TFP improvement. Both of these points imply that examining changes in firm TFP after a period of industrial policy implementation, especially after policy withdrawal, is beneficial for a more comprehensive understanding of the relationship between industrial policy and firm TFP and has significant academic value.

2.3 Industrial Policies and Firm Investment

Government support can lead to corporate over-investment, resulting in a range of significant problems (Bao et al., 2017; Han et al., 2011). Much of the existing research suggested that government-driven industrial policies exacerbated this over-investment. For example, Wang et al. (2017) found that firms encouraged by such policies were able to secure more loans, thereby intensifying over-investment. Similarly, Huang et al. (2015) highlighted that industrial policy support often led to excessive investment by firms. Zhang et al. (2019) also observed that companies benefiting from industrial policies were prone to over-investment. While the literature primarily focused on the relationship between industrial policies and corporate over-investment, less attention was given to whether the withdrawal of these policies could alleviate the problem. Moreover, it remains under-explored whether firms, once freed from policy support, would redirect funds initially allocated for industrial investments into financial asset speculation.

2.4 Exit of Industrial Policies

Existing research predominantly focuses on industrial policies that are either currently in effect or have already been implemented. Only a few studies - due to the specific treatment and control groups used in their identification strategies - address the issue of industrial policy withdrawal, albeit from a limited perspective through their regression results. Notable examples include: Hong et al. (2021), who found that industrial policy withdrawal can reduce cost stickiness in the affected industries; Yang et al. (2018), whose findings suggest that firms in industries where policies have been withdrawn tend to increase their diversification efforts; and Yu et al. (2016), who argued that industrial policy withdrawal is associated with a decrease in the number of invention patents authorized to firms. However, despite these contributions, these studies still largely center on the effects of active industrial policies. Empirical attention specifically devoted to the withdrawal of industrial policies remains insufficient, and there is a notable lack of robustness checks that directly address the impacts of policy withdrawal.

A review of the above literature reveals that existing research largely focuses on the impact of industrial policy implementation on firm behavior or regional economic development. However, there is relatively little research exploring the relationship between industrial policy and firm productivity or over-investment from the perspective of industrial policy withdrawal. From the perspective of the inherent nature of industrial policy, firstly, industrial policies are short-term rather than long-term, let alone permanent. The purpose of industrial policy is to cultivate new industries or assist their growth, certainly not to provide long-term or even permanent protection. Therefore, the withdrawal of industrial policy is as important as its implementation.

Second, industrial policy is intended to provide support to nascent industries facing challenges, rather than to augment the success of already established sectors. Once supported industries mature, policy intervention should be withdrawn to facilitate innovation and the development of new sectors. This allows the government to reallocate resources and policy focus to other industries in greater need of support, enabling their accelerated development.

Third, the timing of industrial policy withdrawal is a critical factor. If withdrawal occurs too early, it may stifle the growth of the supported industry or, in extreme cases, risk abandoning it prematurely. On the other hand, if policy withdrawal is delayed or fails to occur when necessary, it can hinder the development of market mechanisms and reduce resource allocation efficiency within the industry. A particularly important issue that warrants further exploration is whether the withdrawal of industrial policies can effectively mitigate corporate over-investment. What other effects might policy withdrawal have on businesses? These questions remain under-explored in the existing literature, and the discussion in this paper aims to contribute valuable insights to this ongoing research.

3. Empirical Strategy and Data Description

3.1 Model Specification and Variable Definitions

Following Zhang et al. (2019) and Yu et al. (2016), we employ the following two-way fixed effects model to analyze the impact of industrial policy withdrawal on firm TFP and investment behavior:

$$y_{i,t}=\alpha_0+\alpha_1 group_i\times year_t+\sum controls+group_i+year_t+\varepsilon_{i,t} \tag{1}$$

Where i denotes firm, t denotes year, and $y_{i,t}$ is a dummy variable for firm TFP or firm over-investment. $group_i$ equals 1 for the treatment group, which represents industries that have not received industrial policy support for 10 or more years after their first support during the sample period. For firms in the treatment group, $year_t$ equals 1 after the year of their first treatment (i.e., industrial policy withdrawal), and 0 before. Specific information on the treatment group, control group, and treatment time is shown in Table 1. *controls* represents other control variables.

Table 1: Classification of Treatment and Control Groups

	11^{th} Five-year Plan (2006)	12^{th} Five-year Plan (2011)	13^{th} Five-year Plan (2016)
*Treatment Group*_pre	Supported	Withdrawn	Withdrawn
*Treatment Group*_post	Supported	Supported	Withdrawn
Control group	Supported	Supported	Supported

Source: Compiled by the authors.

This paper examines the impact of policy withdrawal on industries that have previously received industrial policy support. Specifically, we analyze the effects of "withdrawal" using industries (or firms) that were supported as our sample. To ensure meaningful comparison, we use industries (or firms) that have consistently received support as the control group, rather than those that have never been supported. This approach is justified for two reasons. First, policy support represents the first stage, and withdrawal is the second. Comparing industries that have experienced both support and withdrawal with those that have never received support would make it difficult to separate the effects of support from those of withdrawal. Thus, industries without prior support are not an appropriate baseline, as any differences could reflect the absence of both stages, rather than isolating the impact of withdrawal alone.

Shifts in international and China's domestic industrial development near the end of the 13^{th} FYP period (2016-2020) could have affected industrial policy support. To prevent contamination of the control group by industries experiencing policy withdrawal during the 14^{th} FYP period (2021-2025), we applied an exclusion criterion. Specifically, we excluded industries that received policy support from the 11^{th} FYP period (2006-2010) through the 13^{th} FYP period but faced withdrawal during the 14^{th} FYP period. This exclusion minimizes the risk of heterogeneity within the control group, thus enhancing the robustness of the regression results. Notably, our results remain robust regardless of whether we explicitly use 14^{th} FYP period data to define the treatment and control groups.

Based on the studies by Biddle et al. (2009) and Zhang Li et al. (2019), this paper incorporates several firm-level control variables: firm age (*Age*, years since establishment), firm size (*Size*, logarithm of total assets at period-end), debt-to-asset ratio (*LEV*, total liabilities/total assets), return on equity (*Roe*, net profit/total assets), fixed asset ratio (*FAR*, fixed assets/total assets), number of employees (*NOE*, employee count), net operating cash flow (*Opncf*, net cash flow from operations in the current year/total assets), Tobin's Q (*TobinQ*, market value at year-end/total assets), and a dummy for state-owned enterprises (*State*, 1 if state-controlled). To address potential endogeneity, lagged values from the previous period are used for *Roe*, fixed asset ratio *FAR*, and Tobin's Q (*TobinQ*), in line with common practices in the literature. In addition, regional-level controls are included for the firm's location, such as the marketization index (*market*), number of national development zones (*DevZone*), log of total freight volume (*ln_trans*), and log of university enrollment numbers (*ln_humancap*).

This paper employs the Generalized Method of Moments (GMM) approach developed by Blundell and Bond (2000) to estimate the TFP of listed firms. Robustness checks are also conducted using TFP calculated by the Levinsohn-Petrin (LP) method and the Olley-Pakes (OP) method. The findings indicate that the choice of TFP estimation method does not affect the conclusions. The GMM method is preferred as it addresses potential endogeneity issues inherent in other TFP estimation techniques. Due to space constraints, subsequent heterogeneity analyses in this paper only report results based on TFP measured using the GMM method.

This paper uses the model of Richardson (2006) to estimate corporate over-investment. The specific model setup is as follows:

$$INV\_F_{i,t}=\alpha_0+\alpha_1 INV\_F_{i,t-1}+\sum controls_{i,t-1}+\sum IND+\sum \text{year}+\varepsilon_{i,t} \qquad (2)$$

In equation (2), $INV\_F_{i,t}$ represents firm i's fixed asset investment level in year t, measured as (Net fixed assets at the end of the period - Net fixed assets at the beginning of the period + Depreciation for the current year) / Net fixed assets at the beginning of the period. $controls_{i,t-1}$ represents a set of lagged control variables, including operating revenue growth rate, debt-to-asset ratio, cash holdings, firm age, and firm size. *IND* and year represent industry and year dummy variables, respectively. A positive residual indicates over-investment, while a negative residual indicates under-investment. Based on the sign of the residual, this paper defines a dummy variable for corporate over-investment, *INV*: *INV* equals 1 if the firm exhibits over-investment, and 0 otherwise. Furthermore, a larger absolute value of the residual indicates lower investment efficiency. Therefore, drawing on Zhang et al. (2019), this paper uses the absolute value of the estimated residuals to construct a firm-level investment efficiency variable for robustness checks.

According to research by Chaisemartin and D' Haultfoeuille (2020) and Goodman-Bacon (2021), among others, when there are multiple treatment periods, using the traditional TWFE model may lead to biased estimates due to the "bad control group problem". This is because: the traditional TWFE estimator is equivalent to a weighted average of the treatment effects of each treatment group (Goodman-Bacon, 2021). When there are multiple treatment periods, the control group of a later-treated group will contain information from earlier-treated groups. This mixes the difference between late policy withdrawal and early policy withdrawal into the treatment effect of policy withdrawal (the difference between policy withdrawal and consistently supported firms), leading to biased estimates. Liu et al. (2022) provide a relatively comprehensive introduction and analysis of this issue.

To address the potential bias in the TWFE model, we draw on the research of Liu et al. (2022) and further employ the estimator developed by Abraham et al. (2021) (the Interaction-Weighted Estimator, IW estimator) to examine the main research question. The specific model setup is as follows:

$$y_{i,t}=\alpha_0+year_t+\sum_{e}\sum_{l\neq-1}\delta_{e,l}(1\{E_i=e\})\cdot D_{i,t}^{l}+\sum controls+\varepsilon_{i,t} \qquad (3)$$

In equation (3), e represents the time when the industry in which firm i is located first received policy treatment (the policy withdrawal time), and l represents the number of periods since the policy event. $1\{E_i=e\}$ is a dummy variable indicating whether a firm i belongs to the early-treated group, and $D_{i,t}^{l}$ is a dummy variable indicating whether firm i is in the treated state in year t. *controls* are consistent with those in model (1). The presence of the $1\{E_i=e\}$ term ensures that the control group for both early-treated and late-treated groups only includes firms that have never been treated. In the context of our research question, using this model can exclude firm samples from industries with early policy withdrawal from the control group of industries with late policy withdrawal, thus addressing the bias arising from the two-way fixed effects model in the face of multiple treatment periods and obtaining robust estimation results. Our reported estimation results cluster standard errors at both the individual and industry levels. We also perform robustness checks by clustering standard errors at the industry level, and find that the regression results remain unaffected by the choice of clustering scope.

3.2 Industrial Policy Data

Existing research employs two main approaches when measuring industrial policy. The first approach uses data on government subsidies received by firms or their effective tax rates. The second approach draws on the idea of "quasi-natural experiments", generally using national major industrial plans such as Five-Year Plans to measure industrial policy. Because the subsidies received by firms and their effective tax rates may be the result of strategic behavior by firms in response to industrial planning (Li and Zheng, 2016; Yang and Rui, 2020), and because they cannot fully reflect preferential policies provided by the government to relevant firms, such as more suitable land locations and more timely government services, this paper adopts the second approach, using information related to national Five-Year Plans to measure industrial policy.

Following Dai et al. (2023), we extract industrial policy information from the national outlines of the 11^{th} to 14^{th} FYPs. We focus on the central, rather than local, FYPs because the industries prioritized at the national level reflect broad, strategic guidance on industrial development. These plans are driven by major technological advancements and overarching national development needs, making them less influenced by the specific priorities of individual provinces or dominant local firms. As a result, national FYPs provide a more exogenous source of variation, making them particularly well-suited for a "quasi-natural experiment" research design.

3.3 Data on Listed Companies and Regions

We use a sample of A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2006 to 2020. The sample period begins in 2006, as the National People's Congress approved the "11^{th} Five-Year Plan" outline resolution on March 14 of that year. The data processing follows standard procedures: (1) Financial and real estate companies are excluded; (2) ST and PT companies are removed; (3) Firms with total assets less than zero or debt-to-asset ratios greater than one are excluded; (4) Continuous variables are winsorized at the 1^{st} and 99^{th} percentiles.

The core data for listed companies are sourced from three authoritative databases: the China Research Data Service (CNRDS), the China Stock Market and Accounting Research Database (CSMAR), and the Wind Financial Terminal (WIND). For missing values, CSMAR data are used as the primary reference, with missing values filled sequentially using data from WIND and CNRDS. Economic data for various regions are obtained from the CEIC database, while the regional marketization index is sourced from the China Marketization Index Database, published by Wang et al. Additionally, to preserve the exogeneity of the "Five-Year Plan" shock, we exclude companies that changed industries during the sample period, as such changes might have been strategically made to gain industrial policy support. For clarity in interpreting the regression results, the *CapR_Dexpr* variable is expressed as a percentage, with the average proportion of capitalized R&D expenditure being 7.82%. Although the corporate R&D expenditure (*RD_exp*) variable contains some random missing values, the missingness is relatively balanced between the treatment and control groups, and the proportion of missing data is within acceptable limits. Therefore, no additional imputation is performed for this variable. It should be noted that the *CapR_Dexpr* variable covers a different sample window, resulting in a smaller sample size for this particular variable.

4. Empirical Analysis

4.1 The Impact of Industrial Policy Withdrawal on Firms

Table 2 presents the regression results of the impact of industrial policy withdrawal on firm TFP and over-investment. Columns (1) and (4) use the regression equation of Model (1) without any control variables, while columns (2) and (5) include control variables. Columns (3) and (6) use firm characteristics such as firm age (*Age*), firm size (*Size*), debt-to-asset ratio (*LEV*), return on equity (*Roe*), fixed assets ratio (*FAR*), number of employees (*NOE*), and net operating cash flow (*Opncf*) as explanatory variables. A Probit regression is used to estimate the probability of a firm falling into the treatment group (i.e., the propensity score). Firms with similar scores in the treatment and control groups are then matched, and the matched samples are regressed using Model (1) as a preliminary robustness check. The *did* term in the table corresponds to the $group_i \times year_t$ term in Model (1), and its estimated coefficients represent the impact of policy withdrawal on firm TFP or over-investment.

Table 2: Effects of Industrial Policy Withdrawal on Firm Efficiency

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	TFP	*TFP*	*TFP*	*INV*	*INV*	*INV*
	BASE	TWFE	PSM-DD	BASE	TWFE	PSM-DID
did	0.089^{***}	0.190^{**}	0.165^{**}	0.035	-0.119^{**}	-0.155^{*}
	(0.034)	(0.091)	(0.079)	(0.023)	(0.051)	(0.075)
Control variables	No	Yes	Yes	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	22553	14388	2118	22553	14388	1553
R-squared	0.735	0.767	0.874	0.179	0.308	0.595

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Robust standard errors clustered at the individual and year level are reported in parentheses.
Source: Calculated and compiled by the authors.

Two key conclusions emerge from the regression results. First, the exit of industrial policies is associated with an improvement in the TFP of firms within the affected industry. The average TFP of firms in the sample is 2.730. In the baseline regression without control variables, the exit of industrial policies leads to an approximate 3% increase in firm TFP (0.089/2.730). When control variables are included, the economic significance of this effect is even more evident, with the policy exit contributing to an approximately 7% increase in firm TFP (0.190/2.730). Additionally, our analysis incorporates a logarithmic transformation of TFP. When using the logarithm of TFP in the regression, the exit of industrial policies is found to improve firm TFP by roughly 5%. Preliminary robustness checks, utilizing the Propensity Score Matching Difference-in-Differences (PSM-DID) method, further validate these findings, showing that the exit of industrial policies continues to enhance firm TFP. Consistent results are also observed when TFP is recalculated using the Levinsohn-Petrin (LP) method.

Second, the exit of industrial policies can reduce the probability of over-investment for firms within the industry. As *INV* is a 0-1 variable, the regression results in column (5) show that policy exit leads to a 12 percentage point decrease in the probability of over-investment for firms within the industry. Preliminary robustness checks using the PSM-DID method also indicate that policy exit can alleviate firm over-investment.

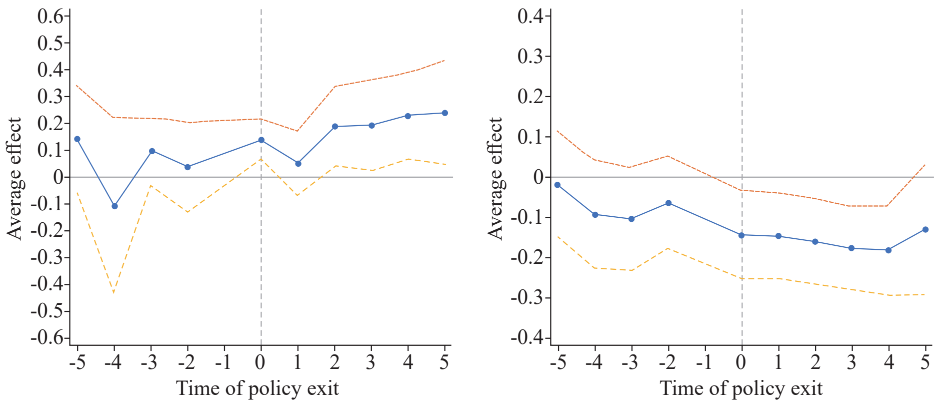
Third, it is important to clarify that the aforementioned regression results, which show that policy exit promotes firm TFP and mitigates over-investment, do not contradict the conventional wisdom that industrial policies enhance the production efficiency of supported firms. The apparent discrepancy stems from a difference in comparison groups. Our analysis compares firms within supported industries, contrasting those that exit policy support with those that remain. The established view, however, compares firms receiving support with those that have never received it. Therefore, both perspectives, though using different benchmarks, address the impact of policy on firm efficiency and are not mutually exclusive.

The two scenarios can coexist. When market mechanisms are underdeveloped in the early stages of an industry, targeted support can boost performance, with supported firms outperforming those that do not participate. However, as industries mature and markets stabilize, continued intervention can be detrimental. Exiting support at this stage can improve efficiency and reduce over-investment compared to remaining in the program. Importantly, the samples used to assess "policy exit" versus "policy receipt" fall into different categories, so direct comparison is invalid, and the two perspectives are not contradictory.

4.2 Robustness Test

4.2.1 Parallel trend test

A critical assumption of the DID approach is the parallel trends assumption. Because our treatment group experiences multiple treatment timings, standard two-way fixed effects (TWFE) regressions can produce biased estimates of the treatment effect (Liu et al., 2022). To address this issue, we employ the IW estimator from model (3) in an event study framework to test for parallel trends between the treatment and control groups. The resulting parallel trend graph, corrected for TWFE bias, is presented in Figure 1 (a parallel trends test using the traditional TWFE method was also performed).



(a) TFP as the dependent variable (b) INV as the dependent variable

Figure 1: Parallel Trend Test

Source: Data compiled and calculated by the author.

As shown in Figure 1, the treatment and control groups exhibit similar trends in both TFP and over-investment prior to policy exit. Given that Five-Year Plans are typically released at the beginning of each year, while firm TFP and over-investment data are reported in year-end statements, our empirical model effectively captures the impact of policy exit on firm TFP and over-investment in the subsequent year. As can be seen, after policy exit, TFP of firms in the treatment group shows a significant increase, and the over-investment problem is also significantly alleviated.

4.2.2 Replacing the dependent variable and controlling for other policy interventions

As a first robustness check, we employ alternative measures for our key dependent variables. First, we replace the TFP measure reported in Table 2 with firm-level TFP re-estimated using the established Levinsohn-Petrin (LP), Olley-Pakes (OP), fixed effects (FE), and ordinary least squares (OLS) methodologies. Concurrently, we replace the original measure of over-investment with a measure of investment efficiency (*INV_E*), defined as the absolute value of the residuals derived from equation (2). Second, considering the potential impact of traditional two-way fixed effects models on the estimation results, we use the heteroskedasticity-robust estimator (IW estimator) represented by equation (3) to estimate the replaced dependent variables. The regression results are presented in Table 3.

Table 3: Robustness Tests with IW Estimator - Alternative Dependent Variables

Variable	(1)	(2)	(3)	(4)	(5)
	TFP_LP	*TFP_OP*	*TFP_FE*	*TFP_OLS*	*INV_E*
ATE_5years	0.164***	0.056**	0.146***	0.150***	-5.213***
	(0.020)	(0.023)	(0.020)	(0.020)	(1.008)
Control variable	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sample size	13609	13609	13609	13609	8251
R-squared	0.943	0.921	0.943	0.940	0.557

Notes: Same as Table 2.
Source: Data compiled and calculated by the authors.

The IW estimator allows us to estimate the average effect of industrial policy withdrawal over a five-year period, shown as *ATE_5years* in Table 3. Table 3 demonstrates that our main findings are robust to alternative specifications of the dependent variables. Specifically, industrial policy exit leads to improvements in both TFP and investment efficiency among firms within the affected industry (a larger *INV_E*, i.e., larger absolute values of the residuals from model (2), indicates lower investment efficiency, and vice versa), confirming the robustness of our estimates.

As a further robustness check, we employ the IW estimator to assess the impact of industrial policy withdrawal on firm TFP (estimated using GMM, hereinafter) and over-investment, explicitly accounting for the potential influence of other concurrent policies. During our sample period, the State Council implemented a series of policies related to strategic emerging industries[1]. These policies targeted sectors such as information technology and new energy, which could potentially confound our estimates. Subsequently, the National Development and Reform Commission (NDRC) introduced relevant supporting policies to further encourage the development of these industries, which may affect our treatment group firms. To mitigate this concern, we exclude firms directly affected by these strategic emerging industry policies and re-estimate our models. The resulting estimates are reported in Table 4.

Table 4: Robustness Check Using the IW Estimator

Variable	(1)	(2)	(3)	(4)
	TFP	*TFP*	*INV*	*INV*
	Full sample	Controlling for other policies	Full sample	Controlling for other policies
ATE_5years	0.349***	0.344***	-0.279***	-0.254***
	(0.071)	(0.045)	(0.060)	(0.059)
Control variables	Yes	Yes	Yes	Yes

[1] The *Decision on Accelerating the Cultivation and Development of Strategic Emerging Industries* (Guofa [2010] No. 32) on October 10, 2010, and the *Classification Table of Strategic Emerging Industries (2012)* in 2012.

Table 4 Continued

Variable	(1)	(2)	(3)	(4)
	TFP	*TFP*	*INV*	*INV*
	Full sample	Controlling for other policies	Full sample	Controlling for other policies
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sample size	13425	7485	13425	7485
R-squared	0.768	0.810	0.324	0.341

Notes: Same as Table 2.

Source: Data compiled and calculated by the authors.

The effect of industrial policy withdrawal on firm TFP is estimated using the IW estimator to mitigate potential biases associated with the conventional two-way fixed effects approach. Our results indicate that industrial policy withdrawal increases firm TFP by approximately 13% (0.35/2.73). This bias correction strengthens both the statistical and economic significance of the estimated impact. Moreover, the robustness of these findings is confirmed through an additional analysis that excludes firms potentially affected by strategic emerging industry policies to control for other policy influences.

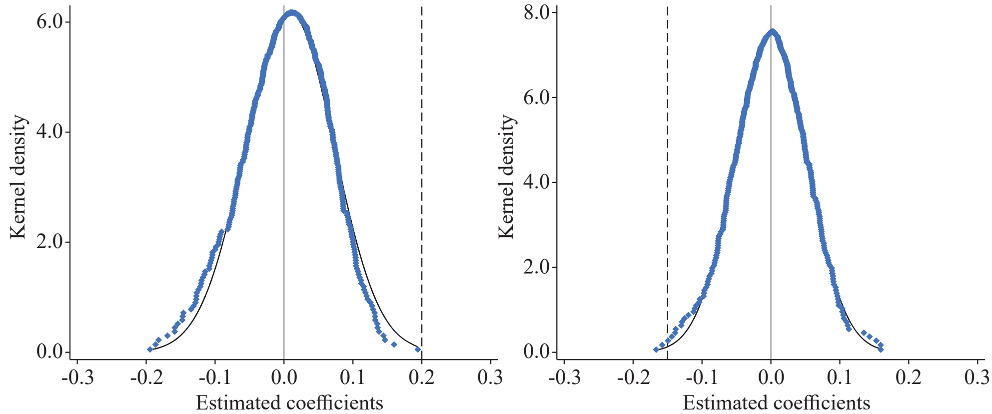
Analysis of corporate over-investment reveals that industrial policy withdrawal reduces over-investment by approximately 30% within a five-year period, after correcting for potential biases associated with the conventional two-way fixed effects approach. This result remains robust after controlling for other policy influences. Compared to the estimates derived from the traditional two-way fixed effects model, the effect of industrial policy withdrawal on reducing corporate over-investment demonstrates enhanced economic and statistical significance, providing further evidence for the robust positive effect of industrial policy withdrawal on firm TFP and its robust negative effect on corporate over-investment.

4.2.3 Placebo tests

We conduct placebo tests from two angles. First, we randomly assign the year of policy withdrawal and examine whether policy withdrawal still promotes firm TFP or inhibits corporate over-investment under this scenario. The logic is as follows: If the improvement in firm TFP and the reduction in over-investment are indeed caused by policy withdrawal, the estimated coefficients of the core variables should be insignificant after randomly assigning the year of policy withdrawal. If the results are contrary to expectations, it implies that some unobservable underlying factors are interfering with the estimation results. Figure 2 reports the results of the placebo test with randomly assigned years of policy withdrawal.

Specifically, for firm TFP and over-investment (*INV*), we randomly assign the year of policy withdrawal $post_t^{false}$ and construct a placebo interaction term $treat_i^{real} \times post_t^{false}$ for regression, repeating this process 500 times to plot the distribution of the estimated interaction terms. In Figure 2, the vertical dashed lines mark the estimated effects of actual policy withdrawal on firm TFP and INV. As shown, when the policy year is randomly generated, the mean effect of the placebo interaction term on firm TFP and *INV* is close to zero, while the actual estimated coefficients are clearly outliers in the distribution of the placebo estimates. That is, the impact of actual policies is not randomly generated, but genuinely exists. This indicates that our estimation results pass this placebo test.

A second placebo test is performed to further address potential endogeneity concerns. This test involves randomly assigning policy withdrawal to industries ($treat_i^{false}$) and constructing a placebo

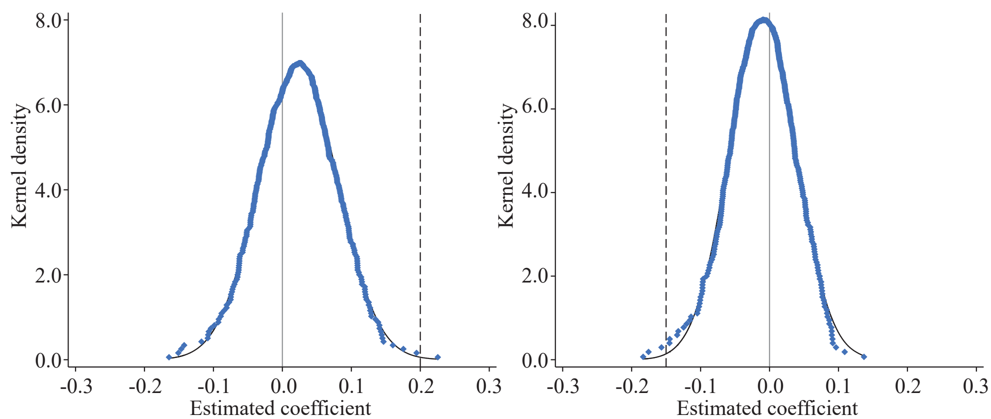


(a) Placebo test for TFP: Random treatment year (b) Placebo test for INV: Random treatment year

Figure 2: Placebo Test Results Using Randomly Assigned Policy Withdrawal Years

Source: Calculated and compiled by the authors.

interaction term $treat_i^{false} \times post_t^{real}$ for regression analysis. A key challenge in establishing causality is that real-world industrial policy decisions are non-random. Consequently, prior findings alone cannot definitively distinguish between two possibilities: (1) that policy withdrawal targeted industries already possessing strong growth trajectories, or (2) that policy withdrawal itself fostered growth in the affected industries. Only the latter scenario would justify the conclusion that policy withdrawal is beneficial. In reality, information asymmetries often prevent governments from possessing complete foresight regarding the future growth potential of all industries when making policy withdrawal decisions. This implies that some industries with limited inherent growth potential may be selected for withdrawal, while some already dynamic industries may continue to receive support. Therefore, by randomly assigning industries for policy withdrawal in a regression experiment (a placebo test), we aim to isolate the impact of policy withdrawal and eliminate the possibility of reverse causality - specifically, that industrial development drives policy withdrawal. For firm TFP and *INV*, we repeat the placebo test with 500 random industry assignments, generating a distribution of the estimated placebo interaction term, which is presented in Figure 3.



(a) Placebo test for TFP: Randomly assigned treatment industry (b) Placebo test for INV: Randomly assigned treatment industry

Figure 3: Placebo Tests with Randomly Assigned Policy Withdrawal Industry

Source: Data compiled and calculated by the authors.

Figure 3 shows that when industries for policy withdrawal are assigned randomly, the average effect of the placebo interaction term on both firm TFP and INV is close to zero. More importantly, the actual estimated coefficients are clearly outliers within the distribution of placebo estimates, signaling statistical significance. In the placebo test for firm INV, presented on the right side of Figure 3, while three placebo regression coefficients fall to the left of the actual estimate, the probability of observing the actual estimate by chance is exceedingly low, at less than 0.01. Together, these results strongly reject the alternative hypothesis that "industries with pre-existing growth momentum were targeted for withdrawal", thereby bolstering the conclusion that "policy withdrawal promoted industrial growth". Specifically, the findings suggest that policy withdrawal has a positive impact on firm TFP and reduces firm over-investment, with these effects remaining relatively robust across different random assignments.

4.3 Heterogeneity Analysis

The previous empirical results demonstrated that policy withdrawal can enhance firm TFP and mitigate over-investment. However, these findings should not be taken as evidence that industrial policy is inherently ineffective or that its absence is always beneficial. This conclusion rests on the assumption that the firms in question have already benefited from industrial policy for some time. If industrial policy initially helped develop previously weak industries, then even if subsequent policy withdrawal promotes further growth in these sectors, it would not be reasonable to conclude that the initial introduction of the policy was ineffective. A more important question for future research is: Under what conditions is policy withdrawal most effective?

We explore the heterogeneous effects of industrial policy withdrawal from two perspectives: industry development and regional development. At the industry level, we focus on industry concentration, measuring it using two methods. The first method calculates the Herfindahl-Hirschman Index (*HHI*), defined as $HHI=\sum(x_i / X)^2$, where $X=\sum x_i$, and x_i represents the share of operating revenue for firm i in the industry. A higher *HHI* indicates greater industry concentration. The second method measures industry concentration by calculating the share of the top five firms' operating revenue (*CR_5*) in relation to the total operating revenue of all firms within the industry. A higher share *CR_5* indicates higher concentration. After calculating the industry concentration for each firm's respective industry, we divide the sample into two groups based on whether the industry concentration is above or below the average, and then conduct separate regressions for each group. Using two methods to measure industry concentration allows for cross-validation of the regression results, providing a robustness check. We also use firms' main business revenue to calculate industry concentration indicators, and test alternative concentration indices, such as *CR_4* and *CR_8*, in additional regressions. The different calculation methods do not affect the robustness of the regression results. The results of the regressions by industry concentration groups are reported in Table 5.

Table 5: Heterogeneity Analysis by Industry Concentration

Variable	*HHI*		*CR_5*		*HHI*		*CR_5*	
	High	Low	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TFP	*TFP*	*TFP*	*TFP*	*INV*	*INV*	*INV*	*INV*
did	0.249^{**}	-0.109	0.268^{***}	-0.267	-0.120^{**}	0.007	-0.110^{**}	0.371^{*}
	(0.121)	(0.136)	(0.100)	(0.171)	(0.045)	(0.091)	(0.044)	(0.199)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Continued

Variable	*HHI*		*CR_5*		*HHI*		*CR_5*	
	High	Low	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TFP	*TFP*	*TFP*	*TFP*	*INV*	*INV*	*INV*	*INV*
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	6037	8084	6434	7760	6037	8084	6434	7760
R-squared	0.827	0.730	0.813	0.716	0.367	0.340	0.357	0.321

Note: Same as Table 2.
Source: Calculated and compiled by the authors.

The regression results in columns (1), (3), (5), and (7) of Table 5 show that for industries with higher concentration, industrial policy withdrawal can improve firm TFP and mitigate firm over-investment. Furthermore, the magnitudes of the effects of policy withdrawal on improving firm TFP or mitigating firm over-investment in the sub-sample regressions are consistent with the previous estimates, which further demonstrates the robustness of the estimation results. The regression results in columns (2), (4), (6), and (8) show that for industries with lower concentration or more intense competition, the effects of industrial policy withdrawal on firm TFP and over-investment are not statistically significant. In terms of direction, policy withdrawal may even reduce firm TFP.

What characteristics of an industry make the withdrawal of industrial policy more effective? The regression results in Table 5 provide an answer: When industrial policy has nurtured competitive leading firms within a supported industry, the withdrawal of that policy becomes beneficial for the industry's development. As pointed out by studies such as Aghion et al. (2015), only industrial policies that promote industry competition are effective. When an industry receiving industrial policy support develops a monopolistic structure, or when government intervention during policy implementation further reinforces existing monopolies, continued policy support becomes redundant and potentially wasteful. In such situations, timely policy withdrawal is essential for effective governance. Industrial policy should provide support to nascent, struggling industries, but once these industries have matured and become self-sustaining, market forces should be allowed to drive further development and resource allocation. Continuing government intervention in mature, competitive markets becomes unnecessary and can even distort efficient resource allocation. This principle of providing initial support and then allowing market mechanisms to function freely is a core tenet of effective industrial policy. Allowing the market to regulate resource allocation and improve the efficiency of enterprise resource utilization is precisely what industrial policy should ultimately aim for.

Another question is whether regional differences influence the effectiveness of policy withdrawal. We examine the heterogeneous effects of policy withdrawal through the lens of regional marketization disparities. The marketization index used in this analysis is derived from the China Marketization Index Database, published by Wang et al. This index relies extensively on data from firm surveys and provides a robust reflection of regional market development. To explore regional differences, we divide firms into two groups based on the marketization level of their location: one group with above-average marketization and another with below-average marketization. Separate regressions are then conducted for each group. The results of these regressions are presented in Table 6.

The regression results in Table 6 reveal the following key insights: First, policy withdrawal has a significant positive effect on firm TFP only in regions with lower levels of marketization. In areas with higher levels of marketization, however, the effect of policy withdrawal on TFP is neither statistically nor economically significant. Second, policy withdrawal helps to mitigate firm over-investment, but only in less market-driven regions. In regions with better market environments, the effect on over-investment is not statistically significant, and the results suggest that policy withdrawal may even lead to an increase

Table 6: Heterogeneity Analysis at the Regional Marketization Level

Variable	Marketization		Marketization	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
	TFP	*TFP*	*INV*	*INV*
did	0.010	0.267**	0.173	-0.195***
	(0.087)	(0.129)	(0.106)	(0.059)
Control variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sample size	6221	7999	6221	7999
R-squared	0.771	0.783	0.337	0.343

Note: Same as Table 2.
Source: Calculated and compiled by the authors.

in firms' industrial investment within the industry. Third, the marketization index developed by Wang et al. includes sub-indices covering factors like the development of regional factor markets, intermediary organizations, and the legal and institutional environment. Heterogeneity analyses based on these sub-indices yield results consistent with those derived from the overall marketization index.

First, policy withdrawal has a more evident effect on mitigating firm over-investment only in regions with imperfect marketization. Research by Dai et al. (2023) also indicates that the effectiveness of high-tech industrial policies is influenced by the local innovation environment. In regions with imperfect marketization, local governments often implement industrial policies through government-led investment, which can inadvertently lead to over-investment by firms. In such contexts, the timely withdrawal of industrial policies is crucial, as it helps optimize resource allocation and reduces the risk of over-investment.

Second, policy withdrawal is more effective in boosting firm TFP in regions with lower levels of marketization. This underscores the critical role that the local institutional environment plays in determining the success of industrial policy. In regions with imperfect market conditions, excessive direct government intervention can be counterproductive. Therefore, rather than active intervention, the government should focus on fostering market development and reducing transaction costs. By doing so, it creates a more conducive environment for firms to thrive, ultimately enhancing overall productivity.

4.4 Policy Transmission Analysis

What are the mechanisms through which industrial policy withdrawal impacts firm TFP and investment behavior? As discussed above, the withdrawal of industrial policy helps alleviate the problem of firm over-investment. Existing research also suggests a link between over-investment and firm TFP (Zhang et al., 2019). Therefore, one way to improve firm TFP is to reduce over-investment. Moreover, column (5) of Table 3 indicates that industrial policy withdrawal enhances firm investment efficiency, representing another transmission mechanism contributing to firm TFP growth. This paper will further explore additional transmission mechanisms through which industrial policy withdrawal affects firm TFP, particularly from the perspectives of firm innovation. It will also examine how industrial policy withdrawal influences firm over-investment, considering factors such as external resource acquisition. The relevant regression results are presented in Table 7.

In Table 7, column (1) reports the effect of industrial policy withdrawal on the number of firm invention patents granted. Invention patents measure a firm's "substantive innovation" capability (Li and Zheng, 2016). The regression results show that industrial policy withdrawal led to an average increase of approximately 13 invention patents for firms in the relevant industries over a five-year period. The withdrawal of industrial policy exposes firms to more intense market competition. To maintain a competitive edge, firms must enhance their innovation capabilities, acquire more advanced technologies, and improve production efficiency. The results in Table 7, column (1) indicate that firms impacted by industrial policy withdrawal increased their innovation capabilities, ultimately boosting TFP. A further question is whether firms, when faced with the increased competition resulting from industrial policy withdrawal, increased the number of R&D personnel or improved the efficiency of R&D funding utilization.

Table 7: Analysis of Transmission Mechanisms

Variable	(1)	(2)	(3)	(4)	(5)
	INNO	*lnRD_P*	*CapR_Dexpr*	*lnsub*	*lntaxr*
ATE_5years	12.806***	0.278***	2.124***	-0.268***	0.036***
	(0.851)	(0.054)	(0.686)	(0.090)	(0.010)
Control variables	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sample size	18904	10493	9380	12601	18780
R-squared	0.657	0.929	0.786	0.617	0.184

Note: Same as Table 2.

Source: Calculated and compiled by the authors.

Columns (2) and (3) of Table 7 present the effects of industrial policy withdrawal on two key outcomes: the number of R&D personnel and the R&D capitalization rate of firms. First, the withdrawal of industrial policy led to an average increase of approximately 28% in the number of R&D personnel at these firms over a five-year period, a result that is both economically and statistically significant. Second, industrial policy withdrawal also had a notable impact on the R&D capitalization rate. R&D expenditures are typically expensed during the research phase but can be capitalized during the development phase if certain criteria are satisfied. Specifically, according to the *Accounting Standards for Business Enterprises No. 6: Intangible Assets*, R&D expenditures can only be capitalized if the firm can demonstrate that the project will generate future economic benefits. If this condition is not met, the expenditures must be treated as expenses. An increase in the R&D capitalization rate, therefore, indicates that firms are increasingly able to capitalize their R&D expenditures, reflecting improved efficiency in utilizing R&D investments or a better input-output ratio in the development phase. The regression results in column (3) of Table 7 show that industrial policy withdrawal increased the R&D capitalization rate by approximately 2.1 percentage points. Given that the average R&D capitalization rate across sample firms is 7.8%, this represents an increase of around 27% (2.1/7.8), highlighting a major improvement in R&D investment efficiency. This enhanced capitalization rate is likely to have a positive effect on firm TFP.

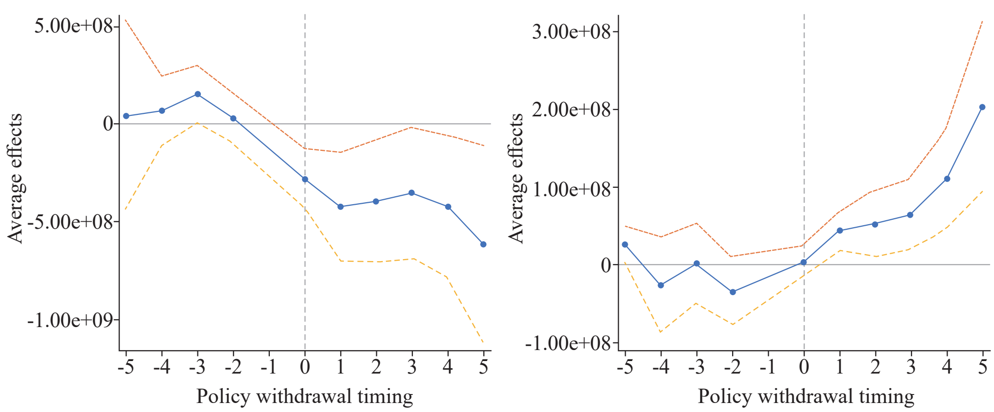
How does industrial policy withdrawal affect the support and intervention received by firms? Columns (5) and (6) of Table 7 report the effects of industrial policy withdrawal on government subsidies received by firms and their effective tax rates. The regression results show that industrial policy withdrawal leads to a decrease of approximately 27% in government subsidies received by firms and an increase of approximately 4 percentage points in their effective tax rates. Undoubtedly, policy withdrawal significantly reduces the external resources available to firms. This will mitigate the extent to which firms can externalize internal costs, ultimately allowing the market to play its role in efficient resource allocation, promoting rational investment by firms, and alleviating the problem of over-investment.

4.5 Extended Analysis

The preceding analysis has shown that industrial policy withdrawal may promote firm TFP by reducing over-investment and improving the efficiency of R&D investment. It also suggests that two transmission channels - reducing firms' perceived policy uncertainty and constricting external resources available to firms - contribute to mitigating over-investment. In practice, industrial policies and firm investment behavior are closely intertwined. Therefore, what impact does industrial policy withdrawal have on firm investment behavior? This paper will provide further analysis on this question and explore the relationship between industrial policy withdrawal and firms' tendency of "shifting from productive investment to financial speculation".

Following Guo et al. (2022), we calculate firms' industrial asset investment by aggregating net fixed assets, net construction in progress, construction materials, net productive biological assets, net intangible assets, development expenditures, and long-term prepaid expenses. Firms' investment in real estate held for rental income or capital appreciation is measured using the "investment property" balance reported in their year-end financial statements. Since the sample in this paper excludes firms in the real estate and financial sectors, the "investment property" account, to some extent, reflects firms' speculative investment in real estate. Using the IW estimator, we analyze the impact of industrial policy withdrawal on firms' industrial asset investment and investment property investment separately. The estimation results using the event study methodology are shown in Figure 4. Figure 4 shows that industrial policy withdrawal prompts a major shift in firms' investment from industrial assets to investment property. In five years following industrial policy withdrawal, firms saw an average decrease of some 50 million yuan in industrial asset investment and an increase of some 20 million yuan in investment property, suggesting a reallocation of funds from industrial to real estate investment.

The observation that the withdrawal of industrial policy leads to a reduction in firms' investment in industrial assets aligns with the finding that it also curtails over-investment. On one hand, the removal of industrial policy helps mitigate the problem of over-investment, as firms are able to reallocate previously idle funds, thereby improving capital efficiency. On the other hand, in their pursuit of returns, firms may



(a) Industrial asset investment as the dependent variable

(b) Investment property as the dependent variable

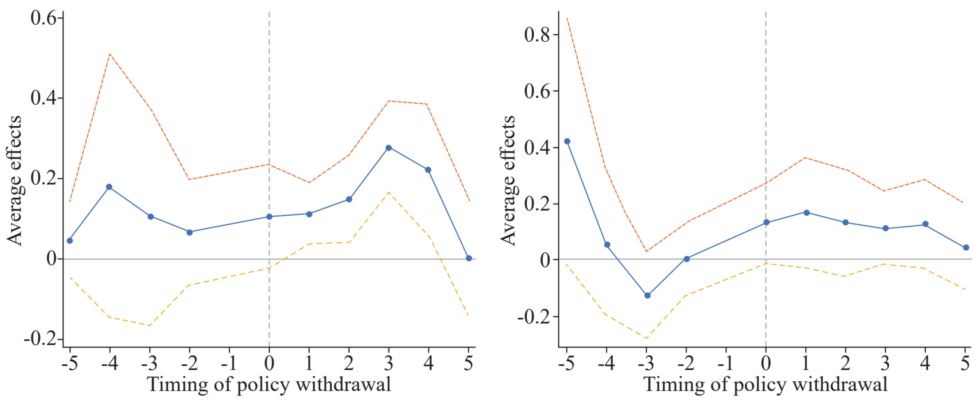
Figure 4: Extended Analysis - Shift from Productive to Financial Investment

Source: Calculated and compiled by the authors.

redirect these idle funds toward investment properties, which, to some extent, exacerbates the shift from productive investments to financial ones.

Another key finding of this paper is that the withdrawal of industrial policy also influences corporate social responsibility (CSR) engagement. Firms receiving industrial policy support are often expected to contribute to broader social goals, such as increasing employment opportunities. These firms may, for example, hire more employees and offer higher wages as part of their commitment to fulfilling social responsibilities (Li and Shao, 2016). To further explore this dynamic, this paper examines the impact of industrial policy withdrawal on firms' philanthropic activities and their efforts to promote local economic development, using the corporate ESG sub-database from the CNRDS database. We define two key dummy variables to capture these CSR activities: The dummy variable for philanthropic support is coded as 1 if the firm engages in charitable donations or related activities in a given year (e.g., establishing a charitable foundation or collaborating with other organizations for social causes), and 0 otherwise. The dummy variable for promoting local economic development is coded as 1 if the firm implements policies or measures aimed at boosting the local economy (e.g., local procurement or hiring policies), and 0 otherwise.

Using the IW estimator, we analyze how industrial policy withdrawal affects these CSR dimensions. The results, based on the event study methodology, are presented in Figure 5.



(a) Dependent variable: Philanthropic support

(b) Dependent variable: Local economic development promotion

Figure 5: Extended Analysis - Corporate Social Responsibility

Source: Calculated and compiled by the authors.

Figure 5 illustrates that industrial policy withdrawal significantly increases the likelihood of firms engaging in philanthropic activities. The regression analysis underpinning Figure 5 reveals that this probability rises by approximately 15 percentage points ($p<0.01$). The underlying rationale for this increase in CSR engagement can be traced to Article 9 of the *Enterprise Income Tax Law of the People's Republic of China*, enacted in 2007, which permits the deduction of charitable donations from taxable income. This provision creates a financial incentive for firms to enhance their philanthropic activities following policy withdrawal. As a result, following policy withdrawal, firms in the affected industries may increase their philanthropic engagement as a strategy to offset potential rises in their effective tax rates. This creates a situation in which the withdrawal of industrial policy inadvertently incentivizes firms to prioritize CSR activities. Furthermore, policy withdrawal also encourages firms to implement policies that promote local economic development, with a 5-year average treatment effect of 12%. In summary, the withdrawal of industrial policy leads to a broader increase in firms' CSR engagement, fostering both philanthropic activities and local economic contributions.

5. Concluding Remarks and Policy Recommendations

Using industrial policy data from the 11th to the 14th Five-Year Plans, this paper examines the impact of industrial policy withdrawal on firm TFP and investment behavior through a quasi-natural experiment design. The analysis uncovers four key findings.

First, the timely withdrawal of industrial policies can enhance firm TFP and help mitigate over-investment. Second, policy withdrawal is particularly effective in curbing over-investment for firms in industries that have matured under policy support and given rise to large leading enterprises. Similar effects are also observed in regions with lower levels of marketization. Third, policy withdrawal boosts firm TFP by reducing over-investment and improving the efficiency of R&D investment. It also curbs over-investment by restricting firms' access to external resources. Fourth, policy withdrawal contributes to a shift from productive to speculative investment - shifting investments away from real economy activities - while indirectly fostering greater CSR engagement.

It is crucial to underscore that while industrial policy withdrawal contributes to improving firm TFP, this should not be interpreted as evidence of the ineffectiveness of industrial policy itself. The positive effects observed after policy withdrawal are contingent on the prior period of policy support. Thus, the role of industrial policy in facilitating industrial transformation and upgrading should not be overlooked. In fact, the post-withdrawal increase in firms' innovative capacity highlights the success of the initial policy support. This paper argues that effective industrial policy focuses on providing critical support during challenging times, rather than simply enhancing already successful sectors. While industrial policies are vital for nurturing new industries, these policies should be gradually withdrawn as those industries mature, allowing market forces to drive further development and prevent over-investment. This shift also frees up resources. By redirecting support and implementing appropriate policies to foster new strategic industries, the cyclical nature and true value of industrial policy - providing targeted assistance when most needed - is fully realized.

Our findings offer the following policy implications: First, industrial policy should primarily serve as temporary support for nascent industries. Therefore, policymakers should carefully consider the timing of policy withdrawal and avoid providing continuous support to already mature industries. Extending support beyond the point of maturity becomes unnecessary and can even create inefficiencies. It is crucial to avoid implementing permanent industrial policies and to maintain flexibility and decisiveness in response to the evolving economic landscape. When an industry has developed to a point of maturity - indicated by a certain level of industry concentration or the emergence of competitive leading firms - a well-timed and gradual withdrawal of policy support is advisable. This approach offers several advantages: First, it helps maintain competition within the industry, unlocking market potential and allowing market mechanisms to play a greater role in resource allocation. This, in turn, can mitigate over-investment and improve firm performance. Second, withdrawing support from mature industries frees up resources that can be redirected to support other strategic emerging sectors, promoting broader economic development.

Second, the formulation and withdrawal of industrial policies should be viewed as a complete cycle, not isolated events. When formulating industrial policies, the government should establish clear policy cycles and set corresponding policy goals for different stages. The government should incorporate a scientific decision-making system into both the "exit" and "entry" decision-making processes, emphasizing not only the withdrawal of support policies for mature industries but also the guidance and support for strategic emerging industries. The government should not only focus on the industry selection and timing of formulating and introducing industrial policies but also fully consider the effectiveness of policy implementation, timely adjustments, and eventual withdrawal. In practice, governments can establish dedicated agencies or committees responsible for regularly assessing industry development based on scientific data, thereby enabling timely policy adjustments.

Third, since the withdrawal of industrial policies may lead to a shift in corporate investment from the real economy to speculative ventures, the government should take steps to regulate investments in virtual assets to mitigate systemic risks. Additionally, it should actively support the development of market intermediaries that can help guide companies with surplus funds toward investments in the real economy, where capital is more urgently needed. Local governments could consider establishing specialized advisory agencies or platforms to provide businesses with investment guidance and up-to-date market information. At the same time, the government should encourage financial institutions to strengthen their oversight and scrutiny of corporate investment projects to ensure that investments are both authentic and rational, aligned with long-term economic growth.

Fourth, the effectiveness of industrial policies hinges on local governments adopting a "tailored approach" that aligns with local conditions. In regions with well-developed market intermediaries, robust legal frameworks, and fully functioning factor markets, industrial policies are more likely to be successful. However, when local governments ignore the regional institutional environment and implement industrial policies without consideration of these factors - relying solely on government funding to drive industrial development, it can lead to significant over-investment and inefficiencies.

Therefore, it is essential for the government to prioritize the cultivation of regional market environments and strengthen the legal framework to ensure fair competition. This includes implementing competitive industrial policies and ensuring their timely withdrawal through effective institutional safeguards. In regions with more developed market conditions, local governments should take a proactive stance, anticipating market trends and crafting flexible policies that maximize the positive impact of industrial policy. In contrast, in less developed regions, the focus should be on addressing gaps in the soft environment, such as improving institutional capacity and fostering market-oriented reforms, to promote broader regional development and facilitate industrial upgrading. CE

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