

Government Procurement Contract Financing Policy and Total Factor Productivity

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Abstract. Government Procurement Contract Financing Policy (referred to as the "government procurement loan" policy) represents a crucial institutional innovation in fiscal and financial synergy aimed at supporting the development of firms. Exploiting the phased implementation of the "government procurement loan" policy across regions as a quasi-natural experiment, this paper uses A-share listed firms from 2015 to 2024 as the research sample and employs a difference-in-differences (DID) approach to examine the impact of the policy on firm total factor productivity (TFP). The findings show that the "government procurement loan" policy significantly promotes firm total factor productivity. Mechanism analysis indicates that the policy mainly operates through three channels: alleviating financing constraints, stimulating corporate innovation, and optimizing labor resource allocation. Further analysis reveals that the effect is more pronounced among firms with lower audit quality, firms in high-tech industries, and private enterprises. From the perspective of total factor productivity, this paper expands the research dimensions of government procurement policy evaluation and uncovers the mechanisms through which the "government procurement loan" policy affects firms' production efficiency. As an innovative financing policy based on government procurement contracts, the policy effectively activates existing government resources and enhances firm production efficiency while facilitating the targeted allocation of financial capital without increasing fiscal burdens. Therefore, future policy optimization should further exploit the credit-enhancing role of government procurement contracts, improve the closed-loop management mechanism of tripartite accounts, and implement differentiated support according to firm characteristics to better promote firm total factor productivity.

Keywords: Government Procurement Contract Financing Policy; Total Factor Productivity; Financing Constraints; Corporate Innovation; Labor Resource Allocation.

1. Introduction

In recent years, government procurement has become an increasingly important policy instrument for supporting the development of the real economy in China. To further activate the value of government procurement contracts, local governments have gradually implemented the Government Procurement Contract Financing Policy (referred to as the "government procurement loan" policy) since 2012. Under this policy, firms may use future payment claims associated with government procurement contracts as collateral to obtain bank financing. Through the coordinated operation of governments, banks, and enterprises, the policy provides firms with financing channels distinct from traditional credit arrangements. By 2021, the policy had expanded to 268 cities across 23 provinces. Against this background, evaluating the economic consequences of the "government procurement loan" policy is important for understanding how fiscal and financial coordination affects firms' production efficiency.

Existing studies mainly examine the economic consequences of government procurement from the perspectives of innovation incentives and financing support. Aschhoff and Sofka (2009) found that government procurement promotes firms' innovation performance. Government procurement tilted toward high-tech industries effectively promotes firms' R&D investment (Slavtchev and Wiederhold, 2016), while procurement orders from major government-affiliated clients likewise increase firms' R&D expenditure (Dou et al., 2020). In addition, government procurement can enhance firms' R&D investment and sales of high-tech products through demand-pull and certification effects (Dai et al., 2021). Domestic studies further suggest that government procurement alleviates firms' financing

pressure and improves firms' access to credit resources (Wang and Zhu, 2022). More recently, Yu et al. (2025) found that the implementation of the "government procurement loan" policy significantly increases bank credit obtained by firms and promotes firms' fixed asset investment and labor employment. However, existing studies mainly focus on financing and innovation effects, while relatively limited attention has been paid to whether the "government procurement loan" policy can improve firms' total factor productivity (TFP) and through which channels such effects operate.

The "government procurement loan" policy may affect firms' total factor productivity through several channels. First, the policy alleviates financing constraints by transforming government procurement contracts into pledgeable assets, thereby improving firms' access to external financing. Better financing conditions enable firms to maintain investment in equipment renewal and technological upgrading. Second, the policy may stimulate firms' innovation activities by providing relatively stable financial support for R&D investment. Improvements in innovation efficiency further enhance firms' production efficiency (Chen et al., 2022; Huang and Gao, 2023). Third, the policy may improve labor resource allocation by helping firms optimize production processes and attract skilled labor.

Using the phased implementation of the "government procurement loan" policy across regions as a quasi-natural experiment, this paper employs a difference-in-differences (DID) approach to examine the impact of the policy on firms' total factor productivity. Using Chinese A-share listed firms from 2015 to 2024 as the research sample, this paper finds that the implementation of the policy significantly improves firms' total factor productivity. Mechanism analysis further suggests that the policy mainly operates through alleviating financing constraints, stimulating corporate innovation, and improving labor resource allocation. Further analysis shows that the effect is more pronounced among firms with low audit quality, firms in high-tech industries, and private enterprises.

This paper contributes to the literature in three aspects. First, it extends the literature on government procurement by examining the productivity effects of the "government procurement loan" policy from the perspective of firms' total factor productivity. Second, this paper enriches the research on the determinants of firms' total factor productivity by incorporating fiscal-financial coordination policies into the analytical framework of productivity improvement. Third, this paper provides empirical evidence for optimizing fiscal and financial coordination policies aimed at supporting the real economy.

2. Literature review and research hypotheses

2.1. Literature review

Existing studies mainly examine government procurement from the perspectives of innovation incentives and financing support. Prior studies suggest that government procurement can stimulate firms' innovation activities and R&D investment (Aschhoff and Sofka, 2009; Slavtchev and Wiederhold, 2016). Domestic research further finds that government procurement improves firms' financing conditions and alleviates financing constraints (Wang and Zhu, 2022). Based on the perspective of credit creation, Yu et al. (2025) showed that the Government Procurement Contract Financing Policy significantly increases firms' bank credit and promotes firms' fixed asset investment and labor employment. Overall, existing studies indicate that government procurement policies may improve firms' operational conditions through financing support and innovation incentives.

Firms' total factor productivity reflects firms' efficiency in transforming production inputs into outputs and is widely regarded as an important indicator of high-quality development. Existing studies show that technological innovation is an important driver of firms' total factor productivity growth (Huang and Gao, 2023; Chen et al., 2022). Meanwhile, improved financing conditions help firms maintain investment in equipment upgrading and innovation activities, thereby enhancing production efficiency. In contrast, financing constraints and inefficient resource allocation may reduce firms' operational efficiency and inhibit productivity improvement (Syverson, 2011).

Although existing studies have separately examined the economic consequences of government procurement policies and the determinants of firms' total factor productivity, relatively limited attention has been paid to the relationship between the "government procurement loan" policy and firms' total factor productivity within a unified analytical framework. Given that the policy can improve firms' financing conditions, stimulate innovation activities, and optimize resource allocation, it may also exert important effects on firms' production efficiency. Therefore, this paper examines how the "government procurement loan" policy affects firms' total factor productivity and further explores the underlying transmission mechanisms.

2.2. Research hypotheses

The "government procurement loan" policy uses government procurement contracts as credit support to provide firms with financing channels distinct from traditional lending arrangements. By relying on the high certainty of government payment and contract performance, the policy reduces banks' lending risks and alleviates information asymmetry between banks and firms. Consequently, firms are more likely to obtain stable financing support.

First, the policy may alleviate firms' financing constraints. Improved financing conditions reduce firms' dependence on internal cash flow and help firms maintain investment in equipment renewal and technological upgrading, thereby improving factor allocation efficiency and production efficiency. Second, the policy may stimulate firms' innovation investment. Government procurement contracts provide relatively stable demand expectations and financing support, which help firms increase long-term R&D investment and improve innovation efficiency. Third, the policy may improve labor resource allocation. Better financing conditions enable firms to recruit skilled labor, strengthen employee training, and optimize production management, thereby enhancing operational efficiency and firms' total factor productivity.

H1: The "government procurement loan" policy can promote firms' total factor productivity by alleviating financing constraints, stimulating corporate innovation, and optimizing labor resource allocation.

3. Empirical research design

3.1. Sample and data

This paper takes A-share listed firms from 2015 to 2024 as the research sample to examine the impact of the "government procurement loan" policy on firms' total factor productivity. To ensure sample representativeness and the reliability of the empirical results, the initial sample is processed as follows: (1) firms located in regions where the "government procurement loan" policy had already been implemented in 2012 are excluded; (2) firms in the financial industry are excluded; (3) firms that were delisted during the sample period are excluded; (4) samples with missing or abnormal financial data are excluded; and (5) all continuous variables are winsorized at the 1% level on both tails.

The data used in this paper mainly come from the following three sources. First, government procurement contract data are obtained from the China Government Procurement Network. Specifically, information on each government procurement contract, including contract name, signing date, supplier name, purchaser name, contract amount, and region, is collected by crawling the "Government Procurement Contract Announcement Inquiry" system. Supplier names are then standardized based on the Qichacha platform to address inconsistencies in disclosure and facilitate matching with A-share listed firms. Finally, supplier names are matched with the names of A-share listed firms to identify whether listed firms have obtained government procurement contracts. Second, data on the implementation of the "government procurement loan" policy are collected from official local government websites. Relevant government documents on government procurement contract financing are manually collected and cross-verified using government service platforms and news releases. The implementation details of the policy across local governments are further sorted out to

determine the specific timing of policy adoption. Firms' geographic locations are then matched with local governments to identify whether A-share listed firms are affected by the policy. Third, financial data for A-share listed firms are obtained from the Wind and CSMAR databases.

3.2. Model specification

This paper treats the phased implementation of the "government procurement loan" policy across regions as an exogenous shock. Following Qi et al.(2018), a difference-in-differences (DID) approach is employed to empirically examine the impact of the "government procurement loan" policy on firms' total factor productivity. The baseline model is specified as follows:

$$TFP_LP_{ict} = \beta_0 + \beta_1 Policy_{ic_Proc_{ct}} + \beta_2 Policy_{ic} + \beta_3 Controls_{ict} + \varphi_t + \delta_i + \mu_{ict} \quad (1)$$

In Equation (1), i, c, t represent firm, city, and year, respectively. The dependent variable in this paper is firms' total factor productivity (TFP), which is calculated using the LP method. Specifically, total output, capital, labor, and intermediate input are measured by firms' operating revenue, net fixed assets, number of employees, and cash paid for purchasing goods and receiving services, respectively, based on the listed firms database. In the robustness tests, the OP method and OLS method are further used to recalculate firms' total factor productivity as alternative measures of the dependent variable.

The core explanatory variable in this paper is the interaction term Policy_Proc in the DID model. Specifically, Policy is a dummy variable indicating whether the region where a firm is registered has been included in the pilot scope of the "government procurement loan" policy in a given year. It equals 1 if the policy has been implemented in the region during that year, and 0 otherwise. Proc is a dummy variable indicating whether a firm holds government procurement contracts. It equals 1 if the firm had obtained government procurement contracts before the implementation of the policy, and 0 if the firm had never obtained government procurement contracts throughout the sample period.

Control variables. This paper controls for a series of factors that may affect the empirical results. Specifically, the control variables include board size(Boardsize), firm size(Size), firm age(FirmAge), firm growth(Growth), return on assets(ROA), asset-liability ratio(Leverage), fixed asset ratio(Fixed), cash flow ratio(CashFlow), and economic development(gdp).The model also includes year fixed effects(φ_t)and firm fixed effects(δ_i).Detailed variable definitions are reported in Table 1.

Table 1. Definition and measurement of variables.

Variables name	Symbol	Definition
Total Factor Productivity	TFP LP	Measured by the LP method
Policy Implementation	Policy	Equals 1 if the policy is implemented in the firm's region in year t , and 0 otherwise
Government Procurement Contract	Proc	Equals 1 if the firm obtained government procurement contracts before policy implementation, and 0 otherwise
Board Size	Boardsize	Ln(board size)
Firm Size	Size	Ln(total assets)
Firm Age	FirmAge	Ln(firm age)
Firm Growth	Growth	Growth rate of operating revenue
Return on Assets	ROA	Net profit /total assets
asset-liability ratio	Leverage	Total liabilities / total assets
fixed asset ratio	Fixed	Net fixed assets / total assets
cash flow ratio	CashFlow	Operating cash flow /total assets
economic development	gdp	Ln(provincial GDP)

Note: This table reports the definitions and measurements of the main variables used in the analysis.

4. Empirical results

4.1. Descriptive statistics

Table 2 reports the descriptive statistics of the main variables. Regarding the dependent variable, firms' total factor productivity (TFP_LP) has a minimum value of 6.535, a maximum value of 11.53, and a standard deviation of 1.065, indicating considerable variation in productivity levels across sample firms. The mean value of the core explanatory variable, the implementation of the "government procurement loan" policy (Policy_Proc), is 0.0929, suggesting that relatively few firms were affected by the policy during the sample period. The descriptive statistics of the remaining variables are generally consistent with those reported in existing studies.

Table 2. Descriptive statistics.

Variable	N	Mean	Sd	Min	Max
TFP_LP	18,028	8.632	1.065	6.535	11.530
Policy_Proc	18,028	0.093	0.290	0	1
Boardsize	18,028	2.093	0.200	1.609	2.639
Size	18,028	22.300	1.234	20.010	26.060
FirmAge	18,028	3.052	0.286	2.303	3.664
Growth	18,028	0.132	0.359	-0.577	2.000
ROA	18,028	0.028	0.071	-0.294	0.199
Leverage	18,028	0.423	0.199	0.063	0.905
Fixed	18,028	0.207	0.148	0.003	0.651
CashFlow	18,028	0.049	0.066	-0.139	0.247
gdp	18,028	11.510	0.496	10.270	12.240

Note: Table 2 reports descriptive statistics for the variables used in the empirical analysis, including the number of observations, mean values, standard deviations, and the corresponding minimum and maximum values. The sample consists of Chinese A-share listed firms from 2015 to 2024 after applying the screening procedures described in Section 3.1. TFP_LP denotes firm total factor productivity estimated using the LP method. Policy_Proc is the DID interaction term combining regional policy implementation and firms' government procurement contract participation. The remaining variables mainly capture firm characteristics, governance structure, financial conditions, and regional economic development. All continuous variables are winsorized at the 1% level on both tails, and detailed definitions are provided in Table 1.

4.2. Baseline regression

Table 3 reports the baseline regression results on the impact of the "government procurement loan" policy on firms' total factor productivity. Column (1) includes only firm fixed effects and year fixed effects, without adding any control variables, while Column (2) further incorporates the control variables. The regression results show that firms obtaining government procurement contracts experience a significant improvement in total factor productivity after the implementation of the "government procurement loan" policy. Specifically, the coefficient of the core explanatory variable Policy_Proc in Column (1) is significantly positive at the 1% level, indicating strong economic significance. In Column (2), the coefficient of Policy_Proc remains significantly positive at the 1% level, strongly supporting Hypothesis H1.

Table 3. Test results of the impact of the "Government Procurement Loan" Policy on firms' total factor productivity.

Variable	(1)	(2)
	TFP_LP	TFP_LP
Policy_Proc	0.371***	0.407***
	(11.418)	(14.776)
Policy	0.016	0.014
	(0.936)	(1.078)
Boardsize		-0.015
		(-0.379)
Size		0.509***
		(27.655)
FirmAge		0.118
		(0.834)
Growth		0.188***
		(16.419)
ROA		0.732***
		(8.340)
Leverage		0.133**
		(2.216)
Fixed		-0.826***
		(-10.640)
CashFlow		0.612***
		(8.628)
gdp		0.110
		(1.548)
cons	8.187***	-4.425***
	(528.821)	(-4.908)
N	18,028	18,028
adj. R ²	0.209	0.438
Firm	Yes	Yes
Year	Yes	Yes

Note: Table 3 reports the baseline DID estimates of the association between the “government procurement loan” policy and firm total factor productivity. The dependent variable is TFP_LP. Policy_Proc is constructed by interacting the policy implementation indicator with the government procurement contract indicator. Column (1) includes only firm and year fixed effects, while Column (2) further controls for firm governance, operating performance, financial structure, cash flow conditions, and regional economic development. The specifications are designed to compare firms affected by the policy with firms not exposed to the policy arrangement over time. Standard errors are clustered at the bank level. t-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

4.3. Robustness tests

4.3.1. Alternative measures of firms' total factor productivity

Following Huang and Gao(2023)and Sheng and Zhang(2019), this paper further recalculates firms' total factor productivity using the OP method and the OLS method. As reported in Columns (1) and (2) of Table 4, the coefficients of the core explanatory variable Policy_Proc remain significantly positive at the 1% level, indicating that the empirical results are reliable and the conclusions remain robust.

Table 4. Robustness test: Alternative measures of the dependent variable.

Variable	(1)	(2)
	TFP_OP	TFP_OLS
Policy_Proc	0.162***	0.250***
	(8.022)	(10.913)
Policy	0.009	0.014
	(0.745)	(1.089)
Boardsize	-0.072**	-0.033
	(-2.002)	(-0.856)
Size	0.344***	0.671***
	(21.602)	(38.037)
FirmAge	0.020	0.092
	(0.157)	(0.673)
Growth	0.175***	0.187***
	(15.749)	(16.859)
ROA	0.772***	0.752***
	(10.187)	(9.249)
Leverage	0.088*	0.134**
	(1.648)	(2.332)
Fixed	-0.607***	0.022
	(-8.841)	(0.305)
CashFlow	0.530***	0.613***
	(8.138)	(9.116)
gdp	0.072	0.093
	(1.067)	(1.379)
_cons	-1.832**	-5.999***
	(-2.161)	(-7.064)
N	18,028	18,028
adj. R ²	0.411	0.522
Firm	Yes	Yes
Year	Yes	Yes

Note: Table 4 presents robustness tests based on alternative measures of firm total factor productivity. To reduce concerns that the baseline results are driven by a specific estimation approach, Columns (1) and (2) replace TFP_LP with productivity measures estimated using the OP method and the OLS method, respectively. The DID interaction term Policy_Proc is defined consistently across all specifications. The regressions include the same control variables as those in Table 3, together with firm and year fixed effects. Standard errors are clustered at the firm level. The table focuses on whether the estimated relationship is sensitive to alternative productivity measurement procedures.

4.3.2. PSM method

To mitigate potential endogeneity concerns arising from sample selection bias, this paper further employs the propensity score matching (PSM) method to conduct robustness tests on the baseline regression results. Whether a firm obtains government procurement contracts (Proc) is not randomly assigned and may be closely related to firm characteristics, such that direct comparisons could lead to estimation bias. The PSM method matches firms with Proc=1 (the treatment group) to firms with similar characteristics but with Proc=0 (the control group). Specifically, firms obtaining government procurement contracts (Proc=1) are treated as the treatment group, while the control variables are used as matching covariates with year fixed effects controlled for. A Logit model is employed to estimate propensity scores. This paper adopts one-to-one nearest neighbor matching with a caliper value of 0.05.

The regression results reported in Table 5 show that the coefficient of Policy_Proc remains significantly positive at the 1% level, consistent with the baseline regression results in Table 3. This

indicates that the core conclusions of this paper are not driven by specific sample selection and that the results are robust.

Table 5. Robustness test: PSM methods.

Variable	(1)	(2)
	TFP LP	TFP LP
Policy_Proc	0.415***	0.436***
	(9.506)	(12.260)
Policy	0.015	-0.016
	(0.358)	(-0.478)
Boardsize		0.083
		(0.990)
Size		0.486***
		(12.652)
FirmAge		0.432
		(1.521)
Growth		0.196***
		(7.329)
ROA		0.780***
		(4.121)
Leverage		0.444***
		(3.633)
Fixed		-1.096***
		(-5.185)
CashFlow		0.636***
		(3.879)
gdp		0.237**
		(2.002)
_cons	8.511***	-6.404***
	(347.224)	(-3.767)
N	5,518	5,518
adj. R ²	0.273	0.424
Firm	Yes	Yes
Year	Yes	Yes

Note: Table 5 reports robustness tests using the propensity score matching (PSM) procedure. Firms obtaining government procurement contracts are treated as the treatment group, while firms without such contracts constitute the potential control group. Propensity scores are estimated through a Logit model using firm-level characteristics and year effects. One-to-one nearest-neighbor matching with a caliper value of 0.05 is employed to improve the comparability between the two groups. Columns (1) and (2) re-estimate the DID specification based on the matched sample, with Column (2) additionally incorporating the full set of control variables. Firm and year fixed effects are included in all regressions, and standard errors are clustered at the firm level.

4.3.3. Parallel trend test

Satisfying the parallel trend assumption is an important prerequisite for causal inference using the difference-in-differences (DID) approach. In this paper's DID model, the parallel trend assumption implies that before the implementation of the "government procurement loan" policy, there is no systematic difference in total factor productivity over time between firms holding government procurement contracts and those without such contracts. After the policy is implemented, firms obtaining government procurement contracts in pilot regions exhibit a clear change in the trend of total factor productivity relative to firms without such contracts. Following Yang et al.(2024), this paper plots Figure 1 based on the estimated coefficients of treatment effects across different periods.

Figure 1 shows that before the implementation of the "government procurement loan" policy, the estimated coefficients in each period are insignificant, indicating no significant difference in total factor productivity between firms with and without government procurement contracts prior to the policy. After the policy implementation, however, firms obtaining government procurement contracts experience a significant increase in total factor productivity, and the positive effect exhibits a certain degree of persistence. These results support the validity of the parallel trend assumption.

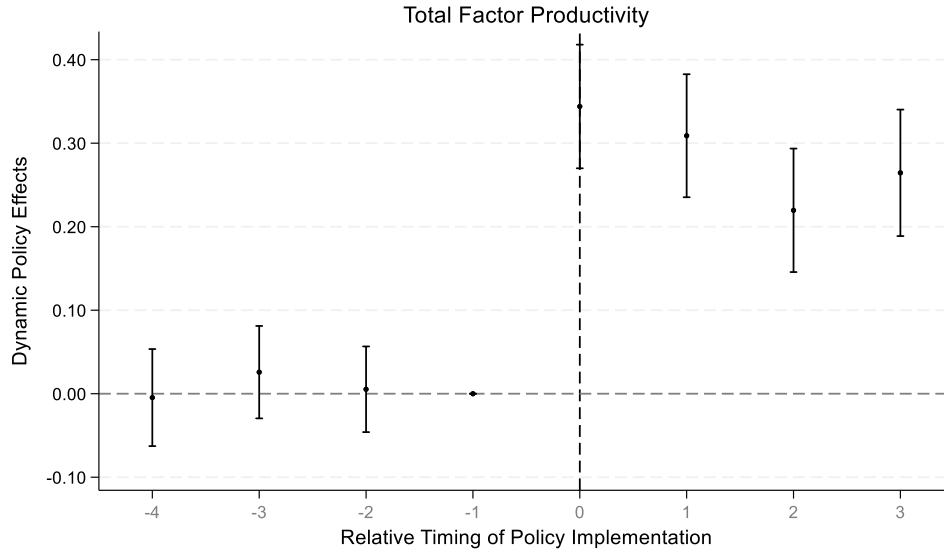


Fig. 1. Parallel trend test.

Note: Fig. 1 reports the dynamic treatment effects estimated from the event-study specification used to examine the parallel trend assumption in the DID framework. The horizontal axis represents the relative timing of policy implementation, while the vertical axis reports the estimated coefficients associated with firms' total factor productivity. The pre-policy periods are used to compare the evolution of productivity between firms holding government procurement contracts and firms without such contracts before the introduction of the "government procurement loan" policy. The post-policy periods capture the relative changes following policy implementation. The dashed vertical line indicates the timing of policy adoption, and the dotted horizontal line represents the zero-effect benchmark. The error bars correspond to 95% confidence intervals based on standard errors clustered at the firm level.

5. Mechanism analysis

This section aims to examine the channels through which the "government procurement loan" policy affects firms' total factor productivity. As discussed above, the policy may mainly exert its promoting effect through three channels: alleviating firms' external financing constraints, stimulating technological innovation activities, and improving the allocation of labor factors across production processes. Following the research hypotheses and the approach of Jiang(2022), this section focuses on the impact of the "government procurement loan" policy on the mediating variables. The specific model is specified as follows:

$$\text{Mediator}_{ict} = \beta_0 + \beta_1 \text{Policy}_{ic} \times \text{Proc}_{ct} + \beta_2 \text{Policy}_{ic} + \beta_3 \text{Controls}_{ict} + \varphi_t + \delta_i + \mu_{ict} \quad (2)$$

where Mediator represents the mediating variables, including financing constraints (WW, KZ), corporate innovation (lnpatent), and labor investment efficiency (laborefficient). φ_t represents year fixed effects, δ_i represents firm fixed effects, and μ_{ict} denotes the random disturbance term.

5.1. Alleviating firms' financing constraints

Under market conditions characterized by severe information asymmetry and relatively underdeveloped risk assessment systems, firms and innovative firms often face significant external

financing obstacles. Such credit rationing problems may constrain firms' investment in technological upgrading and hinder the optimal reallocation of production factors across different uses, thereby suppressing improvements in total factor productivity. As proposed in the research hypotheses, the "government procurement loan" policy can effectively alleviate problems caused by information asymmetry. Specifically, the policy helps broaden firms' external financing channels, enhance their ability to obtain bank credit, and reduce financing pressure.

To examine this mechanism, following Liu et al.(2015)and Wei et al.(2014), this paper adopts the WW index and KZ index to measure firms' financing constraints. Both indicators are negative measures, where larger absolute values indicate more severe financing constraints. The regression results reported in Columns (1) and (2) of Table 6 show that the coefficients of the core explanatory variable Policy_Proc are significantly negative at the 1% level, indicating that the "government procurement loan" policy effectively alleviates firms' financing constraints and thereby improves firms' total factor productivity.

5.2. Promoting corporate innovation

The "government procurement loan" policy effectively alleviates funding uncertainty in the innovation process by providing firms with stable financing support. Firms can obtain bank loans based on government procurement contracts without providing additional collateral required in traditional lending, thereby overcoming external financing barriers caused by insufficient collateral. Reduced funding uncertainty encourages firms to increase long-term R&D investment rather than focusing only on short-term incremental improvements. The accumulation of R&D investment gradually enhances firms' innovation efficiency and innovation quality, as reflected in increases in patent grants, breakthroughs in core technologies, and improvements in production processes. Continuous improvements in innovation efficiency and quality further promote total factor productivity through both technological progress and improved factor allocation efficiency, thereby forming a virtuous cycle between innovation investment and productivity growth.

Following Quan and Yin(2017), this paper uses the natural logarithm of the number of citations to firms' invention patents plus one as a proxy variable for corporate innovation. The regression results in Column (3) of Table 6 show that the estimated coefficient of Policy_Proc is positive and significant at the 5% level, indicating that the "government procurement loan" policy effectively promotes corporate innovation activities and further enhances firms' total factor productivity.

5.3. Optimizing labor resource allocation

Low labor investment efficiency and labor resource mismatch have long constrained firms' productivity improvement. Supported by the stable financial resources provided through the "government procurement loan" policy, firms are better able to perform strategic coordination in integrating internal and external production factors. Improved financing conditions enable firms to optimize labor investment decisions, reduce labor idleness and mismatch, and enhance the marginal productivity of labor resources. Improvements in labor allocation efficiency further strengthen managerial efficiency, improve production processes, and enhance firms' ability to transform technological innovation into actual productivity. These changes jointly improve factor combination efficiency and operational performance, thereby laying a solid labor foundation for the growth of total factor productivity.

Following Kong et al.(2017) and Liu and Sun(2022), this paper uses the laborinefficient indicator to measure inefficient labor investment. This indicator is a negative measure, where larger absolute values indicate more severe inefficient labor investment. The results reported in Column (4) of Table 6 show that the estimated coefficient of Policy_Proc is significantly negative at the 1% level, indicating that the "government procurement loan" policy helps improve firms' labor investment efficiency, optimize labor resource allocation, and ultimately promote firms' total factor productivity.

Table 6. Mechanism analysis.

Variable	(1)	(2)	(3)	(4)
	WW	KZ	lnpatent	laborinefficient
Policy_Proc	-0.030***	-0.586***	0.114**	-0.030***
	(-17.633)	(-11.679)	(2.210)	(-2.859)
Policy	0.001	-0.011	0.061**	-0.004
	(0.509)	(-0.346)	(2.143)	(-0.478)
Boardsize	-0.001	0.003	-0.020	-0.030
	(-0.372)	(0.033)	(-0.230)	(-1.526)
Size	-0.051***	-0.520***	0.407***	0.032***
	(-53.268)	(-14.325)	(11.475)	(4.696)
FirmAge	0.028***	1.175***	-0.893***	0.060
	(3.042)	(3.813)	(-2.710)	(1.007)
Growth	-0.047***	-0.260***	0.043*	0.041***
	(-40.186)	(-9.456)	(1.911)	(5.408)
ROA	-0.082***	-1.627***	0.919***	-0.102**
	(-12.789)	(-8.525)	(5.521)	(-2.322)
Leverage	0.037***	6.059***	-0.296**	-0.013
	(9.753)	(47.453)	(-2.555)	(-0.507)
Fixed	0.014***	3.259***	0.057	-0.003
	(3.083)	(18.571)	(0.350)	(-0.092)
CashFlow	-0.102***	-14.144***	-0.158	-0.059
	(-17.593)	(-87.285)	(-1.100)	(-1.530)
gdp	-0.003	-0.112	0.102	-0.023
	(-0.699)	(-0.757)	(0.729)	(-0.854)
_cons	0.056	7.454***	-4.597**	-0.351
	(1.051)	(3.776)	(-2.381)	(-0.944)
N	15,275	17,881	16,138	16,374
adj. R ²	0.537	0.663	0.207	0.067
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes

Note: Table 6 reports specifications related to the potential transmission channels of the “government procurement loan” policy. Columns (1) and (2) use the WW index and KZ index as proxy variables for firms’ financing conditions. Column (3) employs lnpatent, measured as the logarithm of one plus invention patent citations, to reflect firms’ innovation-related activities. Column (4) uses laborinefficient to capture labor investment inefficiency and labor allocation conditions within firms. The DID interaction term Policy_Proc is constructed in the same manner as in the baseline model. All regressions include the control variables reported in Table 1, together with firm and year fixed effects. Standard errors are clustered at the firm level.

6. Heterogeneity Analysis

6.1. Whether audited by the big four

When conducting heterogeneity analysis based on differences in audit quality, it is necessary to consider the audit work performed by certified public accountants on firms’ internal controls and business activities. High-quality auditing services can alleviate problems caused by information uncertainty through information optimization and also improve overall corporate governance quality (Yang et al., 2024). Firms with higher information disclosure quality and more sound governance structures generally face lower financing constraints, implying that external financing policies may generate relatively limited marginal improvement for such firms. Accordingly, the productivity-enhancing effect of the “government procurement loan” policy is expected to be weaker for firms with high audit quality than for firms with low audit quality.

Based on this analysis, this paper divides the full sample into a high-audit-quality group and a low-audit-quality group according to whether firms are audited by international Big Four accounting firms, and regression analyses are conducted separately for the two groups. The results are reported in Table 7. The regression results show that the estimated coefficient for firms with high audit quality is significantly negative at the 5% level, indicating that the "government procurement loan" policy has a weaker effect on improving total factor productivity for firms with high audit quality compared with firms with low audit quality. This suggests that firms with low audit quality face more severe information asymmetry problems, and therefore benefit more from the policy in terms of total factor productivity improvement.

Table 7. Heterogeneity analysis: Whether audited by the big four.

Variable	(1)
	TFP_LP
Policy_Proc_Big4	-0.168**
	(-2.002)
Policy_Big4	-0.045
	(-1.192)
Big4	0.089**
	(1.981)
Policy_Proc	0.414***
	(14.724)
Policy	0.015
	(1.176)
Boardsize	-0.016
	(-0.412)
Size	0.508***
	(27.785)
FirmAge	0.109
	(0.772)
Growth	0.189***
	(16.427)
ROA	0.732***
	(8.343)
Leverage	0.133**
	(2.217)
Fixed	-0.830***
	(-10.730)
CashFlow	0.611***
	(8.612)
gdp	0.108
	(1.517)
_cons	-4.357***
	(-4.835)
N	18,028
adj. R ²	0.438
Firm	Yes
Year	Yes

Note: Table 7 reports heterogeneity specifications related to external audit environments. Big4 is an indicator variable equal to one if a firm is audited by an international Big Four accounting firm, and zero otherwise. Policy_Proc_Big4 captures the interaction between the baseline DID term and the audit-quality indicator, while Policy_Big4 reflects the interaction between regional policy implementation and audit characteristics. The specification simultaneously includes the baseline DID variable Policy_Proc and the standalone audit-quality indicator Big4. The dependent variable is

TFP_LP. Control variables follow the baseline specification in Table 3. Firm and year fixed effects are included in all regressions, and standard errors are clustered at the firm level.

6.2. Whether belonging to high-tech industries

Firms in high-tech industries typically exhibit higher R&D investment and stronger technological innovation demand, resulting in greater financing needs while also facing more severe information asymmetry and financing constraints. By providing a new financing channel through government procurement contracts, the "government procurement loan" policy effectively alleviates firms' financial pressure and thus generates a stronger marginal effect on productivity improvement. Accordingly, the productivity-enhancing effect of the policy is expected to be stronger for firms in high-tech industries than for those in non-high-tech industries.

This paper divides the sample into two subsamples based on whether firms belong to high-tech industries and conducts separate regressions. The results are reported in Table 8. The regression results show that the estimated coefficient for high-tech firms is positive and significant at the 5% level, indicating that the "government procurement loan" policy exerts a more pronounced effect on promoting total factor productivity among firms in high-tech industries.

Table 8. Heterogeneity analysis: Whether belonging to high-tech industries.

Variable	(1)
	TFP_LP
Policy_Proc_HighTech	0.139**
	(2.423)
Policy_HighTech	0.074***
	(3.220)
HighTech	-0.172***
	(-2.838)
Policy_Proc	0.324***
	(7.070)
Policy	-0.033*
	(-1.679)
Boardsize	-0.017
	(-0.424)
Size	0.507***
	(27.668)
FirmAge	0.047
	(0.334)
Growth	0.191***
	(16.633)
ROA	0.719***
	(8.188)
Leverage	0.125**
	(2.117)
Fixed	-0.823***
	(-10.680)
CashFlow	0.608***
	(8.600)
gdp	0.118
	(1.641)
cons	-4.143***
	(-4.587)
N	18,028
adj. R ²	0.442
Firm	Yes
Year	Yes

Note: Table 8 reports heterogeneity specifications based on firms' industry characteristics. HighTech is an indicator variable equal to one if a firm belongs to a high-tech industry, and zero otherwise. Policy_Proc_HighTech is constructed by interacting the baseline DID variable with the high-tech industry indicator, while Policy_HighTech reflects the interaction between regional policy implementation and industry characteristics. The regressions retain Policy_Proc and HighTech simultaneously to distinguish the incremental role associated with industry classification. The dependent variable is TFP_LP. The control variables are the same as those in Table 3. Firm and year fixed effects are included, and standard errors are clustered at the firm level.

6.3. Ownership structure

Affected by the long-standing phenomenon of "ownership discrimination," China's credit market exhibits a differentiated pattern of resource allocation. Supported by implicit government guarantees and relatively stable profitability, state-owned enterprises (SOEs) have long held an advantageous position in credit allocation. In contrast, private enterprises face stronger financing constraints, which further restrict their technological innovation and total factor productivity growth (Lin and Li, 2001). By broadening firms' financing channels through government procurement contracts, the "government procurement loan" policy further alleviates financial pressure and promotes firms' total factor productivity (Yu et al., 2025). Accordingly, the productivity-enhancing effect of the policy is expected to be stronger for private enterprises than for SOEs.

To test this hypothesis, this paper divides the full sample into private enterprises and SOEs according to the type of firms' ultimate controlling shareholders and conducts separate regressions for each group. The results are reported in Table 9. The regression results show that the estimated coefficient for SOEs is significantly negative at the 1% level, indicating that the "government procurement loan" policy has a more pronounced effect on improving total factor productivity among private enterprises.

Table 9. Heterogeneity analysis:Ownership structure.

Variable	(1)
	TFP_LP
Policy_Proc_SOE	-0.347***
	(-7.253)
Policy_SOE	-0.016
	(-0.688)
SOE	-0.001
	(-0.041)
Policy_Proc	0.564***
	(16.126)
Policy	0.016
	(1.089)
Boardsize	-0.019
	(-0.484)
Size	0.510***
	(27.541)
FirmAge	0.053
	(0.385)
Growth	0.189***
	(16.554)
ROA	0.761***
	(8.774)
Leverage	0.133**
	(2.235)
Fixed	-0.834***
	(-10.831)
CashFlow	0.595***
	(8.373)
gdp	0.112
	(1.574)
cons	-4.264***
	(-4.758)
N	18,028
adj. R ²	0.445
Firm	Yes
Year	Yes

Note: Table 9 reports heterogeneity specifications based on ownership structure. SOE is an indicator variable equal to one if the firm's ultimate controlling shareholder is state-owned, and zero otherwise. Policy_Proc_SOE represents the interaction between the baseline DID term and ownership structure, while Policy_SOE captures the interaction between regional policy implementation and the SOE indicator. The model additionally includes the standalone ownership variable SOE and the baseline DID variable Policy_Proc. The dependent variable is TFP_LP. Control variables are identical to those in Table 3. Firm and year fixed effects are included in all regressions, and standard errors are clustered at the firm level.

7. Conclusion and policy implications

This paper takes Chinese A-share listed firms from 2015 to 2024 as the research sample and exploits the phased implementation of the "government procurement loan" policy across regions as a quasi-natural experiment to examine how the policy affects firms' production efficiency using a difference-in-differences (DID) approach. The empirical results lead to the following conclusions. First, the implementation of the "government procurement loan" policy significantly improves firms' total

factor productivity. This conclusion remains robust after a series of robustness tests, including alternative measures of total factor productivity, propensity score matching, and parallel trend tests. Second, mechanism analysis shows that the policy promotes firms' total factor productivity mainly through three channels: alleviating firms' financing pressure, stimulating corporate innovation, and optimizing labor resource allocation. Third, heterogeneity analysis reveals that the policy effect is more pronounced among firms with low audit quality, firms in high-tech industries, and private enterprises.

Based on the above findings, this paper proposes the following policy recommendations. First, the coverage of the "government procurement loan" policy should be further expanded and its operational mechanism should be improved in order to fully realize its role in enhancing firms' production efficiency. The empirical evidence of this study shows that the policy effectively promotes firms' production efficiency, with a more pronounced effect among private enterprises. Therefore, local governments should accelerate the implementation of the policy in regions where it has not yet been adopted and appropriately lower participation thresholds so that more firms can benefit from the policy. At the same time, application and approval procedures should be simplified to reduce firms' time and financing costs and improve policy accessibility. For regions where the policy has already been implemented, governments may establish specialized consulting service windows and regularly provide policy interpretation and operational training to help firms, especially companies with relatively weak information access capabilities, better understand and utilize the "government procurement loan" channel for financing support, thereby maximizing the policy's productivity-enhancing effect.

Second, differentiated policy arrangements should be implemented according to firm type and industry characteristics in order to improve the targeting accuracy and resource allocation efficiency of the "government procurement loan" policy. The empirical results show that the policy exhibits stronger marginal effects among firms with low audit quality, high-tech firms, and private enterprises, indicating that different market entities benefit from the policy to varying degrees. Therefore, policy resources should be appropriately directed toward areas with greater potential gains. Specifically, for high-tech firms, financial institutions may be encouraged to provide a higher proportion of loans within the contract amount and offer more preferential interest rates to support long-term technological R&D investment. For firms with low audit quality, governments may promote standardized disclosure mechanisms for government procurement contract information to reduce information asymmetry between banks and firms and improve policy accessibility. For private enterprises, participation requirements should be further relaxed and risk-sharing arrangements between governments and banks should be improved to alleviate the long-standing financing difficulties faced by private firms in traditional credit markets, thereby enhancing the overall marginal benefits of the policy.

Third, a coordinated supporting system should be established around the three transmission channels of financing, innovation, and labor allocation to strengthen the overall implementation effect of the "government procurement loan" policy. The mechanism analysis shows that the policy operates mainly by alleviating financing constraints, stimulating R&D activities, and optimizing labor allocation. Accordingly, supporting institutional arrangements should be strengthened in the following aspects. In terms of financing, a nationwide information-sharing platform for government procurement contracts should be established to facilitate banks' real-time access to firms' bidding records and accelerate loan approval procedures, while commercial banks should be encouraged to develop credit products specifically tailored to the needs of the "government procurement loan" policy. In terms of innovation, special funding support programs may be introduced to provide tax incentives or fiscal subsidies for firms using "government procurement loan" funds for technological R&D, thereby guiding firms to allocate financing toward substantive innovation activities rather than short-term financial operations. In terms of labor allocation, firms should be encouraged to use the liquidity released by the policy to recruit professional and technical talent, strengthen employee skill training, and improve human capital structure. At the same time, governments should enhance policy

guidance on labor employment to assist firms in optimizing employment decisions and reducing labor mismatch. Through the coordinated implementation of these measures, the positive effect of the "government procurement loan" policy on firms' production efficiency can be further strengthened, thereby providing stronger institutional support for the high-quality development of the real economy.

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