

Reform, Political Connections, and Enterprise Total Factor Productivity of State-owned Capital Investment and Operation Companies

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ABSTRACT

The reform of state-owned capital investment and operation companies has achieved remarkable results since its first pilot in 2014. Previous research on this reform has mainly focused on how it affects corporate profitability, corporate governance level, and other areas, with insufficient research on how it affects total factor productivity. Therefore, this article conducts quasi natural experiments on state-owned enterprises listed on the A-share market from 12 to 22 years ago, and uses the DID model to explore the impact of reform on TFP. The results indicate that the total factor productivity level of enterprises participating in the reform pilot has been significantly improved. In terms of heterogeneity analysis, the article found that the reform has a more significant effect on improving TFP for enterprises controlled by investment and operation companies of the State-owned Assets Supervision and Administration Commission of the State Council than for enterprises controlled by investment and operation companies of the provincial State-owned Assets Supervision and Administration Commission; At the same time, for companies with no political affiliation between the chairman and executives of listed companies before the reform, the effect of the reform on improving TFP is more significant due to the easier separation of government and enterprises. The research conclusion of the article enriches the research on the reform of state-owned capital investment and operation companies, and provides empirical evidence on how to improve enterprise TFP.

Keywords: Total factor productivity, Reform of state-owned capital investment and operation companies, Political connection.

1. INTRODUCTION

The reform of the state-owned asset supervision system, as an important part of China's state-owned enterprise reform, is currently in a comprehensive and deepening stage. It is an important measure for China to increase its control over state-owned capital and enhance its development vitality. At the Third Plenary Session of the 18th Central Committee of the Communist Party of China, it was pointed out that the focus of state-owned asset supervision should be shifted from "managing enterprises" to "transforming capital". Following this reform focus, the idea of reforming state-owned capital investment and operation companies gradually emerged. [1] Since the State owned Assets Supervision and Administration Commission (SASAC) of the State Council conducted the first pilot projects in important

central enterprises such as the National Development and Investment Group in 2014, the SASAC has carried out a total of three batches of investment and operation company reforms targeting 21 central enterprises. At the same time, due to the demonstration role of the SASAC, provincial-level SASACs have also reorganized and established more than 100 state-owned capital investment and operation companies accordingly.

The reform of state-owned capital investment and operation companies is essentially the formation of a new three-layer state-owned asset supervision mechanism consisting of the State Council or provincial state-owned asset management commission, state-owned capital investment and operation companies, and state-owned enterprises. The situation of "separation of government and enterprise" in state-owned

enterprises has existed for a long time in China, which will significantly affect the listing behavior of state-owned enterprises [2], and also significantly affect the modernization governance level of state-owned enterprises, reducing their efficiency in serving socialist modernization economic construction [3]. With the emergence of the three-layer regulatory model, state-owned capital investment and operation companies can exist as investors of state-owned enterprises between state-owned enterprises and the government, reducing the distortion of state-owned enterprise operations caused by excessive political interference through the State owned Assets Supervision and Administration Commission, and achieving "separation of government and enterprise". Therefore, the reform promotes the streamlining of administration and delegation of power by the State owned Assets Supervision and Administration Commission at all levels, promotes the separation of government and capital, and can promote state-owned enterprises as independent market-oriented operating entities, enhancing their level of market-oriented and independent operation.

So, what is the effect of the reform? This is a hot topic that the academic and policy decision-making communities urgently want to know. Existing research mainly focuses on theoretical exploration, with less empirical evaluation of the system, and mainly focuses on the impact of reform on corporate profitability and performance [6]. TFP (hereinafter referred to as TFP), as a key indicator to measure high-quality development [7], the improvement of enterprise TFP is also a necessary measure to enhance a country's national TFP [8]. Therefore, exploring how the reform of state-owned capital investment and operation companies affects enterprise TFP is of great significance for promoting high-quality economic development in China.

The possible contributions of this article are as follows: The article selects China's A-share state-owned listed companies from 2012 to 2022 as samples, and proves the significant impact of reform on enterprise TFP through the use of a multiple double difference model. At the same time, the article further analyzed three types of impact mechanisms and two types of heterogeneity. The conclusion of the article confirms that reform can significantly improve the TFP level of participating enterprises through three channels: reducing agency costs, increasing salary incentives, and reducing overinvestment. At the same time, the article divides the State-owned Assets Supervision and

Administration Commission (SASAC) and investment and operation companies into national and provincial levels, and finds that the reform has a significant effect on improving TFP for enterprises controlled by SASAC investment and operation companies compared to enterprises controlled by provincial SASAC investment and operation companies. Meanwhile, due to the close focus of the reform of state-owned capital investment and operation companies on the separation of government and enterprises, this article innovatively incorporates political related variables to handle the heterogeneity of enterprises participating in the reform, verifying that the effect of the reform is not significant for enterprises without political connections before the reform.

2. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

Due to the simple structure of the Cobb Douglas form and its consistent estimation of output, the production function is commonly expressed using the following formula, where L represents the labor input of each economic unit in each period, K represents the capital input of each economic unit in each period, Y represents the output of each economic unit in each period, and A represents the TFP of each economic unit in each period.

$$Y_{i,t} = A_{i,t} L_{i,t}^{\alpha} K_{i,t}^{\beta} (\alpha, \beta > 0)$$

From the research before it is not difficult to see that there are three main ways to improve enterprise output: increasing labor and capital investment, and increasing TFP. For China today, as surplus rural labor shifts from unlimited supply to limited supply, the slowing urbanization rate of agricultural population has led to the premature arrival of the Lewis turning point, and the decline in birth rate has accelerated the disappearance of population dividends [9]. It is not realistic to overly rely on the growth of labor input L to drive the growth of enterprise output. China has also been actively promoting industrial upgrading and encouraging the transformation of labor-intensive enterprises. Similarly, real capital resources such as land are limited and follow the basic economic law of diminishing marginal capital input. For human capital, although it is an important indirect condition for improving labor productivity, its effect is not very significant in terms of quantity. Currently, global economic growth is relatively weak, geopolitical conflicts are frequent, and technology and trade protectionism are prevalent,

which is not conducive to the flow of production factors. Therefore, blindly seeking the growth of capital input K to increase enterprise output is not a long-term solution. Therefore, only TFP is the most significant, direct, and sustainable source of output improvement. International experience has also shown that whether TFP can be improved is not only related to whether a country's economy can continue to grow, but also the key to determining whether developing countries can overcome the middle-income trap. TFP is essentially a reflection of resource allocation efficiency. If we want to improve TFP, the key is to handle the relationship between the market and the government well, and improve policy measures that are conducive to optimizing resource allocation. The reform of the concept of "separation of government and enterprises" and "separation of government and capital", shifting from "managing enterprises" to "managing capital", has improved the governance level of enterprises, enhanced the market-oriented operation level of state-owned enterprises, and may reduce the decrease in resource allocation efficiency caused by excessive and inappropriate government intervention, thereby enhancing the TFP of enterprises. Therefore, this article proposes the hypothesis H1:

Assuming H1: Reform can significantly enhance the TFP of enterprises.

3. RESEARCH DESIGN

3.1 Samples and Data

The reform taking place in 2014 provides a good quasi natural experiment for this article, with sample time selected from 2012 to 2022. In terms of acquisition of the control chain of the experimental group, the article refers to the research of Xiao Tusheng and Sun Ruiqi [6]. First, according to the official websites of the State owned Assets Supervision and Administration Commission at all levels and Internet searches, it manually sorts out what state-owned capital investment and operation companies have been established since 2014. Then, it sorts out the information about the controllers of each company through the CSMAR database. If there is a state-owned capital investment and operation company established by the controller of a company in a certain year, it is considered that the company has joined the reform in that year. This article manually sorted out A-share listed companies in the holding chain, with these companies as the experimental group and other state-owned listed companies as the control group. ST, * ST, PT samples, financial companies, and samples with severe variable losses are excluded. Finally, 562 companies and 6007 pieces of data were obtained, including 153 companies in the experimental group and 409 companies in the control group.

The distribution of the number of new experimental group enterprises participating in the reform each year from 2014 to 2022 is as follows ("Table 1"):

Table 1. Number of enterprises participating in reforms in each year

2014	2015	2016	2017	2018	2019	2020	2021	2022
11	4	6	22	50	27	11	17	5

The remaining data in this article, such as the control variables in benchmark regression, and the required data for constructing the dependent and mediating variables, are all from the CSMAR and Wind databases. Political related variables: manually check the resumes and political related information of the chairmen and general managers of 153 companies in the experimental group through the Internet, and check the information leakage data of senior executives in CSMAR, Wind and other databases to ensure the accuracy of TFP_{it} =

political related variables as much as possible. The regression and data processing software for the article is Stata14.

3.2 Variable Definition and Model Construction

To test the impact of the reform, this article sets up the following DID model that controls for individual and time fixed effects:

$$\alpha_0 + \alpha_1 \text{Treat} * \text{Post}_{it} + \alpha_2 \text{TFP}_{it-1} + \beta \text{Controls}_{it} + h_i + s_t + \varepsilon_{it} \quad (1)$$

Among them, Controls represents the control variable, h and s represent year and individual fixed effects of the enterprise, and ϵ represents the random error term.

- Explained variable: Enterprise TFP. This article draws on the research of Lu Xiaodong and Lian Yujun [10] to use the LP method, which has fewer loss samples and can solve certain endogenous problems.
- Core explanatory variable: policy dummy variable (treat x post). This article sets a grouping variable (treat) based on whether or not the state-owned listed companies participate in the reform, where the value of the state-owned listed companies participating in the reform is 1, otherwise the value is 0. At the same time, based on the time of participating in state-owned enterprise reform, the article sets the stage variable (post), that is, the value is 1 in the year of state-owned enterprise reform pilot and after, otherwise the value is 0.
- Control variables: involving multiple aspects such as corporate governance attributes and financial status, including

management shareholding ratio (Mshare), corporate asset liability ratio (ALR), corporate Tobin Q (TQ), total assets (Asset), corporate current asset ratio (LR), corporate return on equity (ROA), proportion of top ten compensation recipients to total compensation payouts (TOP10), proportion of independent directors (Board), number of executives (EN), number of employees (Nemploye), and age of existence (Age).

- Mechanism variables: The mechanism variables selected in this article are total asset turnover rate, external salary gap, and investment efficiency. The calculation method for Total Asset Turnover (TAT) is to divide the net operating income by the average total assets; The calculation method for External Salary Gap (EGAP) is to divide the executive compensation of a company by the industry average; Investment efficiency (OI) is the "overinvestment" data measured by Richardson's [11] regression model.

“Table 2” shows the descriptive statistical results of the variables:

Table 2. Descriptive statistics

		Sample size	Mean value	Standard deviation	Minimum value	Maximum value
Explained variable	TFP	6007	8.86	1.08	6.66	11.16
Explanatory variable	Treat*Post	6007	0.1195	0.3244	0	1
	Mshare	6007	0.0065	0.0375	0	0.6214
	ROA	6007	0.0342	0.0412	-0.0738	0.1553
	ALR	6007	0.4984	0.1930	0.1132	0.8587
	TQ	6007	1.71	1.02	0.83	5.64
	LR	6007	0.53	0.23	0.10	0.93
Control variable	Asset	6007	4.96e+10	1.84e+11	3.38e+08	2.73e+12
	TOP10	6007	57.56	14.84	28.95	89.15
	Inboard	6007	37.58	5.82	33.33	57.14
	EN	6007	18.46	3.75	8	35
	Nemployee	6007	11879.21	28352.99	147	222529
	Age	6007	16.70	6.08	2	32
	TAT	6007	0.6475	0.4388	0.1000	2.1374
Mechanism variable	EGAP	6007	1.0400	0.7938	0.2462	4.2394
	OI	2271	0.0298	0.0397	8.74e-06	0.3235

4. EMPIRICAL RESULTS

4.1 Benchmark Regression Test Results

“Table 3” shows the benchmark regression results. Column (1) shows the results of the complete

model (1), column (2) only controls for total profit level and corporate leverage level, and column (3) only retains the explanatory variables and the regression results after TFP. It can be seen that the core explanatory variable Treat*Post is positive and significant at least at a 5% confidence level

regardless of how the control variables are selected. This indicates that reform can indeed significantly improve a company's TFP, and hypothesis H1 is valid.

Table 3. Benchmark regression results

Variable	TFP		
	(1)	(2)	(3)
TFP	0.572*** (28.13)	0.633*** (36.49)	0.521*** (25.62)
Treat*Post	0.048*** (2.65)	0.041** (2.22)	0.037** (1.98)
ROA	3.037*** (13.62)	3.089*** (14.45)	
ALR	0.699*** (7.34)	0.688*** (6.23)	
Mshare	0.493 (1.53)		
TQ	-0.0140 (-1.56)		
LR	0.670*** (7.53)		
Asset	0.000 (0.26)		
Top10	0.004*** (3.73)		
Inboard	0.000 (-0.03)		
EN	0.008*** (3.43)		
Nemployee	0.000* (1.89)		
age	0.067 (1.40)		
Individual effects	fixed Yes	Yes	Yes
Time effect	fixed Yes	Yes	Yes
R ²	0.9149	0.9365	0.9231

Note: *, **, *** respectively represent significance levels of 10%, 5%, and 1%; The value of t is enclosed in parentheses (the same below)

4.2 Robustness Tests

4.2.1 DID Parallel Trend Rest

To satisfy the parallel trend hypothesis, the article conducts multiple DID parallel trend tests on equation (1) of the benchmark regression model. The time dummy variables set for the parallel trend test in the article are as follows: the value of pre 3

for the third year or above before the enterprise participated in the reform is 1, otherwise it is 0; Pre (i) in the i-th year before participating in the reform is set to 1, otherwise it is set to 0; The current value for the year of participating in the reform is 1, otherwise it is 0; After participating in the reform, the i-th year Post (i) is set to 1, otherwise it is set to 0; The value of post3 for the third year or more after participating in the reform is 1, otherwise it is 0. Meanwhile, this article will enter the year before the reform (pre1) as the benchmark group.

The inspection results are shown in the following "Figure 1" on the next page. Before the enterprise entered the reform, the regression coefficient of enterprise TFP was not significant and there was no obvious prior trend. After the reform, the regression coefficient of enterprise TFP showed a significant upward trend and also showed a significant improvement, indicating that this empirical study conforms to the parallel trend hypothesis.

4.2.2 Placebo Test

The expression of $\hat{\alpha}_1$ for the estimated regression coefficients of the explanatory variable in the benchmark model (1) of this article is as the following equation (2). Among them, α_1 represents the true value of the regression coefficient of the explanatory variable, γ represents the impact of unobservable factors other than the reform of state-owned capital investment and operation companies on enterprise TFP, and N represents other control variables and fixed effects.

$$\hat{\alpha}_1 = \alpha_1 + \gamma \frac{COV(Treat*Post, \varepsilon | N)}{VAR(Treat*Post | N)} \quad (2)$$

To eliminate the interference of unobserved non-policy factors on the results of the article, research should verify whether γ is equal to 0. If it is equal to 0, it means that non-policy factors will not affect the regression results of the explanatory variable coefficients, and the coefficient estimation results are unbiased. This article uses a placebo test to test the robustness of non-observational factors for interference. Referring to the research of Yvonne Jie Chen, Pei Li, Yi Lu [12] and Ma Shuzhong, Wu Peng, and Fang Chao [13], 562 companies were randomly divided into an experimental group and a control group. A simulated policy shock was created and regression was performed according to equation (1), resulting

in an incorrect estimation of α_1' . Then the researcher repeats this process 1000 times and draw a distribution of 1000 α_1' . If the estimated α_1' deviates significantly from 0, it indicates that $\gamma = 0$ is not valid and there is interference from non-policy factors. According to the results of the placebo test in “Figure 2”, it is not difficult to find that α_1' follows a normal distribution with a mean of 0 overall, and the coefficient P value is mostly above 0.1, which is not significant. Therefore, it

can be considered that $\gamma = 0$ is valid and there is no significant interference from non-policy factors. The actual estimated coefficient $\alpha_1 = 0.048$ obtained from the test deviates significantly from the simulated distribution, which is a significant outlier. This indicates that the actual estimated coefficient α_1 is not an accidental value, and the policy effect is significant. The placebo test is in line with expectations. (“Figure 2”)

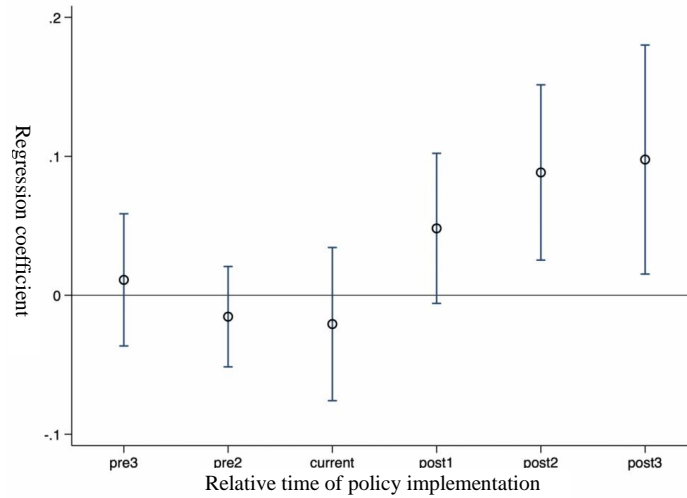


Figure 1 Effect of parallel trend test.

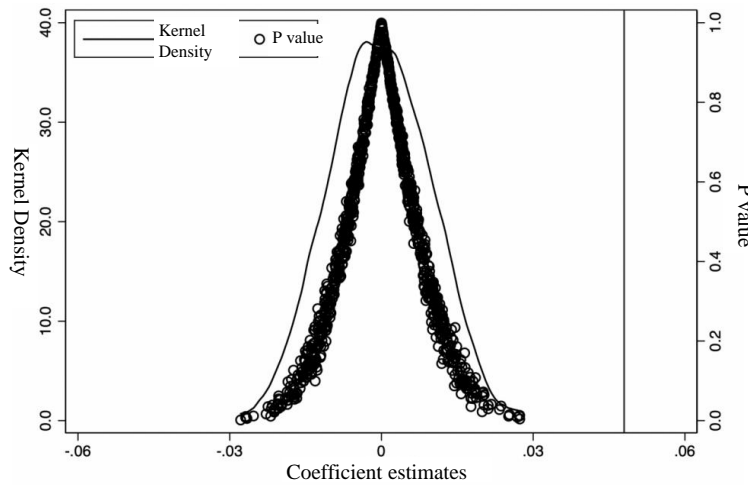


Figure 2 Effect of placebo test

5. HETEROGENEITY ANALYSIS

The existing research on the heterogeneity analysis of reform effects is not sufficient. Therefore, this article conducts heterogeneity analysis based on the attributes of state-owned capital investment and operation companies, as well as whether the listed companies participating in the

reform have political connections in the year before the reform.

5.1 Heterogeneity Analysis Based on the Attributes of the State-owned Assets Supervision and Administration Commission to Which State-owned Capital Investment and Operation Companies Belong

From the Third Plenary Session of the 18th Central Committee to the end of 2021, the State-owned Assets Supervision and Administration Commission of the State Council has successively reorganized and established two state-owned capital operation companies, including China Guoxin, as well as nine state-owned capital investment companies, forming a "2+19" development situation. At the provincial level, according to incomplete statistics, from 2013 to the end of 2021, more than 150 state-owned capital investment and operation companies were reorganized and

established by various provincial-level SASACs in China. Therefore, this article divides a total of 21 investment and operation companies under the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) into one group, while the other investment and operation companies under the provincial local SASAC are divided into another group, to analyze the heterogeneous reform effects of controlling enterprises of investment and operation companies in each group. The control groups for each group are still other state-owned enterprises, and the regression analysis model still uses the benchmark regression model equation (1). The regression results confirm that the reform initiated by the State-owned Assets Supervision and Administration Commission of the State Council will have a more significant effect than the reform at the provincial level.

Table 4. Heterogeneity analysis 1

Variable	TFP	
	The Central State Council	Provincial area
TFP _{t-1}	0.580*** (28.15)	0.568*** (26.25)
Treat*Post	0.057*** (2.63)	0.043 (1.65)
Mshare	-0.199 (-0.54)	0.568* (1.74)
ROA	2.948*** (12.13)	3.102*** (13.20)
ALR	0.678*** (7.30)	0.753*** (7.32)
TQ	-0.009 (-0.94)	-0.016 (-1.62)
LR	0.711*** (7.50)	0.671*** (7.10)
Asset	0.000 (0.74)	0.000 (0.57)
Top10	0.003*** (2.87)	0.004*** (3.16)
Inboard	-0.001 (-0.93)	0.000 (0.17)
EN	0.007*** (2.74)	0.008*** (3.47)
Nemployee	0.000 (1.34)	0.000* (1.78)
age	0.081 (1.61)	0.095* (1.85)
Individual fixed effects	Yes	Yes
Time fixed effect	Yes	Yes
R ²	0.9192	0.9133

5.2 Heterogeneity Analysis Based on Whether Pre-reform Enterprises Have Political Connections

The issue of political connection (PC) of enterprises has been an important research variable in the academic community of China in recent years. In the context of high-quality economic development in China, as a non-market factor, political affiliation is an important influencing factor that cannot be ignored in the process of enterprise operation and development. The political affiliation of enterprises may have a profound impact on their operation, value, and other aspects. Previous studies have shown that political connections have costs for businesses, as companies are likely to incur rent-seeking costs while seeking to form political connections, which can affect their established development strategies. For example, in order to establish political connections, companies may cater to government intervention, distort their investment behavior, and have a negative impact on their performance. [19] [20] The new regulatory model of state-owned enterprises brought about by the reform, which promotes the separation of government and enterprise, and government and capital, reduces rent-seeking activities and excessive interference by local government departments in state-owned enterprises, thereby reducing the short-sighted behavior of state-owned enterprise operators. It is likely to be influenced by whether there were inherent political connections in the enterprises before the reform.

Referring to the research of Zhang Wen, Zhang Sheng, and Li Baixing, this article sets up a binary dummy variable of political affiliation, represented by PC. If the chairman or general manager of an enterprise has previously or currently worked in the central government and various regional people's governments, courts, and procuratorates, and has also served as a representative of various levels of the People's Congress and a member of the National Committee of the Chinese People's Political Consultative Conference, the value of PC is one, otherwise it is zero. [21] The article grouped the listed companies participating in the reform into groups based on whether there was a political affiliation between the chairman and general manager in the year before the reform, and whether the PC was equal to 1. Ultimately, out of 153 experimental group companies, 36 had political affiliations before the reform and 115 had no political affiliations before the reform. Heterogeneity analysis of the control group in each group showed that other state-owned enterprises were still involved. The results of heterogeneity analysis are shown in "Table 10". The first column of "Table 11" shows the regression results of the group without political affiliation, with a coefficient of 0.061 for the explanatory variable, which is significant at the confidence level of 1%; The second column shows the regression results of the political related group, and it is not difficult to find that the coefficient of the explanatory variable is much smaller than 0.061 by 0.008, which is completely insignificant. Therefore, the regression results confirm that the policy effect of the reform is more significant for enterprises without political affiliation before the reform.

Table 5. Heterogeneity analysis 2

Variable	TFP	
	No political connection	Existing political connection
TFP _{t-1}	0.572*** (26.97)	0.577*** (27.50)
Treat*Post	0.061*** (2.90)	0.008 (0.27)
Mshare	0.475 (1.34)	0.130* (0.26)
ROA	3.048*** (13.15)	3.005*** (12.18)
ALR	0.716*** (7.23)	0.715*** (7.58)
TQ	-0.013 (-1.44)	-0.011 (-1.08)

Variable	TFP	
	No political connection	Existing political connection
LR	0.663*** (7.16)	0.724*** (7.47)
Asset	0.000 (0.55)	0.000 (0.89)
Top10	0.004*** (3.57)	0.003** (2.37)
Inboard	0.000 (0.18)	-0.001 (-0.74)
EN	0.009*** (3.76)	0.006** (2.43)
Nemployee	0.000* (1.84)	0.000 (1.27)
age	0.093* (1.84)	0.088* (1.68)
Individual fixed effects	Yes	Yes
Time fixed effect	Yes	Yes
R ²	0.9130	0.9133

6. CONCLUSION

This study found that the reform significantly improved the TFP of its holding companies; In terms of heterogeneity analysis, this article verifies that for reforms under the State-owned Assets Supervision and Administration Commission of the State Council, the impact of the reforms on their enterprise TFP will be more significant than those at the provincial level. At the same time, this article innovatively incorporates political related variables for heterogeneity analysis, demonstrating that companies with chairman or general manager political connections before the reform, due to their strong political attributes, are relatively less likely to "separate government and enterprise" or "separate government and capital", thereby weakening the improvement effect of the reform on enterprise TFP.

The research conclusion of this article also has important practical significance for promoting high-quality development of the Chinese economy:

Firstly, the research findings of this article provide theoretical support and empirical evidence for the further promotion and improvement of the reform pilot work.

Secondly, the article also provides policy reference on how to build government enterprise relationships that are conducive to economic and social development.

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