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Research on the Impact of Innovation Investment Sustainability on Enterprise Total Factor Productivity

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Abstract

Continuous innovation is an important prerequisite for enterprises to build dynamic competitive advantages in a highly complex and uncertain external environment. Therefore, this paper discusses how to improve the total factor productivity of enterprises from the perspective of the sustainability of innovation input. This paper uses the panel data of Shenzhen and Shanghai listed companies from 2008 to 2023 to test how the sustainability of innovation input affects the total factor productivity of enterprises. The study found that: ① The sustainability of innovation input has a positive correlation with the total factor productivity of enterprises and has passed a series of robustness tests such as the replacement variable method, the addition of control variables method, the lagged one-period method and the elimination of special values. ② The regression coefficient of the impact of the sustainability of innovation input on the total factor productivity of enterprises in the central region is the highest, and the regression coefficient of the impact of the sustainability of innovation input on the total factor productivity of enterprises in the eastern region is the lowest. Among non-state-owned enterprises, the regression coefficient of the impact of the sustainability of innovation input on the total factor productivity of enterprises is higher than that of state-owned enterprises. And relevant suggestions are put forward.

Keywords

continuous innovation investment, enterprise total factor productivity, continuous innovation, state-owned enterprises

1. Introduction

Continuous innovation is an important prerequisite for enterprises to build dynamic competitive advantages in a highly complex and uncertain external environment. It is manifested in the continuity

of the process of technological innovation, capability improvement and benefit acquisition of enterprises, and reflects the long-term knowledge accumulation and technological progress of enterprises in R&D investment, product development or process improvement (Clausen, Pohjola, Sapprasert et al., 2012; Ju, Lu & Yu, 2013). Studies have shown that if enterprises are satisfied with the short-term excess profits brought by successful technological innovation at a certain moment, but the innovation lacks sustainability, the advantages brought by innovation will quickly disappear (Sam & Charlie, 2015). Of course, while maintaining the sustainability of innovation, enterprises should also consider how to combine it with their technological foundation, product development and market expansion to enhance the commercial value brought by innovation and improve profitability (He & Ding, 2015).

Total factor productivity refers to the level of output per unit input. It is defined in the Solow residual accounting framework as the "surplus" in total output caused by technology, institutional changes and other factors other than factor input. It is a direct reflection of resource utilization efficiency. The improvement of total factor productivity of enterprises is not only the core driving force for high-quality economic development, but also the micro-foundation for organizations to maintain competitive advantages and achieve sustainable development. Existing studies have explored the influencing factors of total factor productivity of enterprises from the perspective of environment, organization and managers. Therefore, this paper explores how to improve total factor productivity of enterprises from the perspective of sustainability of innovation input.

2. Study Design

2.1 Sample Data and Sources

This paper uses the panel data of Shenzhen and Shanghai listed companies from 2008 to 2023 to test how the persistence of innovation investment (IIP) affects the total factor productivity (TFP_OP) of enterprises. The basic data of enterprises comes from the Guotai An Database (CSMAR). The sample data is processed as follows: samples in ST and *ST status are eliminated; enterprises in the financial industry are eliminated; missing values are eliminated; continuous variables are winsorized at the 1% and 99% levels.

2.2 Variable Definition

Explained variable: Total factor productivity of enterprises (TFP_OP). This paper follows the method of Wang (2025) and uses the total factor productivity of enterprises calculated by the OP method as the explained variable, and uses the total factor productivity of enterprises calculated by the LP method as the replacement variable.

Explanatory variable: Innovation input sustainability (IIP). This paper refers to the research method of He (2017) and uses the month-on-month growth rate of innovation input multiplied by the current innovation input to measure innovation input sustainability (He & Zhang, 2017). The calculation

formula is as follows:

$$IIP_t = \frac{IIN_t}{IIN_{t-1}} \times IIN_t \quad (1)$$

Control variables. Based on the research results from existing literature, variables such as enterprise size (Size), debt-to-asset ratio (Lev), net profit on assets (ROA), cash flow ratio (Cashflow), growth capability (Growth), equity balance (TOP10), number of independent directors (Indep), and enterprise age (FirmAge) were selected as control variables (Guo & Xiao, 2025; Wang, 2025).

Table 1. Variable Definition Table

Variable Types	Variable Name	Variable Symbols	Variable Definition
Explained variable	Total factor productivity of enterprises	TFP_OP	OP method calculation
Explanatory variables	Sustainability of innovation investment	IIP	See formula (1)
	Enterprise scale	Size	Logarithm of total assets
	Debt-to-asset ratio	Lev	Debt-to-asset ratio
	Net profit from assets	ROA	Net profit margin of total assets
	Cash flow ratio	Cashflow	Cash flow ratio
	Growth Capacity	Growth	Operating income growth rate
Control variables	Equity Balance	TOP10	Number of shares held by the top ten shareholders/total number of shares
	Size of independent directors	Indep	Percentage of independent directors
	Company age	FirmAge	Years of Establishment

2.3 Model Construction

- share listed companies in Shenzhen and Shanghai to study the impact of innovation investment sustainability (IIP) on the total factor productivity (TFP_OP) of enterprises. This paper selects a fixed effect model, and the specific model settings are as follows

$$ITFP\_OP_{it} = \alpha_0 + \alpha_1 IIP_{it} + \delta X_{it} + \lambda_j + \mu_t + \varepsilon_{it} \quad (2)$$

In the above model, i and t in the following table represent the enterprise and year respectively; X is the control variable; λ_j is the industry fixed effect, j is the industry to which enterprise i belongs; μ_t is the year fixed effect; ε_{it} is the random disturbance term, and robust standard errors are used to solve the heteroskedasticity problem.

3. Empirical Analysis

3.1 Descriptive Analysis

Table 2 Descriptive analysis is the descriptive analysis results of the explanatory variable innovation input persistence (IIP), the explained variable enterprise total factor productivity (TFP_OP) and the control variables. Among them, the explanatory variable innovation input persistence (IIP) has a mean of 9.465, a standard deviation of 1.727, a minimum of 2.722 and a maximum of 13.83, indicating that the overall innovation persistence is at a medium-high level, but there is significant differentiation. The mean of 9.465 shows that the innovation input persistence of the sample enterprises is generally high, reflecting that most enterprises can maintain innovation momentum through the continuous growth of R&D investment. This may be related to the continuous support of China's policies for scientific and technological innovation in recent years (such as R&D tax incentives, special subsidies) and the promotion of enterprise digital transformation812. The standard deviation of 1.727 shows that there are large differences between enterprises, and the coefficient of variation (standard deviation/mean) is about 18.25%, indicating that the innovation persistence of some enterprises is much higher or lower than the average level.

The explained variable enterprise total factor productivity (TFP_OP) has a mean of 6.742, a standard deviation of 0.858, a minimum of 3.612, and a maximum of 11.16, indicating that the overall efficiency is at a medium level, but there is significant differentiation. The mean of 6.742 indicates that the total factor productivity of the sample enterprises is at a medium level overall. The standard deviation of 0.858 reflects that the total factor productivity (TFP_OP) of enterprises varies greatly among enterprises, which may be due to differences in technical capabilities, management levels, and resource allocation efficiency. For example, enterprises with significant digital transformation effects (such as large state-owned enterprises) may be close to the maximum value of 11.16, while traditional small and medium-sized enterprises may be concentrated in the low value range. The descriptive situation of the control variables is shown in Table 2 Descriptive Analysis.

Table 2. Descriptive Analysis

Variable	Obs	Mean	Std.	Min	Max
TFP_OP	29,673	6.742	0.858	3.612	11.16
IIP	29,673	9.465	1.727	2.722	13.83

Size	29,673	22.33	1.276	19.58	26.44
Lev	29,673	0.427	0.196	0.0298	0.925
ROA	29,673	0.0357	0.0683	-0.375	0.254
Cashflow	29,673	0.0491	0.0656	-0.224	0.283
Growth	29,673	0.142	0.358	-0.653	3.808
Indep	29,673	37.75	5.449	25	60
Top 10	29,673	0.564	0.150	0.208	0.910
FirmAge	29,673	2.952	0.323	1.099	3.638

3.2 Correlation Analysis

Table 3 shows the correlation analysis results of the explanatory variable innovation input persistence (IIP), the explained variable enterprise total factor productivity (TFP_OP) and the control variables, which include the correlation coefficients between the variables and their significance. The correlation analysis in Table 3 shows that the correlation coefficient between the explanatory variable innovation input persistence (IIP) and the explained variable enterprise total factor productivity (TFP_OP) is 0.410, and is significant at the 1% level. The significance between other variables is mostly at the 10% level. This shows that there is a medium- strength positive correlation between innovation input persistence (IIP) and enterprise total factor productivity (TFP_OP), which preliminarily proves that enterprises with higher innovation input persistence (IIP) tend to have higher enterprise total factor productivity (TFP_OP) ; there may also be certain correlations between other variables, proving the rationality of the selection of control variables.

a multi-collinearity test was performed on the explanatory variable innovation input persistence (IIP), the explained variable enterprise total factor productivity (TFP_OP) and the control variables. The test results showed that the VIF value of Size was 1.94, the VIF value of Lev was 1.62, the VIF value of ROA was 1.62, the VIF value of Cashflow was 1.26, the VIF value of Growth was 1.14, the VIF value of Indep was 1.00, the VIF value of Top10 was 1.13, the VIF value of FirmAge was 1.10, the VIF value of IIP was 1.41 and the average VIF value was 1.36, all of which were less than 5, indicating that there was no multi-collinearity between the sample data, in order to further verify the reliability of the data.

Table 3. Correlation Analysis

	TFP_OP	IIP	Size	Lev	ROA	Cashflow	Growth
TFP_OP	1						
IIP	0.410***	1					
Size	0.738***	0.513***	1				
Lev	0.416***	0.139***	0.468***	1			
ROA	0.150***	0.149***	0.057***	-0.344***	1		

Cashflow	0.107***	0.109***	0.085***	-0.176***	0.435***	1	
Growth	0.125***	0.098***	0.037***	0.021***	0.289***	0.041***	1
Indep	0.00700	0.012**	0.011*	-0.010*	-0.023***	-0.00400	-0.016***
Top 10	0.123***	0.093***	0.157***	-0.070***	0.228***	0.147***	0.095***
FirmAge	0.178***	0.019***	0.184***	0.111***	-0.086***	0.015**	-0.099***

	Indep	Top 10	FirmAge
Indep	1		
Top 10	0.033***	1	
FirmAge	-0.00300	-0.161***	1

t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01.

3.3 Main Effect Analysis

Before analyzing the main effect, it is necessary to test the sample data, which is helpful to select the appropriate model for analysis and ensure the reliability of the sample data results. This study uses the Hausman test to perform a Hausman test on the sample data. According to the test results, a more appropriate model can be selected from the fixed effect and random effect models. Through the test, the result of the Hausman test is chi2(9)=695.54; Prob>chi2=0.0000, so the fixed effect model is selected.

In the main effect analysis of Table 4, column (1) is the result without adding control variables and fixed effects; column (2) is the result without adding control variables and fixed effects; column (3) is the result without adding control variables and fixed effects; column (4) is the result with adding control variables and fixed effects. The regression coefficients are all positive and significant at the 1% level, proving that there is a positive relationship between the explanatory variable innovation input persistence (IIP) and the explained variable enterprise total factor productivity (TFP_OP), that is, the higher the innovation input persistence (IIP), the higher the enterprise total factor productivity (TFP_OP).

Table 4. Main Effect Analysis

	(1) TFP_OP	(2) TFP_OP	(3) TFP_OP	(4) TFP_OP
IIP	0.2039 ***	0.0203 ***	0.2580 ***	0.0456 ***
	(77.4747)	(9.1732)	(73.4551)	(13.5164)
Size		0.4127 ***		0.3762 ***
		(117.3482)		(85.6639)
Lev		0.7403 ***		0.6044 ***
		(35.4259)		(27.4729)

ROA		1.9030 ***		1.8542 ***
		(31.6779)		(26.5806)
Cashflow		0.1437 ***		0.2648 ***
		(2.6047)		(4.3318)
Growth		0.1362 ***		0.1437 ***
		(14.2119)		(13.1564)
Indep		0.0009		-0.0003
		(1.4976)		(-0.6319)
Top 10		0.0200		0.0203
		(0.8789)		(0.9671)
FirmAge		0.1720 ***		0.0690 ***
		(16.4752)		(6.2941)
_cons	4.8114 ***	-3.6278 ***	4.2996 ***	-2.6475 ***
	(189.9840)	(-52.0316)	(125.6792)	(-32.1664)
N	29673	29673	29673	29673
adj. R^2	0.168	0.583	0.483	0.683

t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01.

3.4 Robustness Analysis

In order to ensure the reliability of the sample data, it is necessary to conduct a robustness test on the sample data. According to the existing methods, this study selected the replacement explanatory variable method, the addition of control variables method, the one-period lag method, and the removal of special samples for robustness testing. Different measurement methods may have different effects on the results, so it is necessary to use the replacement variable method and other measurement methods for verification. The first column (1) of Table 5 Robustness Analysis is the analysis result of the replacement variable method. Its regression coefficient is 0.0844 and is significant at the 1% level, which is the same as the result before replacement. Both are normal and significant, which preliminarily illustrates the robustness of the sample data.

Affected by the control variables, the analysis results may change due to the variables not added. Therefore, the method of adding control variables is used for testing. This study adds three variables: institutional investor shareholding ratio (INST), management shareholding ratio (Mshare), and management expense ratio (Mfee). The second column of the robustness analysis in Table 5 is the analysis result of adding control variables. Its regression coefficient is 0.0492 and is significant at the 1% level, which is the same as the result before adding control variables. Both are normal and significant, further verifying the robustness of the sample data.

The sustainability of innovation input may have a certain lag effect, so a one-period lag is used for

robustness testing. The first column (3) of the robustness analysis in Table 5 is the analysis result of the one-period lag method. Its regression coefficient is 0.064 and is significant at the 1% level, which is the same as the result before the one-period lag, both of which are normal and significant, which once again verifies the robustness of the sample data.

The existence of special samples may affect the general results and cause a certain degree of deviation. Therefore, the method of removing special samples is used to conduct robustness test. China's four municipalities, namely Beijing, Tianjin, Shanghai, and Chongqing, may be affected by policies or other factors. The sample data in this range have certain special characteristics. Therefore, the sample data of the four municipalities are removed. The first column (3) of Table 5 Robustness Analysis is the analysis result of the method of removing special values. Its regression coefficient is 0.0538 and is significant at the 1% level, which is the same as the result before removal. Both are normal and significant, verifying the robustness of the sample data.

Table 5. Robustness Analysis

	(1)	(2)	(3)	(4)
	TFP_LP	TFP_OP	TFP_OP	TFP_OP
IIP	0.0844 ***	0.0492 ***		0.0538 ***
	(24.0924)	(16.2250)		(14.8140)
Size	0.5186 ***	0.3309 ***	0.3635 ***	0.3618 ***
	(114.3580)	(81.1916)	(75.3250)	(75.4640)
Lev	0.8062 ***	0.3165 ***	0.6025 ***	0.6013 ***
	(35.4591)	(16.2943)	(25.0575)	(25.0898)
ROA	2.1089 ***	0.8207 ***	1.7611 ***	1.7956 ***
	(28.6773)	(13.4024)	(23.3601)	(23.3055)
Cashflow	0.5335 ***	0.1513 ***	0.2821 ***	0.2246 ***
	(8.7190)	(2.7906)	(4.2216)	(3.4372)
Growth	0.1202 ***	0.0976 ***	0.1836 ***	0.1492 ***
	(10.9770)	(10.4466)	(15.5105)	(12.2912)
Indep	-0.0015 ***	0.0011 **	-0.0002	0.0003
	(-2.7519)	(2.2439)	(-0.3425)	(0.4573)
Top 10	0.0909 ***	0.0350	0.0233	0.0208
	(4.2435)	(1.1913)	(1.0130)	(0.9190)
FirmAge	0.1061 ***	0.0310 ***	0.0789 ***	0.0295 **
	(9.4159)	(3.0889)	(6.2964)	(2.4463)
INST		-0.0522 **		
		(-2.2520)		

Mshare		-0.0018 ***		
		(-6.9174)		
Mfee		-4.3251 ***		
		(-58.8824)		
L.IIP			0.0604 ***	
			(15.9269)	
_cons	-4.7274 ***	-1.0413 ***	-2.5473 ***	-2.3321 ***
	(-55.9776)	(-12.8835)	(-28.2570)	(-25.7834)
N	29673	28886	24488	24230
adj. R^2	0.776	0.749	0.687	0.680

t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01.

3.5 Heterogeneity Analysis

In order to explore the results of different enterprises and provide some guidance for enterprises to make more reasonable decisions according to their own conditions, heterogeneity analysis is conducted. Table 6 shows the results of different enterprises divided by region and property rights. Table 6 Heterogeneity Analysis (1) shows the sample data results of the central region, with a regression coefficient of 0.0715, which is significant at the 1% level; Table 6 Heterogeneity Analysis (2) shows the sample data results of the eastern region, with a regression coefficient of 0.0280, which is significant at the 1% level; Table 6 Heterogeneity Analysis (3) shows the sample data results of the western region, with a regression coefficient of 0.0499, which is significant at the 1% level; Table 6 Heterogeneity Analysis (4) shows the sample data results of state-owned enterprises, with a regression coefficient of 0.0376, which is significant at the 1% level; Table 6 Heterogeneity Analysis (5) shows the sample data results of non-state-owned enterprises, with a regression coefficient of 0.0487, which is significant at the 1% level.

of innovation input sustainability (IIP) on the total factor productivity (TFP_OP) of enterprises in the central region is the highest, and the regression coefficient of the impact of innovation input sustainability (IIP) on the total factor productivity (TFP_OP) of enterprises in the eastern region is the lowest. The possible reasons are: in the central region, the "increasing marginal returns" during the innovation catch-up period. The scarcity of innovation resources amplifies the conversion efficiency: enterprises in the central region generally face constraints on innovation resources (funds, talents), and limited innovation investment tends to be invested in mature technology improvements or efficient application fields (such as manufacturing process optimization), which can quickly form productivity improvements. The technology absorption capacity is in an upward period. The technical foundation of enterprises in the central region is weak, but they have a certain digestion capacity. At this time, increasing innovation investment is likely to trigger the "low-hanging fruit effect", and the productivity

per unit input is significantly improved. The policy dividends are released in a concentrated manner. Under the strategy of the rise of the central region, local governments have strong policies on innovation subsidies, tax incentives, etc., and policy synergy has amplified the utilization efficiency of enterprise innovation resources. In the eastern region, the "diminishing marginal returns" during the innovation frontier period. Innovation has entered a deep water zone, and enterprises in the east are close to the technological frontier. Innovation is mostly concentrated in high-risk, long-cycle original research and development (such as chips and biomedicine). There is a long lag from input to output, and the short-term pull on TFP is weakened. Resource mismatch and crowding effect, the fierce innovation competition in the east may lead to repeated research and development or talent competition to push up costs. Some enterprises' innovation investment has fallen into "involution", and the marginal benefits per unit of investment have declined.

- state-owned enterprises, the regression coefficient of innovation input persistence (IIP) on total factor productivity (TFP_OP) is higher than that of state-owned enterprises. The possible reasons are: in terms of innovation goals, non-state-owned enterprises are profit-oriented, while state-owned enterprises are multi-goal-oriented. In terms of core goals, non-state-owned enterprises are profit maximization and market competition survival, while state-owned enterprises are economic + social goals (employment, taxation, strategic security). In terms of innovation motivation, non-state-owned enterprises focus on technology upgrades directly converted into cost advantages or market share, while state-owned enterprises focus on completing policy tasks and maintaining technological follow-up.

Table 6. Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)
	TFP_OP	TFP_OP	TFP_OP	TFP_OP	TFP_OP
IIP	0.0715 ***	0.0280 ***	0.0499 ***	0.0376 ***	0.0487 ***
	(10.0195)	(6.4200)	(6.3795)	(7.6464)	(10.4277)
Size	0.3230 ***	0.3942 ***	0.3771 ***	0.3957 ***	0.3558 ***
	(29.3412)	(73.9598)	(32.1319)	(56.6257)	(59.9930)
Lev	0.5907 ***	0.6493 ***	0.5928 ***	0.5218 ***	0.6166 ***
	(10.7786)	(24.4929)	(9.6936)	(13.3492)	(22.9473)
ROA	1.8336 ***	1.8106 ***	2.3911 ***	2.2170 ***	1.7528 ***
	(11.2840)	(21.7115)	(11.6027)	(15.2608)	(22.1558)
Cashflow	0.2547 *	0.1739 **	0.8634 ***	0.3418 ***	0.2570 ***
	(1.9335)	(2.3747)	(5.1166)	(3.1858)	(3.5116)
Growth	0.1264 ***	0.1554 ***	0.1143 ***	0.1854 ***	0.1287 ***
	(5.6747)	(11.6290)	(3.9987)	(9.9705)	(9.5824)
Indep	-0.0008	-0.0016 **	0.0078 ***	0.0015	-0.0013 **

	(-0.6215)	(-2.5185)	(4.9843)	(1.6020)	(-2.0536)
Top 10	0.0231	-0.0291	0.1031	-0.0164	0.0232
	(0.4468)	(-1.1700)	(1.5710)	(-0.4083)	(0.9209)
FirmAge	0.0803 ***	0.0576 ***	0.2133 ***	0.1093 ***	0.0476 ***
	(2.7463)	(4.5711)	(6.2327)	(4.9301)	(3.7238)
_cons	-1.7810 ***	-2.7569 ***	-3.6102 ***	-3.1237 ***	-2.1516 ***
	(-8.5226)	(-28.1990)	(-15.0589)	(-22.2639)	(-19.8607)
N	5131	21321	3172	10491	19146
adj. R^2	0.695	0.689	0.739	0.709	0.647

t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01.

4. Conclusions and Suggestions

By selecting sample data of Shenzhen and Shanghai A-share listed companies from 2008 to 2023, this paper studies the impact of innovation input persistence (IIP) on enterprise total factor productivity (TFP_OP). The following conclusions are drawn through the analysis of sample data: ① Innovation input persistence (IIP) is positively correlated with enterprise total factor productivity (TFP_OP), that is, the higher the innovation input persistence (IIP), the higher the enterprise total factor productivity (TFP_OP), and a series of robustness tests such as replacement variable method, adding control variable method, one-period lag method and eliminating special values have been passed. ② The regression coefficient of the impact of innovation input persistence (IIP) on enterprise total factor productivity (TFP_OP) in the central region is the highest, and the regression coefficient of the impact of innovation input persistence (IIP) on enterprise total factor productivity (TFP_OP) in the eastern region is the lowest. Among non - state-owned enterprises, the regression coefficient of the impact of innovation input persistence (IIP) on enterprise total factor productivity (TFP_OP) is higher than that of state-owned enterprises. Based on the above conclusions, the following suggestions are put forward:

⑴ Establish a step-by-step incentive mechanism for "continuous innovation". The tax incentives are progressively designed to link the additional deduction ratio of R&D expenses with the duration of innovation sustainability. Establish an "innovation sustainability annuity" to pay government innovation annuities to enterprises that maintain sustainable growth in innovation investment (IIP) at a certain proportion of the average annual increase in innovation investment sustainability (IIP).

⑵ Implement the "precision drip irrigation" strategy of innovation incentives to solve the regional conversion efficiency gap

Eastern region: shift from "input quantity" to "innovation quality". Establish a tax credit system for basic research to encourage enterprises to overcome "stuck neck" technologies. Pilot long-cycle innovation funds, guide social capital to invest in cutting-edge fields such as semiconductors and biomedicine through government mother funds, and alleviate the short-term pressure on the

transformation of total factor productivity (TFP_OP) of enterprises. In the central region, strengthen the " technology application-industrialization" chain. Establish special subsidies for technological transformation of manufacturing industry to promote the continuous investment of innovation (IIP) to upgrade mature technologies. Build regional pilot bases to reduce the engineering cost of innovative achievements and shorten the cycle of improving total factor productivity (TFP_OP) of enterprises. Regional collaboration to build an enclave economy of "Eastern R & D-Central mass production". Establish offshore innovation centers in the Yangtze River Delta/Pearl River Delta, give priority to the industrialization of R&D achievements in the central parks, and achieve the complementarity of innovation investment continuity (IIP) efficiency.

(3) Deepen the reform of state-owned enterprises and activate the "institutional engine" of innovation efficiency.

Implement the "innovation betting" mechanism. State-owned enterprises need to sign a betting agreement on the improvement of enterprise total factor productivity (TFP_OP) to obtain innovation subsidies. If they fail to meet the standards, they will return the fiscal funds in proportion. Pilot the "R & D team follow-up investment system" to allow core technical personnel to participate in major R&D projects by converting their salary into shares + cash follow-up investment. Establish a "red and black list of innovation efficiency". The State-owned Assets Supervision and Administration Commission will include the improvement value of the enterprise total factor productivity (TFP_OP) of the unit's innovation investment sustainability (IIP) in the assessment of state-owned enterprise leaders.

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