Effect of Government Subsidies on the New Quality Productive Forces of Enterprises: An Empirical Study Based on A-Share Listed Companies

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Using data from China's A-share listed companies from 2010 to 2023, we employ the entropy weight method to create an enterprise-level new quality productive forces (NQPF) index to assess the impact of government subsidies on enterprises' NQPF. Our findings indicate that government subsidies can generally enhance the NQPF levels of enterprises, though with notable regional, industrial, and technological variations. In particular, government subsidies can significantly boost NQPF levels in the eastern region. Additionally, these subsidies have a substantial positive effect on technology-intensive and capital-intensive enterprises, while their impact on labor-intensive enterprises is limited. Furthermore, our mechanism analysis suggests that government subsidies can improve NQPF by alleviating financing constraints, enhancing digitalization levels, and stimulating innovation within enterprises.

Keywords: new quality productive forces, government subsidies, entropy weight method, innovation

1. Introduction

The concept of new quality productive forces (NQPF) was introduced in September 2023, referring to the integration of scientific and technological innovation resources that drive the development of strategic emerging industries and future industries. Since its inception, the notion of NQPF has gained traction at the policy level and sparked extensive discussion in academic circles. For enterprises, NQPF has become a crucial factor in enhancing competitiveness and innovation capacity, significantly impacting the long-term development of the national economy. In the context of globalization and intense competition, NQPF has emerged as a key driver of national economic competitiveness, with innovation capabilities and productivity levels playing a critical

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role in the economy's sustained growth.

Academically, NQPF encompasses the ability of enterprises to achieve high value-added and high-quality development through innovation, technological advancement, and management improvement. Unlike traditional productivity, NQPF is a multi-dimensional concept that includes various elements such as technological innovation and industrial upgrading.

From the perspective of measuring NQPF, Zhu *et al.* (2024) constructed an evaluation index system for NQPF and found that, while China's overall NQPF level remains relatively low, it has been steadily increasing. Sun and Guo (2024) also employed the indicator system method and discovered that the NQPF level in the eastern region was significantly higher than that in the central, western, and northeastern regions.

Technological innovation serves as a key driver in the formation of NQPF. It reshapes production processes through technological breakthroughs, industrial upgrades, and efficiency improvements, enabling economic development characterized by higher quality. For example, Gui *et al*. (2024) examined provincial panel data from the perspective of total factor productivity and found that green technological innovation significantly promotes the formation of NQPF. Cao *et al*. (2024) studied data from A-share listed companies and discovered that breakthrough innovations within enterprises can significantly advance the development of NQPF, while incremental innovations have an insignificant impact. As a prominent area of current technological innovation, the digital economy plays a crucial role in promoting the formation of NQPF (Jiao and Du, 2024). In this area, Wu *et al*. (2024) studied 41 cities in the Yangtze River Delta and constructed a new productivity evaluation system, concluding that the digital economy enhances NQPF levels in the region and generates spillover effects. Furthermore, Shi and Sun (2024) highlighted that data elements can improve total factor productivity, thereby promoting NQPF development, with a more significant impact on service-oriented enterprises than on manufacturing enterprises. Duan *et al*. (2024) demonstrated that constructing digital infrastructure contributed to NQPF growth by promoting digital finance and enhancing enterprises' utilization of data elements. Liu (2024) analyzed how the development of NQPF, represented by intelligent technology, would reshape the form, structure, and nature of production relations, such as reducing the coordination of human–human relations while increasing the importance of human–machine coordination. Liang *et al*. (2025) analyzed how technological innovation strongly supported the formation of a modern industrial system through basic, critical, and disruptive technological breakthroughs and their application to the industrial system—facilitating the transformation of traditional industries, promotion of emerging industries, and emergence of future industries.

Fiscal subsidies provide direct financial support to stimulate corporate technological innovation and R&D activities, effectively cultivating NQPF. In recent years, the Chinese government has intensified its support for technological innovation to stimulate R&D investment, facilitate technological advancement, and promote industrial upgrading. However, the effectiveness of government subsidies remains a subject of debate. Some studies have indicated that the impact of financial subsidies on corporate R&D investment is uncertain and depends on factors such as their attributes and scale. For example, González and Pazó (2008), using data from Spanish manufacturing firms, found no full or partial "crowding-out effect" between public and private R&D expenditures. The impact of public support on private R&D investment also varies by company size and technological level. Bronzini and Piselli (2016) examined the effect of an R&D subsidy program implemented in northern Italy on corporate R&D. Their empirical results revealed that the program significantly promoted patent applications, particularly among small companies. Tong *et al*. (2018) analyzed data from China's listed companies from 2012 to 2016 and found that fiscal subsidies significantly boosted the R&D investment of mature-stage companies, while having less impact on start-ups. Lu and Lu (2019) studied listed manufacturing companies from 2008 to 2016, showing that fiscal subsidies had a double threshold effect on the R&D investment of manufacturing enterprises.

In terms of innovation efficiency, existing literature also presents considerable differences. For example, Bai and Li (2011) and Lu and Li (2016) employed a stochastic frontier model and found that government subsidies significantly improved the innovation efficiency of high-tech enterprises. Conversely, Li *et al*. (2015) and Ren (2019) concluded that government subsidies exerted a suppressive effect on firms' innovation efficiency. Furthermore, government subsidies may lead to resource misallocation, inducing strategic innovative behaviors by enterprises, such as "rent-seeking R&D," which can weaken policy effectiveness (Zúñiga-Vicente *et al*., 2014). Some research has also confirmed the negative effects of government subsidies in China. Wang and Zhang (2020) argued that the combination of government subsidies and tax incentives may reduce enterprise innovation efficiency due to adverse selection and a dual "crowding-out effect."

Based on the above literature and relevant theories, we propose the following hypotheses:

H1: Government subsidies can promote the NQPF of enterprises.

H2: Government subsidies can alleviate the financing constraints for enterprises, enhance their digitalization level, and stimulate innovation, thereby improving their NQPF.

The rest of the paper is structured as follows: Section 2 employs the entropy method to measure enterprise-level NQPF; Section 3 conducts an empirical analysis of the new productivity cultivation effect of government subsidies and examines the heterogeneity from regional, industrial, and technological perspectives; Section 4 highlights the potential impact mechanisms of government subsidies; and Section 5 summarizes our findings and provides policy recommendations.

2. Measurement of NQPF and Research Methods

This section employs the entropy method to measure NQPF and introduces the models and data used in the subsequent empirical analysis.

2.1. Measurement of NQPF

We adopt the entropy method to construct an NQPF index. According to existing literature, it is measured using three primary indicators: enterprise innovation capability, financial sustainability, and long-term development potential. In particular, innovation capabilities include four secondary indicators: employee salary level, proportion of highly educated employees, proportion of R&D investment, and number of patent applications. Corporate financial sustainability encompasses Tobin's Q, financial leverage, operating leverage, comprehensive leverage, total asset turnover rate, and return on total assets. The long-term development potential of an enterprise includes secondary indicators such as the proportion of institutional investors, proportion of fixed assets, degree of digitalization, proportion of intangible assets, and environmental investment.

Table 1. Entropy Method to Construct NQPF Indicators of Listed Companies

Primary indicators	Secondary indicators	Measurement	Property	Weight
Innovation capabilities	Employee salary level	Average employee salary/Operating income	Positive	1%
	Proportion of highly educated	Personnel with master's and doctor's Degrees/Total number of employees	Positive	7%
	Proportion of number of R&D	Number of R&D personnel/Total number of employees	Positive	5%
	R&D investment as a proportion of operating income	R&D funds/Operating income	Positive	18%
	Number of patent applications	Number of patents applied for	Positive	16%
Financial sustainability	Tobin Q	Market value /Total assets	Positive	7%
	Financial leverage	(Net income+ Income tax expense+ Financial charges)/(Net profit+ Income tax expense)	Negative	1%

Primary indicators	Secondary indicators	Measurement	Property	Weight
Financial sustainability	Operating leverage	(Net profit+ Income tax expense +Financial charges+ Depreciation of fixed assets, depreciation of oil and gas assets, depreciation of productive biological assets+ Amortization of intangible assets+ Amortization of long-term deferred expenses)/(Net profit+ Income tax expense +Financial charges)	Negative	1%
	Comprehensive leverage	(Net profit+ Income tax expense+ Financial charges+ Depreciation of fixed assets, depreciation of oil and gas assets, depreciation of productive biological assets+ Amortization of intangible assets+ Amortization of long-term deferred expenses)/(Net profit+ Income tax expense)	Negative	1%
	Total asset turnover ratio	Sales revenue/Total assets	Positive	2%
	Return on total assets	Net profit/Net profit	Positive	1%
Long term development potential	Institutional investors' shareholding ratio	Institutional investor holdings/Total number of shares	Positive	2%
	Proportion of fixed assets	Fixed assets/Total assets	Positive	1%
	Enterprise digitalization degree	Number of mentions of digital-related words in annual reports	Positive	4%
	Proportion of intangible assets	Intangible assets/Total assets	Positive	1%
	Environmental investment	Amount of investment in environmental protection	Positive	32%

2.2. Variable Selection and Data Processing

The dependent variable in this study is *NQPF*, which is constructed using the entropy method based on the index system outlined in Table 1. In particular, the entropy weight method calculates the weights of indicators by assessing their information entropy. A higher degree of dispersion (or a lower entropy value) results in a greater weight for the indicator. This method objectively reflects the informational value of the data, avoiding subjective bias, and is particularly suitable for evaluating multidimensional complex systems such as NQPF. A key advantage is its ability to automatically enhance the contributions of significantly differentiated indicators, such as R&D intensity and digital investment. The weights are computed autonomously, unlike subjective assignments made in methods such as the analytic hierarchy process (AHP). Consequently, the weights are entirely determined by the degree of dispersion in the data itself. We use the logarithm of the amount of government subsidy as the explanatory variable.

To analyze the impact mechanism of government subsidies, we consider corporate innovation and financing constraints as mediating variables between government subsidies and NQPF. Innovation is divided into two components: innovation input and innovation output. Innovation input is measured by the proportion of government R&D expenditures to operating revenue, while innovation output is assessed using the logarithm of the number of invention and design patents. Financing constraints refer to the limitations or challenges faced by enterprises in obtaining external funds (such as bank loans or equity financing) to support their operations and expansion activities. We employ the *WW* index to measure the financing constraints encountered by enterprises (see Table 2 for the calculation method).

Based on existing literature, we select the following variables as control variables: age of the enterprise (*Age*), leverage ratio (*Lev*), return on total assets (*ROA*), management structure (*Dual*), whether it is a state-owned enterprise (*SOE*), whether it undergoes a Big Four audit (*Big4*), and the separation rate (*Separation*). In addition, industry fixed effects and time fixed effects are considered.

Table 2. Variable Names and Calculation Methods

Variable type	Variable name	Calculation method
Explained variable	*NQPF*	Entropy method construction
Explanatory variables	Government subsidies (*Subsidy*)	The logarithm of the government subsidy amount (Unit: 10,000 Yuan); government subsidies as a proportion of operating income
Control variables	Separation rate of two powers (*Separation*)	(Control ratio-ownership ratio)/Control ratio
	Leverage (*Lev*)	Total liabilities/Total assets
	Equity checks and balances (*Balance*)	∑(Shareholder *m* holds shares×Shareholder *m* power score) / ∑(All shareholders hold shares × Shareholder power score)
	Enterprise age (*Age*)	Current year - Year of establishment
	Return on total assets (*ROA*)	Income/Total assets
	Management situation (*Dual*)	The two positions of Chairman and General Manager are combined into one. It is 1 if the two positions are combined into one, 0 if not
	Is it Big Four audit? (*Big*4)	1 for Big Four audits, 0 for non-Big Four audits
	Profitability (*EPS*)	Expressed as earnings per share. *EPS* = Net profit for the current period attributable to ordinary shareholders/Weighted average number of ordinary shares outstanding for the current period
	Nature of property rights (*SOE*)	1 for state-owned enterprises and 0 for non-state-owned enterprises.

Variable type	Variable name	Calculation method
Mediating variable	Degree of digital transformation (*DigTras*)	Frequency of appearance in corporate annual reports
	Financing constraints (*WW*)	WW=–0.091×CF–0.062×$DivPos$+0.021×Lev–0.044×$Size$+0.102×ISG–0.035×SG
	Innovation output (*Innovation*)	Add one to the number of patent authorizations and take the logarithm

The data are sourced from the CSMAR database, covering A-share listed companies in China from 2010 to 2023. To ensure the reliability and robustness of the research findings while mitigating the impact of outliers, we ultimately obtain panel data from 4,334 companies, resulting in a total of 16,501 sample observations.

2.3. Model Settings

To examine the nurturing effect of government subsidies on enterprises' NQPF, the benchmark model is constructed as follows:

$$\begin{aligned} NQPF_{it} = {} & \beta_0 + \beta_1 Subsidy_{it-1} + \beta_2 \sum Controls \\ & + \beta_3 \sum Industry + \beta_4 \sum Year + \varepsilon_{it} \end{aligned} \tag{1}$$

where t represents the year, i represents the enterprise, $NQPF_{it}$ represents the enterprise's NQPF, $Subsidy_{it\text{-}1}$ represents government subsidies received in the previous period (lagged by one year), *Controls* represents all control variables, and ε_{it} is the random error term.

To explore the mechanism through which government subsidies influence NQPF, a mediation model is employed as follows:

$$\begin{aligned} NQPF_{it} = {} & \beta_0 + \beta_1 Subsidy_{it-1} + \beta_2 \sum Controls + \beta_3 \sum Industry \\ & + \beta_4 \sum Year + \varepsilon_{it} \end{aligned} \tag{2}$$

$$MV = \gamma_0 + \gamma_1 Subsidy_{it-1} + \gamma_2 \sum Controls + \gamma_3 \sum Industry + \gamma_4 \sum Year + \varepsilon_{it} \tag{3}$$

$$\begin{aligned} NQPF_{it} = {} & \beta_0 + \beta_1 Subsidy_{it-1} + \beta_2 \sum Controls + \beta_3 \sum Industry \\ & + \beta_4 \sum Year + \beta_5 \mathrm{MV} + \varepsilon_{it} \end{aligned} \tag{4}$$

where MV is the mediating variable. The descriptive statistical results of each variable in the article are shown in Table 3.

Table 3. Descriptive Statistical Analysis

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
NQPF	40411	5.168	1.428	1.637	9.344
Subsidy	22187	4225.965	7539.226	20.412	43613.039
ln*Subsidy*	22173	7.304	1.522	3.079	10.683
Age	40404	18.265	6.138	0	64
Lev	40411	0.415	0.206	0.049	0.853
ROA	40411	0.038	0.058	–0.288	0.171
Balance	40368	0.751	0.593	0.028	2.452
Dual	39589	0.302	0.4593	0	1
*Big*4	40093	0.064	0.238	0	1
Separation	38335	4.516	7.037	0	30.055
WW	34722	–1.015	0.073	–1.215	–0.811
HighPol	40411	0.252	0.434	0	1
Manufact	40411	0.658	0.474	0	1
East	40388	0.709	0.454	0	1
Middle	40388	0.173	0.378	0	1
West	40388	0.119	0.323	0	1

3. Impact of Government Subsidies on NQPF

In this section, we first use the benchmark model to test the effect of government subsidies on NQPF. Additionally, we conduct further analysis on the heterogeneous influence from the perspectives of region, industry, and enterprise technology.

3.1. Benchmark Regression Results

Table 4 presents the results of the benchmark regression. Column (1) shows the regression result without control variables, column (2) includes control variables, column (3) incorporates industry and time fixed effects, and column (4) considers the fixed effects of individual enterprises.

Table 4. Benchmark Regression Results

	(1)	(2)	(3)	(4)	(5)
Variables	*NQPF*	*NQPF*	*NQPF*	*NQPF*	*NQPF* (2SLS)
Subsidy	0.068***	0.113***	0.118***	0.048***	0.044***
	(0.008)	(0.007)	(0.007)	(0.009)	(0.003)
Age		–0.033***	–0.018***	–0.343***	–0.001**
		(0.003)	(0.003)	(0.009)	(0.001)
Lev		–0.250***	–0.075	–0.239***	–0.206***
		(0.067)	(0.062)	(0.083)	(0.023)
ROA		7.288***	7.573***	7.662***	–0.335***
		(0.120)	(0.112)	(0.119)	(0.059)
Balance		0.127***	0.089***	0.090***	0.027***
		(0.022)	(0.020)	(0.027)	(0.006)
Dual		0.051**	0.036*	0.000	0.019**
		(0.021)	(0.020)	(0.023)	(0.008)
Big4		0.018	0.066	0.053	–0.028*
		(0.057)	(0.051)	(0.073)	(0.015)
Separation		0.000	0.003**	0.003	–0.001*
		(0.002)	(0.002)	(0.002)	(0.001)
Constant	5.055***	5.201***	4.056***	10.881***	–0.243***
	(0.063)	(0.076)	(0.154)	(0.319)	(0.038)
Year fixed effects	No	No	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	Yes
Individual fixed effects	No	No	No	Yes	Yes
Observations	17,927	16,497	16,497	16,497	12,219
R^2				0.348	0.302

Note: (1) ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively. The values of standard error are in brackets (based on White's heteroskedasticity robust standard error). The same applies below.

In column (1), without control variables, the regression coefficient for government subsidies is 0.068 and is significant at the 1% level, indicating that government subsidies play a significant role in promoting the NQPF of enterprises. After adding control variables, the regression coefficient in column (2) increases from 0.068 to

0.113, suggesting that the impact of government subsidies becomes more pronounced. Regarding control variables, the coefficient for enterprise age on NQPF is significantly negative, indicating that enterprises in the early stages of development are more likely to adopt new technologies and management methods. The debt-to-asset ratio also has a significant negative effect on the NQPF of enterprises, meaning that enterprises with higher leverage face greater financial constraints, which hinders their ability to enhance NQPF. The coefficients for variables such as total asset return rate and equity balance are all significantly positive, indicating that these factors can substantially promote the NQPF of enterprises. Column (3) incorporates industry and year fixed effects, and the coefficient for government subsidies remains significantly positive, suggesting that the effect of subsidies on NQPF persists even after accounting for industry and time influences. Column (4) further includes individual fixed effects, and the coefficient for government subsidies remains positive and significant at the 1% level, reinforcing the robustness of our findings. Additionally, we employ instrumental variable regression in our robustness testing. Using lagged variables as instrumental variables, column (5) presents the results of 2SLS regression. The results indicate that the coefficients are similar to those in column (4) in both direction and magnitude.

3.2. Heterogeneity Analysis of the Impact of Government Subsidies

Considering the regional, industrial, and technological differences among enterprises, we conduct a heterogeneous analysis of these factors that may influence the relationship between government subsidies and NQPF.

First, following Shen *et al*. (2021), we categorize firms into three regional groups: eastern, central, and western China. Table 5 presents the regression results for the regional heterogeneity analysis. Column (1) reports the full sample regression results, while column (2) to (4) provide the empirical results for the eastern, central, and western regions, respectively.

Table 5. Regional Heterogeneity

	(1)	(2)	(3)	(4)
	All	East	Middle	West
Variables	*NQPF*	*NQPF*	*NQPF*	*NQPF*
Subsidy	0.048***	0.061***	0.006	0.009
	(0.009)	(0.011)	(0.022)	(0.023)
Age	–0.344***	–0.379***	–0.221***	–0.270***
	(0.009)	(0.011)	(0.022)	(0.027)
Lev	–0.239***	–0.338***	–0.271	0.083
	(0.083)	(0.099)	(0.199)	(0.235)

Variables	(1) All NQPF	(2) East NQPF	(3) Middle NQPF	(4) West NQPF
ROA	7.662***	7.647***	7.508***	7.591***
	(0.119)	(0.137)	(0.320)	(0.364)
Balance	0.090***	0.118***	–0.023	–0.001
	(0.027)	(0.033)	(0.066)	(0.083)
Dual	0.000	–0.016	0.063	0.035
	(0.023)	(0.026)	(0.060)	(0.071)
*Big*4	0.053	–0.013	0.737***	–0.041
	(0.073)	(0.084)	(0.250)	(0.188)
Separation	0.003	0.004*	0.000	0.002
	(0.002)	(0.003)	(0.006)	(0.005)
Constant	10.893***	11.403***	11.055***	10.352***
	(0.319)	(0.354)	(0.629)	(0.873)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes
Observations	16,501	12,002	2,700	1,795
R^2	0.348	0.366	0.315	0.334
Number of Stkcd	4,334	3,186	715	460
Experience P value				
East versus Middle	0.001***			
East versus West	0.000***			
Middle versus West	0.038			

As shown in Table 5, the coefficient of government subsidies in column (2) is 0.060 and is significant at the 1% level, indicating that government subsidies significantly enhance NQPF in enterprises located in the eastern region. In contrast, although the regression coefficients of columns (3) and (4) are similar to that of column (2), they are not statistically significant, suggesting that government subsidies do not play a significant role in improving NQPF for enterprises in the central and western regions. This disparity may be attributed to the eastern region being more developed, with a concentrated population and active innovation, allowing government subsidies to have a more pronounced effect. The limited impact of government subsidies on enterprises in the central and western regions can be attributed to several factors. These regions are primarily dominated by resource-based and low value-added industries, where subsidies are often used to maintain traditional capacity (such as in energy and primary processing), making it challenging to promote technological upgrades. Additionally, local fiscal pressure is high in central and western regions, leading to delays in subsidy disbursement or the imposition of non-economic conditions (such as tying subsidies to local tax revenue), which weakens the effectiveness of these policies.

Second, following Peng and Mao (2017), we categorize enterprises into high-tech and non-high-tech industries. Columns (1) to (3) in Table 6 present the regression results for the full sample, the high-tech industry, and the non-high-tech industry, respectively.

Table 6. Industrial Heterogeneity

	(1)	(2)	(3)
	All	HT	Non-HT
Variables	*NQPF*	*NQPF*	*NQPF*
Subsidy	0.048***	0.063***	0.033***
	(0.009)	(0.013)	(0.012)
Age	–0.345***	–0.364***	–0.316***
	(0.009)	(0.012)	(0.014)
Lev	–0.239***	–0.240**	–0.261**
	(0.083)	(0.110)	(0.127)
ROA	7.662***	7.444***	7.848***
	(0.119)	(0.158)	(0.184)
Balance	0.090***	0.100***	0.083*
	(0.027)	(0.035)	(0.045)
Dual	0.001	0.005	–0.003
	(0.023)	(0.030)	(0.035)
*Big*4	0.053	0.089	0.015
	(0.073)	(0.103)	(0.105)
Separation	0.003	0.007**	–0.001
	(0.002)	(0.003)	(0.003)
Constant	10.893***	11.350***	10.558***
	(0.319)	(0.227)	(0.393)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Observations	16,501	9,277	7,224
R^2	0.348	0.358	0.340
Number of Stkcd	4,334	2,502	1,913
Experience P value			
HT versus Non-HT		0.000***	

As shown in the table, the coefficient of government subsidies for high-tech enterprises in column (2) is 0.063, significantly higher than that for the entire sample in column (1) and significant at the 1% level. This indicates that government subsidies have a more pronounced effect on high-tech enterprises. In contrast, the results for non-high-tech enterprises in column (3) show a government subsidy coefficient of 0.0329. While this coefficient is significant at the 1% level, it is lower than that of high-tech industries and significantly less than the 0.048 value for the entire sample. This suggests that the impact of government subsidies on cultivating NQPF in high-tech enterprises is significantly greater than that in non-high-tech industries. The more significant effect of government subsidies on high-tech enterprises is primarily due to a higher rate of innovation conversion. These subsidies are directly allocated for R&D and digitalization, enabling technological breakthroughs to quickly enhance productivity.

Finally, referencing Yin *et al*. (2018), we categorize enterprises into labor-, capital-, and technology-intensive types. Table 7 presents the regression results for the full sample and for each of the three technology types.

Table 7. Analysis of Differences in Enterprise Types

	(1)	(2)	(3)	(4)
	All	Labor	Capital	Tec
Variables	*NQPF*	*NQPF*	*NQPF*	*NQPF*
Subsidy	0.048***	0.027*	0.042***	0.058***
	(0.009)	(0.016)	(0.015)	(0.014)
Age	–0.344***	–0.241***	–0.232***	–0.462***
	(0.009)	(0.019)	(0.016)	(0.013)
Lev	–0.239***	0.133	–0.208	–0.473***
	(0.083)	(0.176)	(0.148)	(0.123)
ROA	7.662***	8.552***	7.065***	7.607***
	(0.119)	(0.281)	(0.228)	(0.161)
Balance	0.090***	0.110*	0.158***	0.077**
	(0.027)	(0.059)	(0.055)	(0.038)
Dual	0.001	–0.008	0.035	–0.008
	(0.023)	(0.051)	(0.041)	(0.032)
*Big*4	0.053	–0.026	–0.038	0.120
	(0.073)	(0.133)	(0.136)	(0.113)
Separation	0.003	–0.001	0.005	0.006*
	(0.002)	(0.004)	(0.004)	(0.003)

Variables	(1) All *NQPF*	(2) Labor *NQPF*	(3) Capital *NQPF*	(4) Tec *NQPF*
Constant	10.893***	8.519***	9.031***	13.516***
	(0.319)	(0.474)	(0.326)	(0.255)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes
Observations	16,501	3,750	4,448	8,303
R^2	0.348	0.315	0.309	0.396
Number of Stkcd	4,334	991	1,183	2,273
Experience P value				
Labor versus Capital		0.004**		
Labor versus Tec		0.008**		
Capital versus Tec		0.065		

The results of columns (3) and (4) in Table 7 indicate that the regression coefficients of government subsidies for capital- and technology-intensive enterprises are 0.042 and 0.058, respectively, both statistically significant at the 1% level. However, for labor-intensive enterprises, the regression coefficient is 0.027, significant only at the 10% level.

Several factors contribute to the limited impact of government subsidies on labor-intensive enterprises. First, labor costs typically account for more than 60% of production costs in labor-intensive sectors (such as textiles and assembly). As a result, government subsidies are often directed toward maintaining the existing workforce rather than upgrading technology. Second, the average R&D intensity (R&D/revenue) for labor-intensive enterprises is generally below 1%, while technological enterprises typically exceed 5%. Consequently, government subsidy funds are more frequently utilized to cover operating costs rather than to invest in R&D.

4. Mediation Effects and Influencing Mechanisms

We employ a mediation effect model to examine the potential mechanisms—such as enterprise innovation, financing constraints, and digital transformation—through which government subsidies influence firms' NQPF.

4.1. Innovation Mechanism

Table 8 presents the regression results for *innovation* as a mediating variable. Column (1) estimates the direct effect of government subsidies on NQPF. Column (2) examines the relationship between government subsidies and enterprise innovation, indicating that government subsidies significantly promote the level of enterprise innovation. Column (3) incorporates government subsidies, innovation (measured by the number of patent applications), and NQPF to assess the mediating role of innovation in this relationship.

Table 8. Innovation as a Mediating Variable

Variables	(1) *NQPF*	(2) *Innovation*	(3) *NQPF*
Subsidy	0.117***	0.273***	0.077***
	(0.007)	(0.016)	(0.022)
Innovation			0.283***
			(0.025)
Age	–0.017***	–0.010**	–0.014***
	(0.003)	(0.005)	(0.006)
Lev	–0.075	1.106***	–0.235
	(0.062)	(0.136)	(0.168)
ROA	7.573***	0.937***	6.4361***
	(0.112)	(0.268)	(0.342)
Balance	0.089***	0.020	0.105**
	(0.020)	(0.042)	(0.050)
Dual	0.036*	0.034	0.217***
	(0.020)	(0.043)	(0.053)
*Big*4	0.066	0.387***	0.071
	(0.051)	(0.106)	(0.128)
Separation	0.003**	0.003	0.011***
	(0.002)	(0.004)	(0.004)
Constant	4.056***	0.081	3.619***
	(0.154)	(0.327)	(0.390)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	16,497	2,368	2,368
Number of Stkcd	4,331	1,209	1,209
Sobel test		P=0.000	

Note: *Innovation* refers to the innovation level of an enterprise, measured by the number of patent applications.

As shown in Table 8, after incorporating *innovation* as a mediating variable, the coefficient of government subsidies decreases from 0.117 in column (1) to 0.077 in column (3), indicating that a portion of the impact of government subsidies is absorbed by the *innovation* variable. Column (2) reveals that innovation also positively influences NQPF, with a regression coefficient of 0.273, significant at the 1% level. Therefore, the results in Table 8 suggest that enterprise innovation is a crucial mechanism through which government subsidies promote enterprise NQPF.

4.2. Financing Constraint Mechanism

The financing constraints faced by enterprises—referring to the restrictions or difficulties in obtaining external funds (such as bank loans and equity financing)—are significant factors limiting enterprise growth. We use the *WW* index to measure China's financial constraints, as it eliminates the Tobin Q value, thereby improving the accuracy of the index. According to the calculation formula in Table 2, a larger *WW* value indicates greater financing constraints.

Table 9. Financing Constraints as a Mediating Variable

	(1)	(2)	(3)
Variables	*NQPF*	*WW*	*NQPF*
Subsidy	0.117***	–0.012***	0.092***
	(0.007)	(0.000)	(0.008)
WW			–2.718***
			(0.179)
Age	–0.017***	–0.000***	–0.018***
	(0.003)	(0.000)	(0.003)
Lev	–0.075	–0.073***	–0.378***
	(0.062)	(0.003)	(0.072)
ROA	7.573***	–0.308***	7.067***
	(0.112)	(0.006)	(0.141)
Balance	0.089***	0.001	0.098***
	(0.020)	(0.001)	(0.022)
Dual	0.036*	0.005***	0.054**
	(0.020)	(0.001)	(0.022)

	(1)	(2)	(3)
Variables	*NQPF*	*WW*	*NQPF*
*Big*4	0.066	–0.032***	–0.014
	(0.051)	(0.002)	(0.053)
Separation	0.003**	–0.000***	0.003*
	(0.002)	(0.000)	(0.002)
Constant	4.056***	–0.867***	1.637***
	(0.154)	(0.007)	(0.228)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	16,497	13,193	13,193
Number of Stkcd	4,331	4,109	4,109
Sobel test		P=0.000	

As shown in Table 9, column (1) presents the regression results between government subsidies and NQPF, and column (2) examines the relationship between government subsidies and enterprise financial constraints. The results indicate that the coefficient of government subsidies is -0.012, significant at the 1% level, suggesting that government subsidies significantly alleviate the financing constraints of enterprises. Column (3) displays the regression results incorporating government subsidies, NQPF, and financing constraints. The results indicate that government subsidies enhance the level of enterprise NQPF, while the coefficient of the *WW* index for enterprise financial constraints is negative, indicating that a larger *WW* value corresponds to higher financing constraints, which hinders the improvement of enterprise NQPF.

More importantly, after adding the *WW* index, the regression coefficient of government subsidies is 0.092, significantly lower than the 0.117 value observed in column (1). This indicates that part of the effect of government subsidies on improving NQPF is mediated by the alleviation of financing constraints. In other words, government subsidies help ease the financing constraints faced by enterprises, thereby increasing the value of NQPF. This mechanism occurs because government subsidies signal the government's recognition and endorsement of the enterprise, ultimately making it easier for these enterprises to secure funding and foster the improvement of NQPF.

4.3. Digital Transformation Mechanism

Table 10 presents the regression results with digital transformation as the mediating variable. Column (1) shows the benchmark regression results of government subsidies on NQPF, while column (2) illustrates the regression of government subsidies on enterprise digital transformation. Column (3) displays the regression results among government subsidies, digital transformation, and NQPF.

Table 10. Digital Transformation as a Mediating Variable

	(1)	(2)	(3)
Variables	*NQPF*	*DigTras*	*NQPF*
Subsidy	0.117***	0.857***	0.084***
	(0.007)	(0.105)	(0.006)
DigTras			0.032***
			(0.000)
Age	–0.017***	–0.193***	–0.012***
	(0.003)	(0.053)	(0.002)
Lev	–0.075	–0.479	–0.034
	(0.062)	(0.958)	(0.052)
ROA	7.573***	–2.641*	7.709***
	(0.112)	(1.547)	(0.096)
Balance	0.089***	0.871***	0.059***
	(0.020)	(0.311)	(0.016)
Dual	0.036*	0.012	0.029*
	(0.020)	(0.285)	(0.017)
*Big*4	0.066	0.570	0.068*
	(0.051)	(0.810)	(0.042)
Separation	0.003**	0.012	0.004***
	(0.002)	(0.026)	(0.001)
Constant	4.056***	3.090	4.019***
	(0.154)	(2.691)	(0.123)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	16,497	16,205	16,205
Number of Stkcd	4,331	4,315	4,315
Sobel test		P=0.000	

As shown in Table 10, column (2) presents the regression results of government subsidies on digital transformation, with a coefficient of 0.857, significant at the 1% level. This indicates that government subsidies significantly promote enterprises' digital transformation. Column (3) reveals that, after introducing digital transformation as a mediating factor, the coefficient of government subsidies decreases from 0.117 to 0.084. This demonstrates that government subsidies enhance NQPF through the digital transformation of enterprises.

5. Conclusions

Through an empirical analysis of A-share listed companies, we demonstrate that government subsidies generally improve the level of NQPF among enterprises. Considering heterogeneous effects, further empirical results indicate that government subsidies significantly promote NQPF in the eastern region but have no significant impact in the central and western regions. From an industrial perspective, government subsidies positively affect both high-tech and non-high-tech enterprises, with the effect on high-tech enterprises being significantly stronger. However, government subsidies notably benefit technology- and capital-intensive enterprises, while their impact on labor-intensive enterprises is lower and less significant. In terms of potential mechanisms, government subsidies can improve NQPF by easing financing constraints, promoting enterprise innovation, and facilitating digital transformation.

According to the conclusions drawn above, there are significant differences in government subsidies based on regions, industries, and technologies. Therefore, the government can implement differentiated strategies to promote overall improvements in NQPF across various regions and industries. Additionally, for enterprises with higher innovation capabilities and advanced technologies, the government should provide financial support to encourage investment in R&D and technological innovation, further enhancing their NQPF capabilities.

Furthermore, considering the regional heterogeneity in the impact of government subsidies on enterprises' NQPF, the government must adopt tailored subsidy strategies for different regions. In the central and western regions, there should be an increase in infrastructure construction and improvements in the institutional environment to foster conditions conducive to enterprise innovation. Simultaneously, special funds can be established to support technology-based small and medium-sized enterprises in these areas, thereby enhancing their innovation capabilities.

Finally, the findings indicate that financing constraints are a primary obstacle to improving enterprises' NQPF. In this context, the government needs to enhance the financing environment for enterprises and reduce financing costs. Additionally, financial institutions should be encouraged to design financial products that cater to the diverse needs of different types of enterprises and provide adequate financial support for innovation.

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