New Quality Productivity and the High-Quality Development of High-End Manufacturing Enterprises

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Abstract

New-quality productivity is a key path to promoting high-quality development of high-end manufacturing enterprises. This paper empirically examines the impact of new-quality productivity on high-quality development of high-end manufacturing enterprises, using Shanghai and Shenzhen A-share listed high-end manufacturing enterprises from 2012 to 2022. The study demonstrates that new-quality productivity significantly promotes high-quality development of high-end manufacturing enterprises and passes a series of robustness tests. New-quality productivity can enhance total factor productivity growth by improving digital transformation, enhancing enterprise innovation, and alleviating financing constraints, thereby achieving high-quality development. The enabling effect of new-quality productivity is more pronounced in high-end manufacturing enterprises with smaller scale and less diverse executive teams, as well as in cities with low tax burdens and strong government intervention. To this end, the government should promote the differentiated development of new-quality productivity, guide enterprises to develop and utilize new-quality productivity to improve resource allocation efficiency and develop new-quality productivity tailored to both enterprise and local conditions to better promote high-quality development of high-end manufacturing enterprises.

Keywords: new quality productivity; high-end manufacturing enterprises; high-quality development

1. Introduction

Xi Jinping introduced the concept of new quality productivity during his inspection in Heilongjiang on September 7, 2023, and elaborated its scientific connotation at the 11th National Congress of the CPC Central Committee and the Second Session of the 14th National People's Congress, emphasizing localized development (Song Jia et al., 2024) [1]. This concept enriches productivity's connotation and signals China's economic trajectory (Zhou Wen & Xu Lingyun, 2023) [2]. Amid global digital transformation, new quality productivity, driven by innovation, catalyzes high-quality economic development (Pu Qingping & Huang Yuanyuan, 2023) [3].

High-end manufacturing enterprises, characterized by high technology and value, rely on intelligent, flexible, and digital production to meet rising societal demands (Jin Bei, 2018) [4]. Their high-quality development aligns with new quality productivity, enhancing total factor productivity, green economy growth, and innovation-driven strategies (Jiang Changyun, 2024; Cai & He, 2024; Zhao et al., 2024) [5][6][7].

This study examines how new quality productivity drives high-end manufacturing enterprises' high-quality growth using empirical data from A-share listed firms. It addresses literature gaps by analyzing micro-level impacts, focusing on high-end manufacturing, and providing evidence-based insights, unlike prior macro or qualitative studies. The findings offer practical guidance for enhancing global competitiveness and achieving sustainable growth.

2. Overview of Domestic and International Research

2.1 New quality productivity

New quality productivity is pivotal for industrial transformation and economic upgrading, emphasized by the Chinese government in 2024 (Song Jia et al., 2024; Xie et al., 2024) [1][8]. It surpasses traditional productivity, driven by innovation (Ling Xiaoxiong et al., 2024) [9].

From a political economy perspective, it fosters high-quality growth through technological innovation, new industries, and efficient resource allocation, promoting sustainability and competitiveness (Hu Ying, 2024; Lin et al., 2024; Zhou Wen & Xu Lingyun, 2024) [10][11][12]. It offers a sustainable, inclusive Chinese model for global economic growth.

From a green development perspective, new quality productivity, guided by innovation and green production, drives industrial restructuring and sustainable economic transformation (Tang Kuiyu & Zhao Junhong, 2024) [13].

From a production factors perspective, it emphasizes diverse, innovative factors led by technology, breaking traditional constraints for qualitative productivity leaps (Wei Chonghui, 2023) [14].

From a systems theory perspective, it integrates new workers, tools, and infrastructure to transform technological innovations into products and services, enhancing quality of life (Yang Yang et al., 2024) [15].

2.2 High-quality development of high-end manufacturing

High-quality development, introduced at the 19th National Congress of the Communist Party of China in 2017, marks a shift from quantitative expansion to qualitative optimization (Ren Baoping, 2018) [16]. The 20th Congress emphasized it as essential for Chinese modernization, optimizing resource allocation, enhancing output efficiency, and promoting equitable income distribution (Lin et al., 2024) [17]. It requires theoretical support from quality economics (Liu & He, 2024) [18].

High-end manufacturing is vital for economic growth, attracting skilled labor and driving industrial transformation (Zhu Lan et al., 2024) [19]. Its supply chain resilience supports economic stability (Zhou Jingyu & Tan Chunqiao, 2023) [20], and green development ensures sustainability (Jiang Xuhan & Zhang Liping, 2023) [21].

Scholars highlight that high-end manufacturing's high-quality development, driven by innovation, achieves structural optimization, energy efficiency, and market expansion (Zhu Zhiyong & Li Yanan, 2024) [22]. It involves upgrading manufacturing structures via digital transformation (Ren Zhuanzhuan & Deng Feng, 2022) [23] and enhancing digitalization, innovation, and green practices (Zhang Aiqin & Zhang Haichao, 2021) [24].

2.3 New Quality Productivity and High-Quality Development of High-End Manufacturing Enterprises

New quality productivity drives high-quality development in high-end manufacturing through technological innovation, optimizing production processes, enhancing efficiency, and improving product quality (Zhang Xiaheng, 2024) [25]. Big data and AI enable precise market trend prediction, efficient inventory management, and intelligent product design, fostering competitiveness.

It also facilitates innovative factor allocation, enhancing resource efficiency and total factor productivity by aligning production with market demands (Zhang Xiaheng, 2024) [25].

Additionally, new quality productivity supports industrial transformation toward intelligence and greening, promoting automation, energy-saving technologies, and environmentally friendly materials, thus elevating industry value and global competitiveness (Qiu Shuqin & Lin Shiquan, 2025; Jiang Yongmu et al., 2024) [26][27].

2.4 Literature Review

In summary, domestic and foreign scholars have conducted extensive research in the field of new productivity and high-quality economic development, and their internal role logic and other aspects have been studied in depth, providing solid support for this study. However, there are still the following deficiencies and in-depth exploration: First, the research on the impact mechanism of new productivity on high-quality development is mainly concentrated at the macro level of the economy (Du Chuanzhong et al., 2023; Hu Ying and Liu Keng , 2024) , and there is less research on micro levels such as enterprises [28] [29] . Second, many domestic and foreign scholars have conducted extensive research on the important discourse of new productivity and high-quality development of high-end manufacturing enterprises, but they focus more on tourism (Wang Jinwei et al., 2024; Li Xinjian , 2024; Yang Jianchun and Li Kaichao , 2024), traditional manufacturing (Xu Zheng and Zhang Jiaoyu , 2024) and agriculture (Wang Qinmei and Yang Junge , 2023), and there is less research on high-end manufacturing enterprises [30] [31] [32] [33] [34] . Third, regarding the relationship between new quality productivity and high-quality development of enterprises, most studies remain at the qualitative analysis level (Wang Jinwei et al., 2024), and empirical research is still relatively rare [30] .

3.   Theoretical Analysis and Research Hypotheses

3.1 New quality productivity can promote the high-quality development of high-end manufacturing enterprises

New quality productivity, driven by technological breakthroughs, innovative factor allocation, and industrial transformation, enhances total factor productivity (TFP) through innovation-led, high-quality development (Zhang et al., 2025; Ren et al., 2025) [35][36]. At the macro level, it optimizes high-end manufacturing's industrial structure, promoting intelligent, green, and high-value development (Li Zhanping & Wang Hui, 2024) [37]. It fosters innovation ecosystems, supported by government policies like tax incentives, enabling enterprises to access resources and accelerate R&D (Liu Yang & Li Haoyuan, 2024; Li Bingyan & Yu Fei, 2024) [38][39].

At the micro level, new quality productivity transforms production factors, integrating digital technologies to create innovative workers, materials, and objects (Zhu Zhiyong & Li Yanan, 2024) [22]. It enhances management efficiency through data-driven decision-making and supply chain optimization, boosting competitiveness (Wang Xin et al., 2024) [40]. Enterprises develop innovative, high-quality products, reduce costs, and gain market advantages, ensuring sustainable high-quality development (Zhao Ruonan et al., 2024) [41].

H1: New quality productivity can promote the high-quality development of high-end manufacturing enterprises.

3.2 New quality productivity promotes high-quality development of high-end manufacturing enterprises by enhancing digital transformation

New quality productivity drives digital transformation by integrating new workers, tools, and objects, providing foundational support (Sima Haoxiang et al., 2024) [42]. It enhances digital transformation through safe, cost-effective production and improved innovation performance, fostering a synergistic relationship (Liu Da et al., 2024; Jin Xin et al., 2024) [43][44].

Digital transformation is critical for high-end manufacturing's high-quality development. It boosts innovation, agile development, and resource efficiency (Niu Zhiwei & Zheng Liang, 2025; Wu Haoqiang & Hu Sumin, 2023) [45][46]. It enhances production efficiency, sustainability, and total factor productivity (Ji et al., 2023; Zhao Chenyu et al., 2021) [47][49]. Digital transformation also improves market competitiveness, ESG performance, and enterprise resilience through industrial upgrading and digital trade, supporting sustainable growth (Tan Yafei et al., 2024; Zhan et al., 2024; Liu Mingyang et al., 2024) [50][51][52].

H2: New quality productivity promotes high-quality development of high-end manufacturing enterprises by enhancing digital transformation.

3.3 New quality productivity promotes high-quality development of high-end manufacturing enterprises by enhancing their innovation level

New quality productivity significantly enhances enterprise innovation through data element integration, exhibiting a threshold effect that amplifies innovation motivation in high-end manufacturing (Wu Yongxia & Li Wei, 2025) [53]. It boosts innovation investment, fosters industry-wide innovation spillovers, and supports new product and process development, enhancing industrial chain competitiveness (Zeng Guoan et al., 2024; Cui et al., 2025) [54][55]. It also promotes inter-enterprise collaboration, creating innovative ecosystems.

Enterprise innovation is crucial for high-quality development in high-end manufacturing, shifting from factor-driven to innovation-driven growth (Tao Changqi & Peng Yongzhang, 2018) [56]. R&D investment, technological breakthroughs, and management innovation improve product quality, efficiency, and global competitiveness, while an innovative culture attracts talent and ensures sustainability (Yu Bo & Fan Conglai, 2022) [57]. Innovation is a core strategy for maintaining competitive advantage.H3: New quality productivity promotes the high-quality development of high-end manufacturing enterprises by enhancing the innovation level of enterprises.

3.4 New quality productivity promotes high-quality development of high-end manufacturing enterprises by easing financing constraints

New quality productivity eases financing constraints, enhancing enterprise ESG performance (Su Jian & Li Linghan, 2024) [58], improving financing environments for private enterprises (Li Su & Guo Yuantong, 2024) [59], and boosting organizational resilience (Li Xinru et al., 2024) [60]. It stabilizes operations and attracts financial support, promoting high-quality development.

Financing constraints hinder high-end manufacturing development by limiting innovation, investment efficiency, and competitiveness (Niu Zhiwei & Zheng Liang, 2025) [61]. Excessive constraints negatively affect total factor productivity, particularly for non-state-owned enterprises (Qi Xiuhui & Fu Lishuang, 2023; Xiao Shuguang et al., 2020) [62][63]. Easing

constraints supports a "virtual to real" shift, enabling focus on core businesses for high-quality development (Tao Aiping & Li Yingxiao, 2024) [64].

H4: New quality productivity promotes the high-quality development of high-end manufacturing enterprises by easing the level of financing constraints.

4. Research Design

4.1 Research Sample and Data Source

This study examines A-share listed high-end manufacturing firms (2012–2022), defined per the 2017 Classification of High-tech Industries (codes C34, C35, C37, C38, C39, C40) as technology-intensive with high R&D and value-added. Sample adjustments excluded ST-type firms, incomplete records, and winsorized continuous variables at 1% and 99% quantiles, yielding 1,539 firms across 22 provinces with 7,561 observations. Data on high-quality development, regional new quality productivity, and control variables were sourced from the CSMAR database and analyzed using Stata 17.

4.2 Variable Description and Definition

4.2.1 Explained Variables

high-end manufacturing enterprises (TQD): Referring to the research of Hu Haiyang (2025), the total factor productivity (TFP) of enterprises is used as a proxy variable for high-quality development of enterprises [65] . Regarding the total factor productivity (TFP) of enterprises, the academic community mainly adopts three types of methods: least squares estimation based on regression analysis, non-parametric method and parameter estimation method for measurement . Among them, the representatives of the parametric method : LP method and OP method are widely recognized in the academic community. The OP method requires that the investment amount of the enterprise must be a positive number. This restriction condition will cause a large number of samples to be eliminated; in contrast, the LP method introduces intermediate inputs as a proxy variable for productivity, which not only avoids the restriction of investment amount and retains more valid samples, but also effectively alleviates endogenous bias, and its calculation logic is more scientific. In the empirical analysis, this paper will use the TFP results calculated by the OP method in the benchmark regression, and use the TFP results calculated by the LP method in the robustness test link for verification.

4.2.2 Explanatory variables

New Quality Productivity (NQP): Referring to the research of Wang Jue and Wang Rongji (2024), the entropy method was used to calculate and construct a provincial new quality productivity development level evaluation index system from the three dimensions of workers, labor objects and means of production [66] , see Table 4-1 .Table 4-1 New quality productivity indicator system

Target layer	Standards layer	First-level indicators	Secondary indicators	Level 3 indicators	Measurement	property
new quality born Produce force	Workers	Worker skills	Education level	Per capita education level	Average years of education per capita	just
			Human capital structure	Workers' human capital structure	The education level of the labor force is divided into 5 levels, and the vector angle is used to measure	just
				Student structure in higher education institutions	The proportion of college students in the total population	just
		Labor productivity	Per capita output value	GDP per capita	GDP/total population	just
			per capita income	Average salary	Average wage of employed workers	just

Object of labor	Workers' consciousness	Employment Concept	Proportion of employees in the tertiary industry	The proportion of employees in the tertiary industry in the total employment	just
		Entrepreneurial philosophy	Entrepreneurial activity	Entrepreneurial activity	just
	New quality industry	strategic emerging industries	Proportion of emerging strategic industries	Added value of emerging strategic industries/GDP	just
		Future Industries	Number of robots	Number of robots/total population	just
	ecological environment	Green and environmentally friendly	forest coverage	forest coverage	just
			Environmental protection efforts	Environmental protection expenditure/government public financial expenditure	just
		Pollution reduction	Pollutant emissions	Sulfur dioxide emissions/GDP Wastewater discharge/GDP General industrial solid waste generation/GDP	burden
			Industrial waste management	Industrial wastewater treatment facilities (sets) Industrial waste gas treatment facilities (sets) Industrial solid waste	just
means of production	Material means of production	Infrastructure	Traditional infrastructure	Highway mileage and railway mileage	just
			Digital infrastructure	Fiber length Number of Internet broadband access ports per capita	just
		Energy consumption	Overall energy consumption	Energy consumption/GDP	burden
			Renewable energy consumption	Renewable energy power consumption/total social electricity consumption	just
	Intangible means of production	Technological innovation	Number of patents per capita	Number of patent authorizations/total population	just
			R&D investment	R&D expenditure/GDP	just
		Level of digitalization	Digital Economy	Digital Economy Index	just
			Enterprise Digitalization	Enterprise digitalization level	just

4.2.3 Mechanism variables

Following Wu Fei et al. (2021), this study uses Python to segment listed companies' annual report texts, counting word frequencies of key technical terms listed in Table 4-2. These are classified and aggregated to form a total word frequency, constructing a preliminary enterprise digital transformation (DCG) indicator system, finalized by taking the logarithm of these indicators [67].

<div align="center">Table 4-2 Enterprise Digital Transformation Index System</div>

Target layer	Structural feature words	Keywords
number Character change change change type	Artificial Intelligence Technology	Artificial intelligence, business intelligence, image understanding, investment decision support systems, intelligent data analysis, intelligent robots, machine learning, deep learning, semantic search, biometrics, face recognition, speech recognition, identity verification, autonomous driving, natural language processing
	Big Data Technology	Big data, data mining, text mining, data visualization, heterogeneous data, credit reporting, augmented reality, mixed reality, virtual reality
	Blockchain technology	Blockchain, digital currency, distributed computing, differential privacy technology, smart financial contracts
	Cloud computing technology	Cloud computing, stream computing, graph computing, in-memory computing, multi-party secure computing, brain-inspired computing, green computing, cognitive computing, converged architecture, billion-level concurrency, EB-level storage, Internet of Things, cyber-physical systems
	Application of digital technology	Mobile Internet, Industrial Internet, Mobile Internet, Internet Healthcare, E-commerce, Mobile Payment, Third-Party Payment, NFC Payment, Smart Energy, B2B, B2C, C2B, C2C, O2O, Internet of Things, Smart Wearables, Smart Agriculture, Smart Transportation, Smart Healthcare, Smart Customer Service, Smart Home, Smart Investment Advisory, Smart Tourism, Smart Environmental Protection, Smart Grid, Smart Marketing, Digital Marketing, Unmanned Retail, Internet Finance, Digital Finance, Fintech, Financial Technology, Quantitative Finance, Open Banking

Financing constraint level (KZ): Referring to the research of Liu Huihao and Jiao Wenniu (2022), this paper uses the KZ index to measure the degree of financing constraint[68]. The larger the KZ index, the greater the financing constraint[68]. The estimation of the KZ index refers to Kaplan & Zingales (1997)[69]. The specific calculation formula is :

$$KZ_{i,t} = -12.3103CF_{i,t}/TA_{i,t} - 25.9919DIV_{i,t}/TA_{i,t} - 4.6063CASH_{i,t}/TA_{i,t} + 6.6481Lev_{i,t} + 0.5181TobinQ_{i,t}$$

Where $CF_{i,t}$ is net cash flow from operating activities, $TA_{i,t}$ is total assets, $DIV_{i,t}$ is cash dividends, $CASH_{i,t}$ is cash holdings, $Lev_{i,t}$ is the ratio of total liabilities to total assets, and Tobin $Q_{i,t}$ is the sum of the total market value of stocks and the book value of debt divided by the book value of total assets.

Enterprise innovation level (PAT): Based on the research of Yang Jinyu et al. (2022) and Xiao Tusheng et al. (2022), the enterprise innovation level is measured by adding 1 to the natural logarithm of the number of invention patent applications, which is more in line with the actual output level of the enterprise's current innovation[70][71].

4.2.4 Control variables

This paper controls the following variables: asset size (SIZE), debt-to-asset ratio (LEV), enterprise age (AGE), board size (BOARD) , proportion of independent directors (INDEP), proportion of institutional investors (INST) , operating income growth rate (salesgrowth) and management expense ratio (Manage) .

4-3 for specific variable definitions .

<div align="center">Table 4-3 Variable definitions and measurement methods</div>

Variable Type	variable name	variable symbols	Measurement method

Dependent variable	Total factor productivity of enterprises	TFP_OP	Estimating TFP using the OP method
		TFP_LP	Estimating TFP using the LP method
Independent variable	Regional new quality productivity	NQP	Based on the new quality productivity development level evaluation index system, the entropy method is used to estimate
Mechanism variables	Enterprise digital transformation	DCG	Comprehensive indicators constructed using Python crawler technology based on text analysis
	Financing constraint level	KZ	Modified KZ Index
	Enterprise innovation level	Pat	The natural logarithm of the number of invention patent applications plus 1
Control variables	Enterprise scale	Size	Natural logarithm of total assets
	debt-to-asset ratio	LEV	Total liabilities/total assets
	Company age	AGE	Years on the market
	Board size	BOARD	Number of board members
	Ratio of independent directors	INDEP	Number of independent directors/total number of board members
	Institutional shareholding ratio	INST	Institutional investors' shareholding ratio
	Operating income growth rate	salesgrowth	(Current sales - previous sales) / previous sales * 100%
	Management expense ratio	Manage	Administrative expenses/operating income

4.3 Empirical model construction

Based on the theoretical analysis and research hypotheses in the previous article, this study constructs the following econometric model to verify the mechanism by which regional new quality productivity affects the high-quality development of high-end manufacturing enterprises through multiple paths.

Model 1: Test hypothesis H1, the direct impact of regional new quality productivity on the high-quality development of high-end manufacturing enterprises.

$$TFP_{OP_{i,t}} = \alpha_0 + \alpha_1 NQP_{i,t} + \alpha_2 controls_{i,t} + \delta Year + \eta Firm + \varepsilon_{i,t} \tag{1}$$

Model 2 to Model 4: Test hypotheses H2-H4. Regional new quality productivity affects the high-quality development of high-end manufacturing enterprises through three paths .

$$DCG_{i,t} = \alpha_0 + \alpha_1 NQP_{i,t} + \alpha_2 controls_{i,t} + \delta Year + \eta Firm + \varepsilon_{i,t} \tag{2}$$

$$KZ_{i,t} = \alpha_0 + \alpha_1 NQP_{i,t} + \alpha_2 controls_{i,t} + \delta Year + \eta Firm + \varepsilon_{i,t} \tag{3}$$

$$Pat_{i,t} = \alpha_0 + \alpha_1 NQP_{i,t} + \alpha_2 controls_{i,t} + \delta Year + \eta Firm + \varepsilon_{i,t} \tag{4}$$

Where i and t represent the firm and year, TFP_OP represents the firm's total factor productivity, NQP represents new quality productivity , DCG represents the firm's digital transformation, KZ represents the level of financing constraints, Pat represents the firm level, controls represents the control variables, δ_{Year} represents the year fixed effect, η_{Firm} represents the individual fixed effect, and εrepresents the random disturbance term.

5.   Empirical Analysis

5.1 Descriptive Statistics

Table 5-1 shows descriptive statistics: high-quality development (TFP_OP) of high-end manufacturing enterprises has a mean of 6.509, median of 6.441, ranging from 4.867 to 8.570, indicating varied development levels. Regional new quality productivity (NQP) has a mean of 0.470, standard deviation of 0.165, and ranges from 0.153 to 0.747, reflecting significant regional disparities in NQP across China.

Table 5-1 Descriptive statistics of main variables

variable	N	min	mean	p50	max	sd
TFP_OP	7870	4.867	6.509	6.441	8.570	0.746
NQP	7870	0.153	0.470	0.499	0.747	0.165
Size	7870	19.87 0	22.03 0	21.89 0	25.64 0	1.142
LEV	7870	0.068	0.413	0.412	0.875	0.189
AGE	7870	2.000	9.494	8.000	27.000	6.687
BOARD	7870	5.000	8.245	9.000	12.000	1.480
INDEP	7870	33.33 0	37.87 0	36.36 0	57.14 0	5.402
INST	7870	0.177	38.07 0	38.21 0	87.38 0	24.20 0
salesgrowth	7870	-0.708	0.300	0.141	3.584	0.628
Manage	7870	0.01 4	0.09 7	0.079	0.414	0.069

5.2 Correlation Analysis

Table 5-2 presents Pearson correlation test results, showing a correlation coefficient of 0.033 between regional new quality productivity (NQP) and high-quality development of high-end manufacturing enterprises (TFP_OP), significant at the 1% level. This confirms a significant positive correlation, preliminarily supporting Hypothesis 1.

Table 5-2 Person correlation coefficient matrix

	TFP_OP	NQP	SIZE	LEV	AGE	BOARD	INDEP	INST	salesgrowth	Manage
TFP_OP	1									
NQP	0.033***	1								

SIZE	0.757***	-0.041***	1							
LEV	0.427***	-0.065***	0.472***	1						
AGE	0.336***	-0.209***	0.372***	0.348***	1					
BOARD	0.171***	-0.113***	0.236***	0.138***	0.197***	1				
INDEP	-0.058***	0.032***	-0.060***	-0.016	-0.080***	-0.585***	1			
INST	0.322***	-0.118***	0.377***	0.187***	0.245***	0.222***	-0.092***	1		
salesgrowth	-0.044***	-0.101***	-0.014	0.003	0.018	0.021*	0.018	0.034**	1	
Manage	-0.595***	-0.067***	-0.339***	-0.214***	-0.106***	-0.084***	0.070**	-0.147***	0.129***	1

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

5.3 Benchmark Regression

Table 5-3 shows regression results: column (1) indicates an insignificant NQP coefficient (0.123) on high-quality development (TFP_OP) without control variables; column (2) shows a significant NQP coefficient (0.228, 1% significance) with control variables, confirming a significant positive effect of regional new quality productivity on high-end manufacturing enterprises' high-quality development, supporting Hypothesis 1.

Table 5-3 Benchmark regression results

VARIABLES	(1) TFP_OP	(2) TFP_OP
NQP	0.123	0.228***
	(0.93)	(3.31)
Size		0.373***
		(31.06)
LEV		0.199***
		(3.31)
AGE		0.008***
		(4.62)
BOARD		-0.010
		(-1.03)
INDEP		0.000
		(0.01)
INST		0.001**
		(2.18)
salesgrowth		0.020*
		(1.86)
Manage		-4.173***
		(-21.44)
Constant	6.203***	-1.539***
	(83.18)	(-5.66)
Observations	7 , 870	7 , 870
R-squared	0.043	0.715
Adj. R2	0.714	0.714

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

5.4 Endogeneity Test

5.4.1 Instrumental Variable Method

To address endogeneity, this study uses two instrumental variables: lagged new quality productivity (LNQP) and regional R&D intensity (RD_GDP). LNQP correlates with NQP via temporal inertia, indirectly affecting high-end manufacturing, ensuring exogeneity. RD_GDP, driven by regional policies, boosts innovation without direct micro-level impact. Table 5-4 shows significant positive LNQP and RD_GDP coefficients in the first stage, and a significant positive NQP impact on total factor productivity in the second stage, supporting Hypothesis 1.

Table 5-4 Instrumental variable test results

VARIABLES	(1) First stage NQP	(2) S econd stage TFP_OP	(1) First stage NQP	(2) S econd stage TFP_OP
Fitted NQP		0.197***		2.092***
		(6.006)		(14.368)
LNQP	0.987***			
	(424.684)			
RD_GDP			3.592***	
			(22.653)	
Size	0.000	0.372***	0.001	0.356***
	(0.064)	(64.292)	(0.526)	(53.609)
LEV	-0.002	0.199***	0.019*	0.218***
	(-0.904)	(6.321)	(1.741)	(6.176)
AGE	-0.000	0.008***	-0.004***	0.017***
	(-0.226)	(9.578)	(-15.405)	(14.530)
BOARD	-0.000	-0.015***	-0.007***	0.003
	(-0.852)	(-3.329)	(-4.833)	(0.576)
INDEP	0.000	0.000	-0.001**	0.001
	(1.173)	(0.086)	(-2.302)	(0.654)
INST	-0.000*	0.001***	-0.000***	0.002***
	(-1.702)	(4.033)	(-6.060)	(7.426)
salesgrowth	0.000	0.020**	-0.026***	0.061***
	(0.307)	(2.409)	(-9.158)	(6.201)
Manage	-0.015**	-4.198***	-0.277***	-3.758***
	(-2.447)	(-48.726)	(-9.521)	(-37.873)
Constant	-0.024**	-1.444***	0.529***	-2.335***
	(-2.467)	(-10.752)	(11.577)	(-14.136)
Observations	6 , 153	6 , 153	7,561	7,561
R-squared	0.971	0.719	0.170	0.561
Adj. R2	0.971	0.718	0.168	0.560

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

5.4.2 Propensity Score Matching (PSM) Method

This study uses propensity score matching (PSM) to address sample self-selection endogeneity. The sample is split into high- and low-variability groups based on new quality productivity (NQP) median. A Logit model estimates propensity scores with total factor productivity as the dependent variable and explanatory variables including enterprise size, debt-to-asset ratio, age, board size, independent director proportion, institutional shareholding, revenue growth, and management expense ratio. Kernel matching (bandwidth 0.06) yields 7549 balanced observations. Table 5-5 shows that NQP coefficients remain significant at the 1% level after introducing control variables, confirming the robust positive effect of NQP on high-quality development of tourism enterprises, supporting hypothesis H1.

Table 5- 5 Propensity matching score test results

VARIABLES	(1) m1_psm TFP_OP	(2) m2_psm TFP_OP
NQP	0.126	0.205***
	(0.95)	(2.92)
Size		0.371***
		(30.21)

VARIABLES		
LEV		0.212***
		(3.42)
AGE		0.008***
		(4.72)
BOARD		-0.012
		(-1.21)
INDEP		-0.001
		(-0.21)
INST		0.001**
		(2.21)
salesgrowth		0.017
		(1.52)
Manage		-4.126***
		(-20.51)
Constant	6.192***	-1.453***
	(83.94)	(-5.25)
Observations	7,549	7,549
R-squared	0.044	0.714
Adj. R2	0.713	0.713

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

5.5 Robustness Test

To verify research reliability, robustness tests were conducted. First, per Hu Haiyang (2025), TFP_LP was used as an alternative dependent variable for high-quality development [65]. Second, data from 2020–2022 were excluded to avoid COVID-19 disruptions (Wang Yanan et al., 2025) [72]. Third, per Lu Jiang et al. (2024), new quality productivity was assessed using scientific, green, and digital productivity indicators [73]. Tables 5-6 show: column (1) NQP coefficient is 0.385 (1% significance); column (2) NQP coefficient is 0.266 (1% significance); column (3) NQP2 coefficient is 0.137 (1% significance), confirming robust positive effects on high-quality development.

Table 5-6 Robustness test results

VARIABLES	(1) Adjusting the dependent variable TFP_LP	(2) Adjustment year TFP_OP	(3) Adjusting independent variables TFP_OP
NQP	0.385***	0.266***	
	(5.14)	(3.36)	
NQP2			0.137***
			(3.12)
Size	0.551***	0.371***	0.371***
	(40.47)	(25.26)	(30.55)
LEV	0.233***	0.171**	0.205***
	(3.70)	(2.42)	(3.36)
AGE	0.010***	0.009***	0.008***
	(5.09)	(4.30)	(4.71)
BOARD	-0.010	-0.007	-0.009
	(-1.01)	(-0.61)	(-0.97)
INDEP	-0.001	0.001	-0.000
	(-0.26)	(0.25)	(-0.01)
INST	0.002***	0.001	0.001**
	(3.95)	(1.56)	(2.25)
salesgrowth	-0.003	0.019	0.017
	(-0.28)	(1.41)	(1.62)
Manage	-4.659***	-3.878***	-4.114***
	(-20.29)	(-17.20)	(-20.66)
Constant	-3.820***	-1.584***	-1.462***
	(-12.30)	(-4.86)	(-5.33)
Observations	7 , 626	4,755	7 , 626
R-squared	0.803	0.702	0.716
Adj. R2	0.715	0.715	0.715

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

5.6 Impact Mechanism Test

The regression results of the impact mechanism of regional new quality productivity on enterprise high-quality development are shown in Tables 5-7 . Column (1) shows that the regression coefficient of regional new quality productivity (NQP) on enterprise digital transformation (KZ) is -0.588 , and is significant at the 1% level, indicating that the impact effect of new quality productivity is to promote enterprise high-quality development by suppressing financing constraints; Column (2) shows that the regression coefficient of regional new quality productivity (NQP) on digital transformation (DCG) is 1.173 , and is significant at the 1% level; Column (3) shows that the regression coefficient of regional new quality productivity (NQP) on enterprise innovation level (Pat) is 0.464 , and is significant at the 5% level, indicating that enterprise financing constraints, digital transformation, and enterprise innovation level play a mediating role in the promotion effect of regional new quality productivity on enterprise high-quality development. Therefore, the research hypotheses H2 , H3 , and H4 are established.

Table 5-7 Results of mechanism of action test

VARIABLES	(1) KZ	(2) DCG	(3) Pat
NQP	-0.588***	1.173***	0.464**
	(-3.46)	(5.12)	(2.55)
Size	-0.460***	0.267***	0.847***
	(-14.05)	(6.84)	(27.47)
LEV	8.085***	-0.746***	-0.242
	(52.51)	(-3.68)	(-1.52)
AGE	0.040***	-0.001	-0.010**
	(9.48)	(-0.15)	(-2.13)
BOARD	-0.034	-0.045	-0.020
	(-1.56)	(-1.57)	(-0.85)
INDEP	-0.002	0.005	-0.007
	(-0.32)	(0.71)	(-1.04)
INST	-0.001	-0.005***	0.001
	(-0.94)	(-3.42)	(0.84)
salesgrowth	0.043	0.155***	-0.016
	(1.26)	(3.90)	(-0.53)
Manage	5.016***	1.318**	0.023
	(9.49)	(2.50)	(0.06)
Constant	8.963***	-4.872***	-14.760***
	(11.86)	(-5.56)	(-20.62)
Observations	7 , 640	7 , 640	7 , 640
R-squared	0.566	0.147	0.427
Adj. R2	0.426	0.426	0.426

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

5.7 Heterogeneity Analysis

5.7.1 Heterogeneity of enterprise characteristics from a micro perspective

1. Differences in educational background among corporate executive teams

Educational background represents a person's knowledge and ability foundation to a certain extent and affects people's cognition. In the case of large differences in the educational backgrounds of the executive team of an enterprise, it may affect the decision-making of the executive team and further affect the high-quality development of the enterprise. Therefore, this paper refers to the measurement method of Huang Yue et al. (2011) and adopts the Herfindal-Hirschman coefficient (Herfin coefficient)[74]. The specific calculation formula is:

$$H = 1 - \sum_{i=1}^{n} P_i^2$$

Where Pi represents the proportion of members of category i to the total number of team members, i=1: below college level; i=2: college level; i=3: undergraduate level; i=4: master's level; i=5: doctorate level.

Tables 5-8 show: column (1) indicates an insignificant positive NQP coefficient (0.108) for enterprises with large educational background differences in executive teams, reflecting decision-making inefficiencies and weak technology absorption due to strategic disagreements. Column (2) shows a significantly positive NQP coefficient (0.290, 1% significance) for teams with small differences, enabling unified strategies, efficient resource integration, and enhanced technology absorption, significantly promoting high-quality development.

Differences in enterprise size

This study categorizes listed companies by size using the average natural logarithm of total assets. SMEs, with flexible structures and faster decision-making, are more responsive to new quality productivity (NQP), achieving breakthroughs in high-quality development. Tables 5-8 show: column (3) indicates an insignificant NQP coefficient (0.077) for large enterprises, where hierarchical management and coordination costs reduce marginal benefits. Column (4) shows a significantly positive NQP coefficient (0.277, 1% significance) for SMEs, reflecting their agility and efficient resource allocation for high-growth areas.

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2. Differences in enterprise size

This study categorizes listed companies by size using the average natural logarithm of total assets. SMEs, with flexible structures and faster decision-making, are more responsive to new quality productivity (NQP), achieving breakthroughs in high-quality development. Tables 5-8 show: column (3) indicates an insignificant NQP coefficient (0.077) for large enterprises, where hierarchical management and coordination costs reduce marginal benefits. Column (4) shows a significantly positive NQP coefficient (0.277, 1% significance) for SMEs, reflecting their agility and efficient resource allocation for high-growth areas.

Table 5-8 Results of heterogeneity analysis of enterprise characteristics

VARIABLES	(1) Large differences in educational background TFP_OP	(2) Little difference in educational background TFP_OP	(3) Large scale TFP_OP	(4) Small scale TFP_OP
NQP	0.108	0.290***	0.077	0.277***
	(1.17)	(3.36)	(0.66)	(3.55)
Size	0.375***	0.373***	0.409***	0.329***
	(23.93)	(23.16)	(19.06)	(14.99)
LEV	0.257***	0.176**	0.149	0.238***
	(3.34)	(2.08)	(1.38)	(3.38)
AGE	0.007***	0.008***	0.005	0.009***
	(2.63)	(3.42)	(1.63)	(4.41)
BOARD	-0.000	-0.020*	-0.022	0.003
	(-0.02)	(-1.65)	(-1.40)	(0.34)
INDEP	-0.001	-0.000	-0.004	0.002
	(-0.29)	(-0.12)	(-1.03)	(0.88)
INST	0.001	0.001**	0.001	0.001
	(1.27)	(2.18)	(1.37)	(1.16)
salesgrowth	0.043***	0.003	0.021	0.022*
	(3.10)	(0.21)	(0.98)	(1.81)
Manage	-4.015***	-4.105***	-5.747***	-3.555***
	(-15.88)	(-16.25)	(-10.58)	(-18.32)
Constant	-1.618***	-1.437***	-1.808***	-0.892*
	(-4.40)	(-4.12)	(-3.64)	(-1.84)
Observations	3 , 604	3,535	3,047	4,092
R-squared	0.715	0.700	0.603	0.522
Adj. R2	0.520	0.520	0.520	0.520

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

5.7.2 Regional Differences from a Macro Perspective

1. Differences in corporate tax burden levels

Regional tax burdens influence high-end manufacturing firms' decisions through funding, policy, agglomeration, and risk factors. Using National Bureau of Statistics data (tax revenue/regional GDP), Tables 5-9 show: column (1) indicates a negative NQP coefficient (-0.398, 1% significance) in high-tax regions, reflecting R&D and growth constraints; column (2) shows a positive NQP coefficient (0.529, 1% significance) in low-tax regions, enabling innovation and efficiency.

Government intervention affects resource access, innovation, and market expansion. Using fiscal expenditure/regional GDP data, Tables 5-9 show: column (3) indicates a positive NQP coefficient (1.538, 1% significance) in high-intervention regions, driven by subsidies and technical support; column (4) shows an insignificant NQP coefficient (0.038) in low-intervention regions, reflecting limited policy support.

Table 5-9 Regional characteristic heterogeneity analysis results

	(1)	(2)	(3)	(4)
	High tax burden	Low tax burden	High government intervention	Low government intervention
VARIABLES	TFP_OP	TFP_OP	TFP_OP	TFP_OP
NQP	-0.389***	0.527***	1.527***	0.044
	(-3.53)	(5.44)	(7.78)	(0.38)
Size	0.398***	0.339***	0.379***	0.347***
	(27.09)	(18.04)	(21.37)	(21.47)
LEV	0.101	0.356***	0.044	0.372***
	(1.29)	(3.91)	(0.43)	(4.91)
AGE	0.006**	0.010***	0.008***	0.008***
	(2.41)	(3.73)	(2.79)	(3.26)
BOARD	-0.006	-0.014	-0.025*	-0.002
	(-0.54)	(-0.87)	(-1.79)	(-0.20)
INDEP	0.000	-0.002	0.001	-0.001
	(0.17)	(-0.55)	(0.34)	(-0.36)
INST	0.000	0.001**	0.002**	0.001
	(0.68)	(2.42)	(2.55)	(1.52)
salesgrowth	0.023	0.022	-0.004	0.037***
	(1.48)	(1.45)	(-0.24)	(2.68)
Manage	-3.845***	-4.493***	-3.870***	-4.525***
	(-16.01)	(-16.18)	(-15.62)	(-16.69)
Constant	-1.698***	-0.886**	-1.999***	-0.948**
	(-4.86)	(-2.10)	(-5.38)	(-2.42)
Observations	3,741	3 , 398	2,478	4 , 661
R-squared	0.719	0.715	0.752	0.703
Adj. R2	0.701	0.701	0.701	0.701

Note: *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

6. Conclusion and Implications

6.1 Main Conclusions

Using panel data from 1540 high-end manufacturing enterprises listed on the Shanghai and Shenzhen A-share markets (2012–2022), this study employs two-way fixed-effect, instrumental variable, and propensity score matching methods to analyze the impact, mechanisms, and heterogeneity of regional new quality productivity on high-quality development. Findings indicate: (1) Regional new quality productivity significantly drives high-quality development with a robust positive correlation; (2) It promotes development through digital transformation, enhanced innovation, and alleviated financing constraints; (3) Heterogeneity analysis shows stronger effects for enterprises with less diverse executive teams, smaller firms, lower tax burdens, and higher government intervention.

6.2 Policy Implications

Cultivate Regional New Quality Productivity: Prioritize new quality productivity as a core strategy for regional industrial growth. Local governments should design targeted plans for AI, industrial internet, and green manufacturing, increase fiscal and resource inputs, and establish innovation platforms to promote technology application in high-end manufacturing. Foster cross-regional coordination to enhance technology, data, and talent flows, building a robust ecosystem to support high-quality development.

Promote Digital Transformation and Innovation: Implement precise policies to drive digital transformation, innovation, and financing. Establish subsidy funds for intelligent transformation and digital management upgrades. Strengthen R&D tax incentives and intellectual property protection to boost innovation. Encourage financial products like special loans and risk compensation to ease financing constraints, enabling new quality productivity to empower high-end manufacturing.

Differentiated Policies for Enterprise and Regional Needs: Tailor policies to enterprise characteristics, optimizing executive teams with technical expertise and supporting SMEs with training and collaborative innovation models. Large enterprises should accelerate digitalization and green practices. For regions, implement tax reductions in high-tax areas and strengthen policy guidance in low-intervention regions through special funds and government-enterprise platforms to maximize new quality productivity benefits.

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