

Regional Integration and Enterprise New Quality Productive Forces

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Abstract: In the context of the domestic macrocycle, regional integration plays a pivotal role in reducing regional barriers, promoting the flow of capital and human resources, and building a unified national market. This study, based on data from Chinese listed firms (2011–2022) and using the entropy method to construct new productivity indicators, examines the impact and mechanisms of regional integration on firms' new quality productivity. The findings reveal that regional integration significantly enhances firms' new quality productivity, with structural heterogeneity, and this conclusion is robust across various tests. Mechanism analysis identifies three pathways: (1) fostering industrial upgrading and emerging industries; (2) enabling the cross-regional flow of high-quality human capital; (3) attracting foreign capital to boost innovation and investment. Additionally, the study underscores the importance of digital governance, as the digital economy amplifies the positive effects of regional integration on productivity. These insights provide strategic guidance for advancing high-quality enterprise development and promoting regional integration within the domestic macrocycle.

Keywords: Firms, new quality productivity, Regional integration, Digital economy policies

1. Introduction

Regional integration is a key driver of coordinated development, underpinning a new development pattern centered on the domestic macrocycle, reinforced by the interplay of domestic and international cycles. It fosters a regional economic structure marked by complementary advantages and high-quality growth, enabling reforms from a higher baseline and advancing economic development to a more sophisticated level.

The concept of new quality productive forces addresses issues in China's economic development driven by two main actors: state-owned enterprises (SOEs) and private enterprises. SOEs are the main force for efficiently fulfilling their economic responsibilities and promoting high-quality development, and they bear the main responsibility in the historical process of promoting Chinese-style modernization, leading a high level of scientific and technological self-reliance, and realizing high-quality economic development[1]. SOEs play a pivotal role in promoting Chinese-style modernization, achieving technological self-reliance, and driving high-quality economic development. However, challenges such as single industrial structures, resource dispersion, redundant construction, and outdated capacities persist. Besides, private enterprises, as critical "capillaries" of the national economy, account for 70% of societal technological innovations, 80% of national "small

giants," and 90% of innovative technology firms, serving as key drivers of China's high-quality economic development. It is an important market mainstay in promoting China's high-quality economic development[2]. However, private enterprises still have problems with innovation. However, private enterprises still have problems such as insufficient innovation momentum, sloppy production and operation methods, and low economic efficiency[3]. China's pursuit of high-quality development requires new productive forces and a guiding productivity theory. However, existing research on firms' new quality productive forces remains insufficient, primarily focusing on its necessity. Studies exploring the impact of regional integration on new quality productive forces are notably scarce.

This paper makes three key contributions: (1) It examines the relationship between regional integration and enterprise new quality productive forces in China's new era, expanding the understanding of firms' new quality productive forces and enriching related academic research. (2) It explores the transmission mechanisms of regional integration policies on enterprise new quality productive forces, uncovering their internal dynamics. (3) From the perspectives of city location and administrative level, it evaluates the heterogeneous effects of regional integration policies on enterprise new quality productive forces, providing empirical evidence and policy insights to guide localized and actionable policymaking.

2. Literature Review

New quality productive forces represents an advanced form of productivity, transcending traditional paradigms through scientific and technological innovation. Driven by emerging and future industries, it leverages high-efficiency and high-quality transformation of nature, aligning with the demands of high-quality development. Rooted in the new technological revolution, it departs from conventional growth paths, embodying integration and new connotations within the digital era.

Since the introduction of the concept of new quality productivity (NPRO), numerous studies have explored its driving factors, with a focus on digital intelligence and government policies. Most domestic research emphasizes the role of the digital economy in driving enterprises' NPRO. Zhao and Li Juntin's study highlights that enterprise digital transformation promotes NPRO primarily through enhancing technological innovation and alleviating financing constraints[4]. Meanwhile, Song Hongqiao and Zhang Xiaoheng's study confirms that digital transformation induces significant shifts in socialized production methods and improves resource allocation efficiency through technological innovation and the multiplier effect of data, thereby shaping enterprise new quality productive forces[5]. Zhang Xiu'e et al. concluded that digital transformation can enhance the absorptive capacity and enterprise new quality productive forces, and the intensity of market competition plays a positive role in the relationship between digital transformation and new productivity of enterprises[6]. In addition, Song Jia et al. argue that ESG development promotes new productivity by improving the relationship between firms and stakeholders, lowering the cost of intermediate goods and the cost of debt financing, and increasing the proportion of institutional shareholding[7].

This paper uses regional integration to explore its impact on enterprise new quality productive forces. Regional integration development is one of the major national strategies in the new era and is an important part of implementing the new development concept and building a modernized and powerful country. The in-depth implementation of the strategy of regional coordinated development, major regional strategies, the main functional area strategy, and the new urbanization strategy, the construction of complementary advantages, and high-quality development of the regional economic layout and territorial spatial planning will help to promote the reform from a higher starting point, open up to the outside world at a higher level, to improve and enhance the spatial layout of China's new round of reform and opening up.

At the innovation level, Wang Xiaolong's research shows that regional integration significantly improves STI capacity and economic resilience[8]. Ni Tingting and Wang Yuetang show that with the reduction of regional barriers, the increase of innovation activities by firms has become an important focus for the restructuring of competitive dynamics in the face of external shocks[9]. The study by Wu Qingshan et al. shows that regional integration can improve enterprise new quality productive forces by reducing firms' costs and increasing firms' demand[10]. The existence of these mechanisms may make regional integration have a significant impact on enterprise new quality productive forces.

3. Theoretical Assumption

This paper examines the analytical mechanisms by which regional integration affects enterprise new quality productive forces. Based on this, the paper suggests three paths through which regional integration may affect enterprise new quality productive forces.

Regional integration revitalizes enterprises by fostering resource integration across industries and advancing industrial structure rationalization and upgrading. Through enhanced industrial chain synergy and regional division of labor, it establishes stable supply chains, reduces transport costs, and minimizes intermediate depletion, thereby lowering production costs. These cost savings improve profit margins, enabling firms to invest in technological innovation and equipment upgrades, ultimately driving productivity gains.

Regional integration promotes innovation by facilitating the flow of resources, technology, and talent within regions, enhancing enterprise new quality productive forces. From a competitive perspective, integration dismantles administrative barriers, aligns cities under unified spatial planning, and attracts enterprises to participate in broader market competition. This stimulates R&D investment and talent training, driving the transformation of traditional factors into innovation—key to advancing new-quality productivity. From the perspective of factors of production, regional economic integration can significantly improve the efficiency of regional resource allocation and mismatch of resources. Furthermore, regional integration fosters closer collaboration among enterprises, universities, and other stakeholders, facilitating scientific and technological innovation. This collaboration accelerates the transformation and practical application of technological achievements, further enhancing productivity growth. Regional integration promotes the full influx of labor, technology, resources, and other factors of production so that the cost of raw materials for enterprises is reduced, more funds are used for R&D investment in enterprises, and more excellent talents are integrated into enterprises[11]. Enterprise new quality productive forces will be improved.

Regional integration can strengthen the dynamics of innovation at the input level, thereby enhancing enterprise new quality productive forces. Regional integration, as a policy prerequisite for promoting high-quality economic development, can bring in adequate financing, especially in terms of expanding the size of markets and creating cost advantages within the region. It promotes capital inflow by enhancing the location advantage of the whole region[12]. In terms of inputs, it enhances innovation dynamics. Capital inflows stimulate increased R&D investment in subsequent periods, as firms proactively respond to market demands through continuous innovation to optimize product quality. This innovation-driven optimization plays a pivotal role in shaping the trajectory of production development and serves as a critical factor in fostering enterprise new quality productive forces. Accordingly, this paper formulates the core research hypothesis.

Hypothesis 1: Other things being equal, regional integration will significantly increase the level of enterprise new quality productive forces.

The impact of regional integration on enterprise new quality productive forces is conditioned by government support for the digital economy. Literature highlights a strong correlation between digitalization and productivity, driven by technological R&D, digital infrastructure, and digital

transformation. Strong government support facilitates technological breakthroughs and infrastructure development, amplifying regional integration's role in resource optimization, innovation, and productivity growth. Conversely, low government support diminishes this effect. Therefore, when government support is high, regional integration significantly enhances firms' new productivity, leading to the proposed hypothesis.

Hypothesis 2: Regional integration contributes significantly to enterprise new quality productive forces, when government support is high.

4. Research Design

4.1. Sample Selection and Data Sources

The research object of this paper is the new quality productive forces level of nationally listed enterprises, and the sample interval is 2011-2022. Based on the availability of data, this paper selects the financial statement data of A-share listed enterprises from 2011 to 2022, as well as the statistical yearbooks and statistical reports published by each prefecture-level city, and the relevant data are processed as follows: ① excluding the samples of ST and * ST listed enterprises with poor operation; ② excluding the samples of the financial industry and the real estate industry; and ③ the shrinkage of the front and back 1% quartiles.

4.2. Description of Variables

4.2.1. Explained Variables

The explanatory variable in this paper is enterprise new quality productive forces, the concept of enterprise new quality productive forces started late, and there is no fully mature measurement system, so this paper refers to Song Jia's method. Based on the theory of two factors of production, productivity includes two factors: labor and production tools. The index system of Npro is constructed, and the weight of each index is calculated by the entropy value method.

4.2.2. Core Explanatory Variables

This paper adopts the degree of regional integration (Integ) as the core explanatory variable, where the market integration index is chosen to measure the degree of regional integration, which is used to indicate the closeness of regional commodity market linkages. We use the "one-price method" to measure the market integration index of cities, and the data are mainly obtained from the price index of prefecture-level city yearbooks.

4.2.3. Control Variable

In this paper, we refer to the existing research literature and use equity concentration (Top1), urbanization level (urban), board size (Board), export openness (Open), listing age (ListAge), and industrial structure (Ind) as control variables.

4.2.4. Intermediary Variable

According to the research hypotheses of this paper, human capital level (Hcapital), and industrial structure upgrading (Indadv) cross-district mobile capital (InBranches) are selected as mediating variables respectively.

4.2.5. Moderator Variable

The development level of enterprise new quality productive forces is affected by the digital economy policies enacted by the government, and the word frequency (eco) of digital economy policies is selected as the moderating variable in this paper. Table 1 reports descriptive statistics for all the main variables.

Table 1: Descriptive statistics

variable name	Variable Definition	sample size	average value	standard deviation	minimum value	maximum values
Integ	Marketization index for cities	27420	17.353	3.322	1.169	24.637
Hcapital	Level of human capital	31909	0.021	0.005	0.008	0.044
Ind	industrial structure	31909	0.54	0.113	0.327	0.838
Open	Degree of openness of cities	28547	0.572	0.862	0	28.368
Board	Board size	31909	2.119	0.198	1.609	2.708
Top1	Percentage of first shareholders	31911	0.336	0.147	0.081	0.758
ListAge	Number of years listed	31911	2.161	0.784	0.693	3.401
Npro	Level of enterprise new quality productive forces	31602	52.094	26.138	0.88	329.955
urban	Urbanization level of cities	27511	0.757	0.149	0.181	1
PGDP	GDP per person	31909	83617.675	39014.608	16024	190313
TEP	Total factor productivity	31911	8.288	1.053	4.374	13.096

The mean value of the explanatory variable Npro is 52.094, with a standard deviation of 26.138, and a range from 0.88 to 329.955. The mean being much smaller than the maximum indicates significant variation in firms' new quality productivity, suggesting that the overall level in China remains low. Similarly, the explanatory variable Integ and other control variables exhibit significant differences between their minimum and maximum values. The large and geographically diverse sample size used in this study enhances the reliability of the findings.

4.3. Modelling

To test the research hypothesis H1, the following regression model (1) was constructed:

$$Npro_{it} = \alpha_0 + \alpha_1 Integ_{it} + X_{it}\psi + \lambda_t + \varepsilon_{it} \quad (1)$$

Npro is the explanatory variable, representing enterprise new quality productive forces; *Integ* is the explanatory variable, representing the degree of regional integration; X_{it} is a set of control variables; λ_t represents year fixed; ε_{it} is a random disturbance term; subscripts i and t, represent individual firms and time, respectively.

In order to test the mechanism hypothesis, this paper constructs the conduction mechanism model (2):

$$MV_{it} = \beta_0 + \beta_1 Integ_{it} + X_{it}\psi + \lambda_t + \varepsilon_{it} \quad (2)$$

In model (2), MV_{it} is the mediating variable, and the regression uses human capital, industrial upgrading, cross-regional capital flows, and artificial intelligence as explanatory variables, respectively.

5. Regression analysis

5.1. Basic results

The following table demonstrates the results of this benchmark regression, with the first column indicating the results of the direct regression between the explanatory and interpreted variables, the second column indicating the results with the inclusion of time-fixed effects, the third column indicating the results with the inclusion of time fixed effects and control variables, and the fourth column indicating the results with the industry fixed effects. This is shown in Table 2 below.

Table 2: Benchmark regression

	(1) Npro	(2) Npro	(3) Npro	(4) Npro
Integ	0.532*** (9.983)	0.114*** (3.249)	0.320*** (4.610)	0.103*** (2.980)
mopen			-8.767*** (-15.740)	-5.042*** (-8.268)
Board			8.785*** (9.899)	-1.142 (-1.438)
Ind			36.364*** (20.003)	5.781 (1.377)
Top1			-2.369** (-2.022)	0.186 (0.127)
urban			17.033*** (9.320)	8.086*** (3.043)
ListAge			-0.893*** (-4.176)	5.384*** (17.094)
_cons	44.287*** (50.820)	26.455*** (20.442)	-2.129 (-0.907)	3.639 (1.150)
N	26652	26652	26652	26652
Year	No	Yes	Yes	Yes
Industry	No	No	No	Yes
R ²	0.004		0.085	
F	99.652		137.144	

The results show that the coefficient of regional integration is significantly positive at the 1 percent level before and after the inclusion of control variables and fixed effects, indicating that regional integration has a significant positive impact on enterprise new quality productive forces and the hypothesis of this paper is valid.

5.2. Mechanism studies

Table 3, column (1) shows the regression results for the transmission mechanism between firms and human capital (Hcapital). The significantly positive Integ coefficient at the 1% level confirms that regional integration enhances human resource mobility and quality, thereby promoting enterprise new

quality productive forces by reducing administrative barriers and facilitating high-quality talent flows.

Column (2) of Table 3 presents the regression results for the transmission mechanism between enterprises and industrial structure upgrading (Ind-adv). The significant coefficient of minteg at the 1% level confirms the mediating role of industrial structure upgrading, validating the hypothesis that regional integration promotes industrial upgrading, thereby enhancing enterprise new quality productive forces. This is likely due to regional integration optimizing industrial chains by fostering upstream and downstream collaboration, reducing production costs, increasing R&D investment, and driving product innovation.

Column (3) of Table 3 presents the regression results for the transmission mechanism between firms and capital inputs (lnBranches). The significant coefficient of minteg at the 1% level confirms the mediating role of capital inputs, validating the hypothesis that regional integration promotes cross-border capital flows, thereby enhancing enterprise new quality productive forces. This effect likely stems from increased R&D investment facilitated by regional integration, which boosts firms' innovation capacity and productivity.

Table 3: Mechanistic studies

	(1) Hcapital	(2) Indadv	(3) lnBranches
Integ	0.016*** (17.429)	0.010*** (14.261)	0.007** (2.334)
controls	Yes	Yes	Yes
_cons	0.732*** (14.539)	1.257*** (32.253)	-0.724*** (-4.683)
N	26093	26093	21194
R ²	0.411	0.793	0.175
F	188.926	1035.984	47.124

***p<0.01,**p<0.05,*p<0.10

5.3. Heterogeneity test

As cities with different administrative levels exhibit varying infrastructure and development, the impact of regional integration policies on firms may also differ. This study differentiates the sample into capital and non-capital cities, revealing that regional integration significantly enhances enterprise new quality productive forces in provincial capitals but has no significant effect on firms in non-capital cities. As shown in (1) below and in column (2).

Given the disparities in economic strength, resource endowment, and policy support among the eastern, central, and western regions, this study divides the sample accordingly to examine the policy effects of regional integration. Findings indicate that cities in the eastern region, with their strong economic base, favorable geographic location, and resource endowment, experience stronger policy effects, whereas the central and western regions, constrained by weaker economic foundations and urban-rural disparities, exhibit comparatively weaker effects.

Table 4: Heterogeneity test

	(1) Npro	(2) Npro	(3) Npro	(4) Npro	(5) Npro
Integ	0.279*** (2.810)	-0.052 (-0.841)	0.299*** (3.840)	0.092 (0.512)	-0.125 (-0.660)
controls	Yes	Yes	Yes	Yes	Yes

Table 4: (continued).

_cons	37.932*** (5.746)	41.935*** (8.796)	-2.814 (-0.550)	-7.484 (-0.969)	34.222*** (3.645)
N	7357	13431	18612	4579	3461
Year	Yes	Yes	Yes	Yes	Yes
Fe	Yes	Yes	No	No	No
Industry	No	No	Yes	Yes	Yes
R ²	0.213	0.218	0.215	0.268	0.316
F	95.295	178.366	52.676	19.840	18.784

***p<0.01,**p<0.05,*p<0.10

5.4. Endogeneity test

To address endogeneity caused by causal relationships, this study employs a multi-period DID method. The results, both without (column 1) and with (column 2) control variables and two-way fixed effects, show significantly positive coefficients, indicating that regional integration enhances enterprise new quality productive forces and confirming the robustness of the baseline findings.

Table 5: Endogeneity test

	(1) Npro	(2) Npro
did	2.928*** (9.971)	1.184*** (2.759)
controls	No	Yes
_cons	50.667*** (247.064)	47.102*** (12.613)
N	31602	27177
Year	No	Yes
Fe	No	Yes
R ²	0.003	0.209
F	99.425	342.180

***p<0.01,**p<0.05,*p<0.10

5.5. Robustness check

In economics, productivity is often equated with total factor productivity (TFP). Therefore, this paper uses TFP, calculated via the LP method, as a proxy for enterprise new quality productive forces. Benchmark regression results in column (1) of Table 6 indicate that the Integ coefficient is significantly positive at the 1% level, suggesting that regional integration positively influences enterprise new quality productive forces, initially supporting the hypothesis.

To further validate this relationship, the study replaces the primary explanatory variable (regional integration index of prefecture-level cities) with the provincial regional integration index (PInteg). As shown in column (2), the PInteg coefficient remains significantly positive at the 1% level, confirming that regional integration at a macro level enhances enterprise new quality productive forces and reinforcing the hypothesis.

To account for potential disruptions caused by the COVID-19 pandemic (2020–2022), data from these years were excluded. The regression results in column (3) reveal that the Integ coefficient

remains significantly positive at the 1% level, demonstrating that regional integration continues to promote enterprise new quality productive forces, even after removing abnormal observations, thereby strengthening the robustness of the findings.

The inclusion of per capita GDP (PGDP) as an additional control variable further verifies the results. Column (4) of Table 6 shows that the Integ coefficient remains significant at the 1% level, indicating that the positive impact of regional integration on enterprise new quality productive forces persists, even after controlling for regional economic conditions.

To ensure result robustness, clustering robust standard errors were employed to address heteroskedasticity. The findings consistently affirm that regional integration significantly enhances enterprise new quality productive forces, offering strong empirical support for the proposed hypothesis.

Table 6: Robustness tests

	(1) TEP	(2) Npro	(3) Npro	(4) Npro	(5) Npro
Integ	0.010*** (5.688)		0.211*** (3.323)	0.228*** (3.809)	0.236*** (3.434)
PInteg		0.518*** (5.084)			
controls	Yes	Yes	Yes	Yes	Yes
PGDP				0.000** (2.064)	
_cons	4.084*** (35.637)	2.513 (0.818)	6.994** (2.022)	4.772 (1.486)	3.639 (0.547)
N	26093	27177	17470	25815	25815
Year	No	No	No	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes
R ²	0.312	0.208	0.221	0.228	0.228
F	138.994	83.737	52.964	78.285	3.639

***p<0.01,**p<0.05,*p<0.1

6. Moderating effect

Under the wave of digitization, digital economy policies are increasingly becoming a key tool to enhance the innovation capacity of firms and the efficiency of regional economic collaboration. By constructing a moderating effect model, this paper explores how digital economy policies play a moderating role between regional integration (Integ) and enterprise new quality productive forces (Npro). This paper chooses digital economic policy as the moderating variable in this paper, and empirical analyses show that digital economic policy significantly strengthens the positive impact of regional integration on enterprise new quality productive forces.

Table 7: Regulatory effects

	(1) Npro	(2) Npro
Integ	0.467*** (8.848)	0.010 (0.185)
eco	0.263*** (18.142)	0.143*** (9.539)

Table 7: (continued).

interact		0.013*** (2.742)
controls	No	Yes
_cons	39.544*** (41.225)	3.608 (1.066)
N	27611	26467
Year	No	No
Industry	No	Yes
R ²	0.016	0.190
F	217.774	71.269

***p<0.01,**p<0.05,*p<0.1

7. Conclusions

This paper investigates the impact of regional integration on enterprise new quality productive forces and its underlying mechanisms using data from A-share-listed enterprises in Shanghai and Shenzhen (2011–2022). The main research findings are as follows:

First, regional integration significantly increases the level of firms' NPRO. In particular, This effect is asymmetric across cities and regions, with enterprises in provincial capitals and eastern regions benefiting more due to better resource endowments and innovation capabilities. Secondly, Regional integration improves factor mobility, promotes cross-regional capital flows, drives industrial upgrading, and optimizes firms' R&D investment, thereby enhancing new quality productivity. Third, A robust digital economy positively moderates the effect of regional integration on NPRO, serving as a critical external condition.

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