Original Paper

Empirical Study on the Impact of New-Quality Productivity on Regional Economic Development in China

Hao Gu[1*]

[1] School of Economics, Shanghai University, Baoshan Campus, Shanghai, China

[*] Corresponding author

Abstract

New-quality productivity (NQP) reflects the modernization of productivity, characterized by higher technological levels, better quality, and greater efficiency and sustainability. Against the backdrop of technological innovation, NQP plays an increasingly significant role in economic development. Sustained growth of NQP is key to maintaining stable and rapid economic progress. This paper adopts the new-quality productivity index developed by scholar Lu Jiang, Guo Ziang and Wang Yuping, which comprises three dimensions, including innovation capacity, technological research and development, and production efficiency. By using this index, an OLS regression analysis is conducted on the economic development levels of various regions. Through regression analysis, the paper examines the impact of these indicators on regional economic development and provides relevant policy recommendations. The results show with a higher new-quality productivity index tend to have a higher level of economic development. Theoretically, this result further illustrates that new-quality productivity enhances production efficiency through technological innovation and resource optimization, thereby driving economic growth. New-quality productivity not only transcends the traditional factor-driven growth model but also injects stronger innovative momentum and potential for sustainable development into regional economies. On a practical level, improving the level of new-quality productivity can effectively promote the rational allocation of resources, accelerate industrial structure upgrades, and significantly enhance the affluence and vitality of regional economies.

Keywords

New-quality productivity, Economic development, Technological innovation

1. Introduction

In September 2023, during an inspection in Heilongjiang, Chinese President Xi Jinping emphasized the need to integrate resources for technological innovation, promote strategic emerging industries and future industries, and accelerate the formation of new-quality productivity (NQP). This is a new concept introduced by Chinese President Xi, representing productivity aligned with the new development framework and high-quality economic growth. NQP is established on the requirements of new industries, new business models, and is driven by innovation as the key factor.

NQP marks a qualitative leap in productivity, distinct from traditional productivity. It features four prominent characteristics: it abandons the traditional expansion model driven by factors, is driven by disruptive innovation, forms entirely new industrial chains, and meets the requirements for high-quality development. Some scholars, from the perspective of the history of productivity development, believe that human society is evolving from traditional productivity to NQP, following an inevitable historical trajectory (Li & Liao, 2023).

Chinese President Xi also remarked, "Economic development is a spiraling process, not a linear ascent. Once quantitative accumulation reaches a certain stage, a shift to qualitative improvement is necessary. China's economic development must follow this rule" (Xi, 2021). Traditional productivity is limited in its contribution to economic development, making the formation of NQP both urgent and necessary. First, the consumption and unsustainability of traditional productivity pose common developmental challenges worldwide. Second, traditional productivity models and systems no longer adequately address China's current developmental challenges. Lastly, traditional productivity cannot provide the necessary momentum for China's high-quality development (Zhang & Pu, 2023). NQP effectively addresses these issues. It can enhance economic development efficiency through digital economy technologies and reduce consumption, as NQP itself is green productivity. The development of NQP can also optimize and upgrade the economic structure, with high-quality development reflected in supply, demand, circulation, and distribution. Lastly, the development of NQP can increase economic resilience. Technological innovation is key to enhancing economic resilience, and independent innovation is a characteristic of NQP (Han & Ma, 2024). Therefore, in an era of technological innovation and complexity, we must strive for higher-quality productivity to drive today's economic development.

2. Literature

NQP is a newly coined term in recent years, and research on it in China is still in its infancy, with the theoretical framework yet to be fully established. Since 2023, research on new-quality productivity has gradually increased. Existing studies mainly focus on the following aspects: the conceptual definition of NQP, where Wang and Zeng (2024) point out that, unlike traditional productivity, NQP arises from emerging and future industries, based on technological and industrial revolutions, relying on technological innovation and the ability to utilize and transform nature; measurement indicators of NQP,

with Lu, Guo and Wang (2024) constructing a comprehensive evaluation system that includes three primary indicators and ten secondary indicators, using the entropy-weighted TOPSIS method to assess the levels of NQP across cities nationwide; and how NQP influences supply and demand in the economy, where Fang and Zhou (2024) suggest that NQP provides important opportunities for creating high-quality supply and new demand in China. However, despite the growing exploration of NQP, research on its impact on regional economic development and how local governments can enhance regional economic growth through the development of NQP remains relatively scarce.

2.1 The Connotation of New-Quality Productivity

Regarding the connotation of new-quality productivity, Wang et al. (2024) believe that new-quality productivity emerged in the current information age as an upgrade and transition from traditional productivity, encompassing both innovation and development, and is characterized by its dynamism, people's orientation, and openness. Zhou and Xu (2023) suggest that to accurately understand the connotative features of new-quality productivity, it is necessary to grasp it from both the "new" and "quality" aspects. The "new" refers to new-quality productivity being distinct from traditional productivity in the general sense, as it results from key disruptive technological breakthroughs and is primarily composed of new technologies, new economies, and new business models. The "quality" emphasizes that, while maintaining the essence of innovation-driven development, breakthroughs in key and disruptive technologies provide a stronger innovation driving force for productivity growth. Other scholars propose that new-quality productivity is an advanced form of productivity born from revolutionary breakthroughs in modern technology, innovative allocation of production factors, and deep transformation and upgrading of industries in the era of digital economy (Ji, 2024).

In summary, scholars have conducted relatively systematic explorations of the connotation of new-quality productivity, viewing it as an upgrade and breakthrough from traditional productivity in the context of the information age, with characteristics of innovation, dynamism, and openness. Understanding new-quality productivity from both the "new" and "quality" aspects highlights the core role of innovation-driven growth and disruptive technological breakthroughs in productivity development. However, existing research largely focuses on the theoretical level, with a lack of sufficient empirical studies on the practical applications and manifestations of new-quality productivity in industries. Moreover, the future development of new-quality productivity and its impact on regional economies and industrial structures still require further in-depth exploration.

2.2 Indicators for Measuring New-Quality Productivity

Given that NQP is a newly introduced term, its measurement is still in the developmental stage and is gradually maturing. Below are two recently published and popular evaluation indicators for NQP.

The evaluation indicator for NQP proposed by Lu et al. (2024) shows that the main first-level indicators for NQP include technological productivity, green productivity, and digital productivity. These are further subdivided into secondary and tertiary indicators. For instance, technological productivity is subdivided into innovation productivity and technological productivity, while

innovation productivity is further divided into innovation R&D, innovation industry, and innovation products. The corresponding data for the tertiary indicators are measured and comprehensively weighted to reflect the first-level indicators.

Similarly, J.Wang and R.Wang (2024) constructed NPQ indicator from three dimensions: laborers, labor objects, and means of production. The laborers dimension includes seven indicators, such as the average level of education and human capital. The labor objects dimension includes six indicators, such as the proportion of new strategic industries and the number of robots. The means of production dimension includes eight indicators, such as traditional infrastructure, digital infrastructure, and enterprise digitalization.

2.3 The Impact of New-Quality Productivity on Supply and Demand

2.3.1 New Quality Productivity Expands Effective Demand

In terms of the impact of new-quality productivity on demand, some scholars approach the topic from three aspects: consumption drivers, consumption objects, and consumption methods. They argue that new-quality productivity not only empowers high-quality supply and adjusts supply-demand mismatches, but also creates new demand by transforming consumption drivers, consumption objects, and consumption methods (Fang et al., 2024). Other scholars propose that starting from the basic connotation of new-quality productivity, labor is its main element, while labor materials and labor objects are its objective elements. These two aspects form two pathways through which new-quality productivity can activate effective demand. The activation occurs by stimulating consumption demand with payment capability through new production factors and by optimizing the combination of production factors to activate effective investment demand (Zhang & Zhou, 2024).

2.3.2 New-Quality Productivity Provides Sufficient High-Quality Supply

New-quality productivity aligns with high quality, high efficiency, and high standards (Han & Guo, 2024). It improves product quality and efficiency through scientific, technological, and business model innovation, thereby enhancing the competitiveness of Chinese products. NQP combined with education helps cultivate high-quality talents and drives industrial structural optimization and upgrades. It ensures that products and services meet not only quantity demands but also consumers' desires for quality, personalization, and higher-level spiritual and cultural needs. This enriches and improves the quality of market supply, fostering emerging industries and injecting strong momentum into production in these areas.

In summary, existing research on new-quality productivity has examined its impact on effective demand and high-quality supply through various aspects such as consumption drivers, objects, and methods. Many scholars argue that new-quality productivity enhances market supply competitiveness and satisfies consumers' demands for high quality and personalization by fostering technological innovation and optimizing production factors. However, there is still a lack of exploration regarding the specific mechanisms of new-quality productivity in practical applications.

3. Empirical Research

3.1 Econometric Model

To study the impact of new-quality productivity on regional economic development, we constructed a multiple linear regression equation with the logarithm of per capital GDP of each province as the dependent variable to reflect the level of regional economic development. Lu Jiang's new-quality productivity index serves as the core independent variable, as this indicator covers multiple key aspects, has gained widespread recognition, and better reflects the new-quality productivity level across regions. The equation also includes control variables such as urbanization level and unemployment rate.

$$lnagdp_{it} = \alpha_0 + \beta_1 nqf_{it} + \beta_2 X_{it} + \epsilon_{it}$$

Where $lnagdp_{it}$ represents the logarithm of the per capital GDP of region i at time t, used to indicate the level of economic development. nqf_{it} represents the NQP index for region i at time t. X_{it} is a set of control variables, including urbanization rate, unemployment rate, and education level, which may affect economic development levels (per capital GDP). ϵ_{it} is the random disturbance term.

3.2 Variable Settings

3.2.1 Dependent Variable

The dependent variable in this study is the per capital output of each province. We use per capital GDP (regional GDP divided by the year-end permanent population) to measure the level of economic development across provinces.

3.2.2 Core Independent Variable

Lu Jiang's new-quality productivity evaluation index is used as the core independent variable. This index is based on a comprehensive system consisting of three first-level indicators: technological productivity, green productivity, and digital productivity, which are further divided into six second-level indicators and eighteen third-level indicators. Data for 30 provincial regions in China from 2012 to 2021 were collected. The improved entropy-weight TOPSIS method was used to assign weights, resulting in a new-quality productivity index that reflects the development level across regions.

3.2.3 *Control Variables*

In order to avoid the influence of other irrelevant factors on the causal relationship to be verified in this article, the following three control variables were added to the regression model:

Urbanization Rate (urb): This is expressed as the ratio of the year-end urban population to the total population in the region. Urban areas concentrate more knowledge and resources and have a better capacity to allocate them efficiently. The relationship between urbanization and industrial upgrading is a key driver of economic growth.

Unemployment Rate (ue): The year-end registered unemployment rate (excluding the percentage symbol) is used. Unemployment can have a significant impact on both supply and demand, which in turn affects regional GDP.

Education Level (edu): This is calculated as the number of university students divided by the year-end permanent population. Regions with higher education levels typically have more developed economies.

3.3 Data Sources

The data for these indicators come mainly from the China Statistical Yearbook, provincial statistical yearbooks, the National Bureau of Statistics, and the China Labor Statistical Yearbook. To ensure the availability and comparability of the data, we ultimately selected panel data for 30 provinces from 2012 to 2021 for empirical testing.

3.4 Descriptive Statistics of Variables

3.4.1 Descriptive Statistics for the Key Variables Are Shown as Follows

Table 1. Descriptive Statistics for the Key Variables

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
lnagdp	300	10.87	0.434	9.841	12.12
nqf	300	0.204	0.181	0.0267	0.877
urb	300	0.602	0.118	0.363	0.896
ue	300	3.221	0.638	1.200	4.600
edu	300	0.0208	0.00550	0.00853	0.0425

3.4.2 Correlation Test

In order to preliminarily determine the correlation between variables in the empirical model of new quality productivity and economic growth, and to test for multicollinearity, this paper conducted correlation and VIF tests as follows:

Table 2. Correlation Analysis of Variables

	lnagdp	nqf	urb	ue	edu
lnagdp	1				
nqf	0.59***	1			
urb	0.88***	0.49***	1		
ue	-0.23***	-0.27***	-0.14**	1	
edu	0.50***	0.04	0.57***	-0.03	1

According to the correlation test results in Table 2, it can be seen that the new quality productivity index is significantly positively correlated with economic growth, with a correlation coefficient of 0.59, indicating that new quality productivity can promote economic growth. Generally speaking, provinces with high new quality productivity tend to have more developed regional economies.

3.5 Regression Results Analysis

3.5.1 NQP and Economic Growth

As a productivity form driven by innovation, NQP significantly promotes regional economic development. The first row of the benchmark regression model reports the direct impact of NQP on economic growth. The results show that the coefficient of NQP (nqf) is significantly positive at the 1% significance level, indicating that NQP strongly promotes economic growth. Provinces with higher levels of NQP experience faster and more sustainable economic development due to accelerated technological innovation, technological progress, and resource optimization. NQP also drives the optimization of industrial structures, promoting the development of high-tech industries and green economies, further enhancing economic resilience. Therefore, we can infer that regions with higher NQP tend to have more developed economies, under otherwise equal conditions.

3.5.2 Control Variables

Education Level (edu) promotes economic growth. Higher education levels not only cultivate high-quality talent but also promote technological progress and rapid dissemination of knowledge. Educated regions tend to have a more skilled workforce, stronger innovation capacity, and are better equipped to lead industrial upgrades. The regression analysis results in this study show that education significantly promotes economic growth, and as educational resources continue to improve, the economic potential of regions will also be further released.

Urbanization Rate (urb) also promotes economic growth. As urbanization increases, rural labor flows into cities, improving regional labor structures (Zeng, Jiang, & Cui, 2022). This urban influx not only boosts overall labor productivity but also spurs industrial growth and consumption upgrades. The regression results indicate that urbanization significantly promotes economic growth, with higher urbanization levels leading to more efficient and higher-quality economic growth.

Unemployment Rate (ue) inhibits economic growth. High unemployment means a significant portion of the labor force is idle, which directly affects household income levels and reduces overall consumption demand. As unemployment rises, societal problems such as instability and crime may also increase, negatively impacting the investment environment and market confidence. The results clearly show that unemployment has a significant negative effect on economic growth. Especially during periods of significant economic volatility, an increase in unemployment often exacerbates downward pressure on the economy. Therefore, reducing unemployment rate and increasing employment opportunities are important tasks in promoting sustained economic growth. By reducing the unemployment rate, it can effectively increase residents' disposable income, further stimulate consumer demand, and form a virtuous cycle of economic growth.

Table 3. Baseline Regression Results

VARIABLES	lnagdp
nqf	0.5066***
	(0.0732)
edu	5.9812***
	(2.2342)
ue	-0.0458**
	(0.0181)
urb	2.6628***
	(0.1375)
Constant	9.1847***
	(0.0902)
Observations	300
R-squared	0.8179

Robust standard errors in parentheses

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

3.6 Robustness Checks

To ensure the robustness of the regression results, this paper conducted robustness checks by substituting the core explanatory variable, the NQP index. Specifically, the benchmark regression uses Lu Jiang's (2024) indicator system to measure NQP, while the robustness test replaces this with Wang Jue's (2023) measurement system. Wang Jue's indicator system is constructed from the three dimensions of laborers, labor objects, and means of production, providing another comprehensive approach to measuring NQP.

The regression results show that the NQP index (nqf1), after replacement, still has a significant positive effect on economic growth at the 1% significance level, with a regression coefficient of 2.5940 (p<0.01). This indicates that NQP continues to play a significant role in promoting regional economic development. Additionally, the results of the control variables, such as urbanization rate, education level, and unemployment rate, remain consistent with those of the benchmark model, further demonstrating the reliability of the model's results. This robustness check confirms that the positive impact of NQP on economic development is not limited to a specific indicator system. While Lu Jiang's and Wang Jue's systems differ in their construction methods and dimensions, both reveal consistent findings: the improvement of NQP significantly promotes regional economic development. This suggests that the conclusions of this study do not rely on a single indicator but are broadly applicable and robust.

Furthermore, the comparison of the two NQP indices shows that despite differences in the details, both

capture the impact of NQP on economic growth with a high degree of consistency. This indicates that, regardless of the method used to measure NQP, its positive effect on economic development is evident. The robustness test further strengthens the credibility of the conclusions, eliminating concerns of bias due to the selection of a specific indicator system.

Therefore, the study's findings are not based on one specific NQP index but apply to multiple measurement standards, ensuring broad applicability of the conclusions. This robustness test further supports the core conclusion that NQP has a significant positive impact on economic growth.

Table 4. Robustness Test Table for Replacing Core Independent Variables

VARIABLES	lnagdp
nqf1	2.5940***
	(0.2798)
edu	4.9702***
	(1.6635)
ue	-0.0285**
	(0.0145)
urb	2.2966***
	(0.1100)
Constant	9.1188***
	(0.0696)
Observations	300
R-squared	0.8802

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ Table 4

4. Policy Recommendations

First, optimize industrial structures and improve production efficiency. By integrating data resources into the production process, data aggregation from multiple sources, and data mining using multiple models, data can be transformed into a productive factor. This helps optimize processes, achieve breakthroughs in key technologies, and upgrade upstream and downstream systems (Xia, Jiang, & Zhang, 2024). At the same time, it is essential to focus on breakthroughs in core technologies to break through international technological barriers and establish a self-sufficient innovation system. Strengthening the collaborative development of upstream and downstream industries through integrated innovation and joint research can further improve the efficiency of various industrial sectors, forming stable and sustainable economic growth.

Second, improve system construction. The development of NQP requires a sound system to support industrial upgrading, promote technological research and development, improve economic efficiency, and drive sustainable development (Bi & Ma, 2024). The development of NQP must rely on specific industrial systems, and a well-developed industrial system can provide better support for industries. First, a comprehensive industrial system helps various sectors gain more resources and opportunities in technology R&D and innovation applications, especially in emerging industries and future technology fields. Second, policies should be further optimized, such as increasing fiscal support, innovation subsidies, and tax incentives to attract more enterprises and research institutions to participate in the technological innovation of NQP. Meanwhile, local governments should formulate differentiated policies according to local conditions to promote the widespread application of NQP nationwide, thereby driving regional coordinated development and enhancing overall economic efficiency.

Third, strengthen cultural education and cultivate outstanding talents. The improvement of NQP depends on the solid support of high-quality talents. We must work to build a high-quality talent pool, with individuals not only possessing deep professional knowledge and skills but also demonstrating outstanding innovation abilities and teamwork in practical work. These high-quality talents will drive the leap in enterprise productivity, lead technological innovation, and accelerate regional economic prosperity and development. Through continuous investment in cultural education and innovations in talent cultivation mechanisms, we will lay a solid talent foundation for the sustainable development of society.

Fourth, promote regional coordinated development. The development of NQP varies significantly across different regions. Economically developed regions tend to benefit more quickly from NQP, while less developed regions are at risk of being marginalized. Therefore, the government should implement policies to promote regional coordinated development and reduce regional disparities. This can be achieved by increasing fiscal support for less developed areas and encouraging them to invest more in digital transformation and technological innovation. Developed regions can also help less developed regions improve their NQP levels through talent and technology transfer, thus achieving balanced economic development across the country.

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