Article

Not peer-reviewed version

An Invisible Force—Research on The Relationship between New Quality Productivity and Economic Growth in China

Wang Weijia *

Posted Date: 19 November 2024

doi: 10.20944/preprints202411.1282.v1

Keywords: new quality productivity; Demand side; Dynamic quantitative analysis; Economic growth

Article

An Invisible Force—Research on The Relationship between New Quality Productivity and Economic Growth in China

Wang Weijia

Xi'an Jiaotong-Liverpool University, China. 18522704823@163.com

Abstract: This paper investigates the connotation of new quality productivity, integrating existing research findings to construct a measurement index system tailored for our country, and conducts an in-depth analysis of its impact on economic growth. The study utilizes provincial panel data from Chinese provinces spanning 2012 to 2022. The results indicate that, in contrast to prior studies, new quality productivity influences economic growth not only through supply-side mechanisms but also plays a pivotal role in demand-side transmission; notably, the upgrading of consumption structures and the expansion of investment domains exert both direct and indirect effects. Accordingly, this paper proposes relevant policy recommendations. The innovative aspects of this study are as follows: 1. Measuring new quality productivity across multiple dimensions by incorporating environmental and ecological factors while exploring its transmission mechanism from the demand side; 2. Introducing dynamic quantitative analysis to simulate the operational mechanisms of new quality productivity on consumption and investment; 3. Empirical tests demonstrate that after addressing issues related to heterogeneity, endogeneity, and robustness, the transmission mechanism of new quality productivity remains significant and robust.

Keywords: new quality productivity; Demand side; Dynamic quantitative analysis; Economic growth

1. Introduction

With the ongoing global economic integration and the rapid advancement of science and technology, new quality productivity—an innovation-driven form of productivity—is progressively emerging as a pivotal force in fostering high-quality economic development. This study aims to elucidate the role of new quality productivity in stimulating economic growth by enhancing consumption structures and broadening investment domains, thereby providing a pathway analysis for achieving high-quality development.The cultivation and advancement of new quality productivity not only significantly bolster the momentum of economic growth but also generate extensive spatial externalities through mechanisms such as technological spillovers, factor mobility, and industrial linkages. These dynamics subsequently drive increases in consumption and investment, ultimately leading to broader economic expansion. Firstly, new quality productivity directly enhances output levels by improving total factor productivity (TFP). Secondly, it fosters industrial upgrading and bolsters innovation capacity, which elevates industry value-added contributions and propels technological progress. Additionally, optimizing resource allocation while enhancing labor quality further contributes to improved output levels; specifically, efficient resource allocation reduces transaction costs while enhanced labor quality boosts labor productivity. Finally, new quality productivity facilitates a synergistic relationship between economic growth and environmental protection through its promotion of green development.In terms of consumption and investment dynamics, new quality productivity augments individual income levels and purchasing power via advancements in workforce capabilities—including novel worker profiles—and promotes an upgraded consumption structure. Concurrently, this phenomenon has attracted increased

 doi:10.20944/preprints202411.1282.v1

investments—particularly within high-tech sectors and green industries—thereby expanding investment horizons.

Consequently, it is imperative to conduct an in-depth examination of the transmission pathways linking new quality productivity with economic growth to better comprehend its role in advancing economic development while providing a foundation for crafting more precise and effective policy measures.New quality productivity influences output levels through several mechanisms: Its impact on economic growth manifests primarily through these dimensions:Firstly, it markedly enhances production efficiency via technological advancements and innovations that elevate Total Factor Productivity (TFP), thus directly influencing overall economic output levels.Secondly, it catalyzes structural upgrades within industries towards higher-end technology-intensive trajectories; this transformation not only amplifies industry value-added but also injects renewed vitality into sustained economic expansion.

Furthermore, emphasis on scientific research initiatives underscores the centrality of technological innovation; continuous R&D investments foster enduring momentum for technological progress that underpins ongoing economic growth.Moreover， new quality productivity optimizes resource allocation by facilitating efficient coordination among data factors alongside other production inputs—notably reducing transaction costs while simultaneously enhancing resource utilization efficiency which furthers optimal operational efficacy across economies.Simultaneously,it raises standards regarding workforce qualifications; educational enhancements improve knowledge bases along with skill sets enabling adaptability toward emergent technologies whilst supplying essential talent support crucial for long-term sustainable developmental objectives.

Lastly， the focus on sustainable practices inherent within new qualitative paradigms emphasizes green innovations coupled with clean energy applications aimed at mitigating adverse environmental impacts thereby achieving harmonious coexistence between robust fiscal performance alongside ecological stewardship.

2. Literature review

The concept of new quality productivity has increasingly captured the attention of scholars in the field of economics, particularly within the context of a global economy shifting towards high-quality development, where its significance is becoming ever more apparent. In contrast to traditional productivity, new quality productivity emphasizes optimizing the integration of novel labor forces, innovative labor materials, and advanced labor objectives in terms of quantity while achieving qualitative enhancements (Zhang and Li, 2024; Pu Qingping and Yearning, 2024; Gao, 2023). This reflects a profound convergence between intelligence and technology in the modern economy. This paper reviews theoretical discussions surrounding new quality productivity and its implications for economic growth, analyzes its constituent elements as well as pathways for optimal integration, and ultimately identifies existing gaps along with future research directions. The foundation of new quality productivity stems from transforming and enhancing traditional productive factors. Pu and Xiang (2024) posited that new quality productivity encompasses higher-quality labor forces, media-rich labor materials, and broader-ranging labor objectives—these components collectively foster efficient forms of production through qualitative advancements. Zhang Yang and Li Haibo (2024) examined new quality productivity from a factor supply perspective. Overall, there is consensus among academics that new quality productivity comprises novel workers, innovative labor goals, and advanced labor materials. Liu Yi et al., including Zhengchu He (2024), explored how new quality productivity synergistically influences various industries by optimizing combinations within industrial chains while promoting coordinated system development.The index system for measuring new quality productivity is grounded in theoretical frameworks; some researchers are dedicated to establishing evaluation systems for this construct alongside

 doi:10.20944/preprints202411.1282.v1

measurement methodologies. Wang Jue & Wang Rongji (2024) as well as Zhu et al. (2024) have developed analytical frameworks assessing levels of new-quality productivity across Chinese provinces based on worker contributions, production objects' roles ,and means of production utilized . However ,current measurement studies exhibit two notable shortcomings: firstly ,they overlook both 'how' transmission mechanisms operate regarding newfound qualities in productive capacity ; secondly ,the selection criteria employed may not accurately encapsulate either 'novelty' or 'quality' inherent to this emergent form .Theoretical investigations into how newly defined productive capacities impact economic growth generally assert their substantial role in fostering such expansion . Xu et al.(2023) indicated that these enhanced capabilities yield not only quantitative increases but also improvements concerning overall output standards —serving fundamentally as driving forces propelling China toward high-caliber developmental trajectories . Zhai & Pan(2024) contended that emerging paradigms disrupt conventional models reliant upon outdated technological infrastructures . Nevertheless,much contemporary scholarship tends toward logical analyses lacking robust quantitative assessments which hampers deeper theoretical exploration whilst impeding practical applications' alignment with established theories .

Research examining mechanisms underlying fresh definitions around productive capacities predominantly adopts supply-side perspectives focusing on optimal resource allocation coupled with innovative factor integrations acting internally driven dynamics wherein big data analytics alongside artificial intelligence play pivotal roles facilitating economic advancement(Yang&Bai2017 ;Huangetal., 2022). Conversely,literature addressing demand-side transmission processes remains relatively sparse necessitating foundational inquiries into related phenomena .In conclusion,newly articulated notions surrounding productivities transcend mere quantifiable enhancements associated traditionally understood factors instead embody comprehensive transformations yielding qualitatively distinct outcomes.Although preliminary findings substantiate claims regarding positive correlations linking these emergent constructs towards stimulating broader economies significant deficiencies persist pertaining specifically targeted metrics alongside rigorous empirical evaluations.Additionally,current discourses remain disproportionately weighted favorably towards supply-oriented considerations thereby underscoring urgent needs directing further explorations aimed at refining evaluative indices bolstering quantitative scrutiny.To elucidate specific operational mechanics governing optimal configurations underpinning newly conceptualized productivities thus better informing policy-making practices ultimately advancing aspirations geared towards sustainable high-grade economic progress.

3. Theoretical model and mechanism

This paper develops a dynamic quantitative model of new quality productivity by advancing the real business cycle theory (RBC) and elucidates the impact of new quality productivity on economic growth through consumption and investment, building upon the work of Bloom (2007) and Bloom et al. (2007).

This section begins by defining the household sector, which aims to optimize its utility function, typically represented in the following form:

$$U = \sum_{t=0}^{\infty} \beta^t U(C_t, L_t) \quad (1)$$

Where C_t is the consumption in period t, $L_t$is the labor supply in period t, β^t is the discount factor ($0<\beta<1$) and $U(C_t, L_t)$ is the immediate utility function, usually assumed to be *CRRA* (constant relative risk aversion) utility function:

$$U(C_t, L_t) = \frac{C_t^{1-\sigma}}{1-\sigma} - \frac{L_t^{1+\phi}}{1+\phi} \quad (2)$$

 doi:10.20944/preprints202411.1282.v1

Where σ is the risk aversion coefficient of consumption and ϕ is the elasticity coefficient of labor. The budget constraint faced by the household is:

$$C_t + I_t = w_t L_t + r_t K_t \quad (3)$$

Where I_t is the investment in period t and w_t is the wage rate in period t and r_t is the return on capital in period t.

Then, the enterprise sector is constructed. The objective of the enterprise sector is to maximize profits, and the production function adopts the Cobb-Douglas form:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \quad (4)$$

Where Y_t is the output in period t, A_t is the new quality productivity in period t, K_t is the capital stock in period t, L_t is the labor input in period t, α is the output elasticity of capital, $0<\alpha<1$

The profit maximization problem faced by enterprises is as follows:

$$\max_{K_t, L_t} : Y_t - w_t L_t - r_t K_t \quad (5)$$

The dynamic equation of constructed capital is:

$$K_{t+1} = (1-\delta) K_t + I_t \quad (6)$$

Of this, δ is the capital depreciation rate

Market equilibrium conditions include that goods market output equals consumption and investment:

$$Y_t = C_t + I_t \quad (7)$$

In the labor market, labor supply equals labor demand:

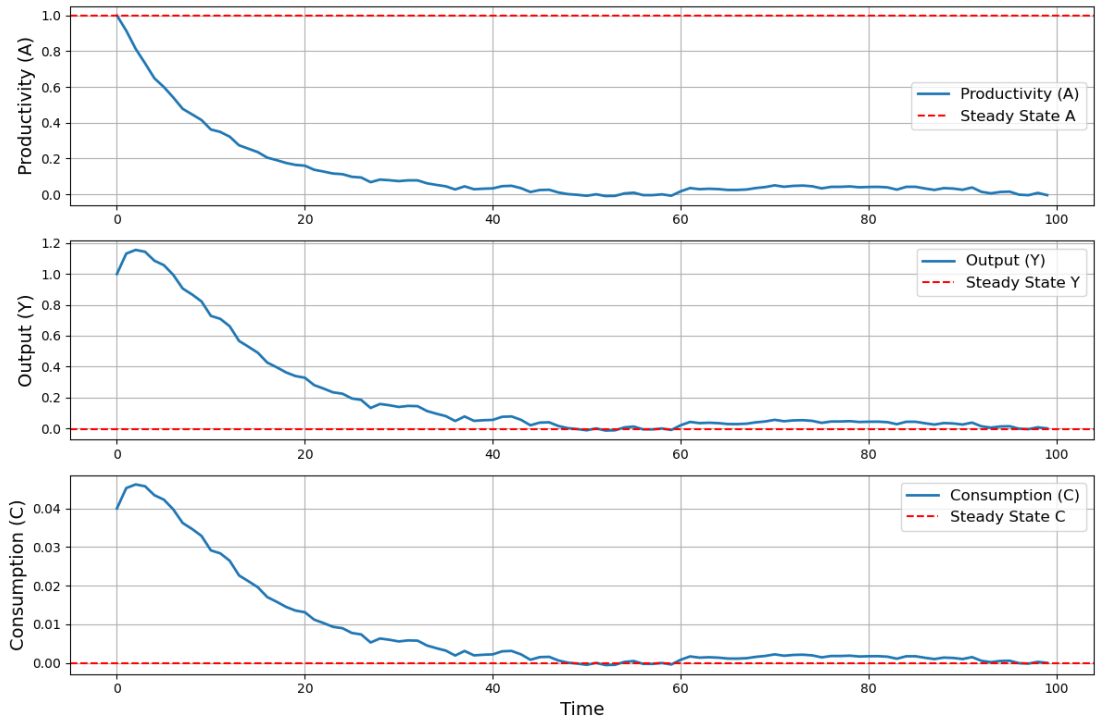
$$Lt^* = Lt^* \quad (8)$$

Capital supply equals capital demand in the capital market:

$$Kt^* = Kt^* \quad (9)$$

The quantitative simulation of the above dynamic model allows us to obtain the relationship between the variables on the optimal path.

 doi:10.20944/preprints202411.1282.v1



.

Figure 1. Growth path and steady state of new quality productivity, output and consumption.

Figure 1 depicts the impact of new quality productivity on output, consumption and investment paths, where the horizontal axis represents time, the vertical axis represents new quality productivity, output and consumption respectively, the solid line is the simulated value function, and the dotted line is the steady state growth path. The simulation shows that the new quality productivity will increase output and consumption in the initial stage, and eventually return to the steady state of balanced growth path.

4. Measurement and characteristics of new quality productivity level

The assessment of new quality productivity should be grounded in its fundamental definition, emphasizing the enhancement of workforce capabilities, labor objectives, labor resources, and their optimal combinations (Zhang and Li, 2024). On one hand, new quality productivity is contingent upon specific tangible factors such as a skilled workforce, innovative labor goals, and advanced labor resources; on the other hand, intangible ecological factors—such as improvements in energy efficiency and decarbonization—also facilitate the optimal integration of these tangible elements. By thoroughly exploring the essence of new quality productivity, this paper draws upon Yi Liu's research (2024), constructs an index system, and provides a detailed analysis of the current status and advancements in China's new quality productivity.

4.1. Indicator system construction

"Productivity is characterized as the capability of humans to generate material goods, with its evolution being influenced by a plethora of factors encompassing the utilization of labor tools, production inputs, advancements in science and technology, and organizational architectures (Ma and Wei, 2013). These determinants can be classified into two principal categories: physical factors and institutional factors such as production organization (Chen and Ha, 2018). Physical factors exert a direct effect on production activities, while institutional

 doi:10.20944/preprints202411.1282.v1

factors enhance the productivity potential of physical elements indirectly through ameliorations in ecological conditions or business milieus. For instance, abundant green resources can significantly enhance workers' living conditions, thereby escalating their productivity levels. Furthermore, the significance of information accessibility within production processes has become increasingly prominent; communication services and equipment play pivotal roles in shaping enterprise operations and influencing workers' productive endeavors (CAI and Niu, 2021). New quality productivity constitutes an advanced form of traditional productivity while adhering to its fundamental framework. Consequently, this paper contends that the primary value of information accessibility lies in facilitating physical elements to augment production capabilities through enhancements in automation and informatization rather than participating directly as raw materials. The interaction between tangible entities and institutional components constitutes a social productivity system that evolves concurrently with shifting social dynamics and historical contexts.

On one hand, the augmentation of new quality productivity necessitates continuous development among contemporary workers along with mastery over novel labor materials to achieve innovative production targets. Specifically, individual competencies are evaluated using metrics such as years of education attained, educational investment levels, and research & development manpower; new labor aspirations are manifested through indicators like evolving labor consciousness, labor productivity rates, and industrial structural alterations. Metrics for new labor data encompass degrees of automation adoption, levels of information access, availability of transportation infrastructure, and communication facilities. On the other hand, the ecological environment in combination with emerging production landscapes assumes an increasingly crucial role in fostering growth in new quality productivity—facilitating not only high-level integration between human activity and natural ecosystems but also driving profound transformations within labor processes towards sustainable industrial advancement. As a soft driving force, improvements in air quality coupled with green innovations catalyze coordinated advancements across fundamental elements underpinning both productivity frameworks and natural resource management, thereby propelling sustainable trajectories for new quality output. For example, green innovation is quantified via metrics such as counts of green patent applications; ecological health is evaluated against energy efficiency ratios or decarbonization indices; and business climates are gauged through entrepreneurial engagement statistics or digital transformation benchmarks.

Additionally, this study takes several other critical indicators into consideration. For instance, indicators related to ecological health include energy efficiency (energy consumption relative to GDP), decarbonization degree (index measuring shifts within the energy consumption structure), waste gas treatment capacity (capacity metrics from waste gas processing facilities), green resources (forest coverage percentage), environmental intensity (ratio comparing environmental protection expenditures against public financial outlays), and water quality (chemical oxygen demand emissions compared against GDP). Industrial water efficiency measures the correlation between industrial water usage and overall GDP figures, while air quality is assessed by the ratio of sulfur dioxide emissions to GDP, and green innovation is represented by the proportion of green patent applications among all patent applications. Market-oriented indicators comprise e-commerce growth rates (e-commerce sales expressed proportionately versus total GDP) and product innovation investments (spending directed at developing novel products represented similarly). Through comprehensive analyses encompassing these diverse parameters, this research aims to comprehensively evaluate the natural dimensions associated with the newly defined qualities surrounding productive outputs while elucidating distribution patterns observed within respective ecological settings.

In light there of the present investigation formulates an index system specifically designed for assessing NPM-related productivities aimed at quantifying China's performance spanning

Preprints.org (www.preprints.org) | NOT PEER-REVIEWED | Posted: 19 November 2024 doi:10.20944/preprints202411.1282.v1

from 2012 until 2022, as delineated within Table 1. To ensure the accuracy and reliability of the resultant calculations, this analysis excludes provinces with significant variable omissions and employs extrapolation techniques where necessary to supplement missing datasets across certain temporal intervals."

Table 1. Indicator system for measuring new quality productivity.

new labourer	personal skill	educational attainment	Years of schooling per capita
		Investment in education	Education expenditure/financial expenditure
		R&D manpower	Number of R&D staff
		Research and development outputs	Number of patents granted/total population
New labour goals	New Labour Awareness	Educational structure	Undergraduate students/resident population
	labour productivity	Number of 5G subscribers	Data from the Ministry of Industry and Information Technology
		Number of artificial intelligence companies	Data from Skywatch.
	industrial structure	Percentage of employment in higher education	Higher education employment/total employment
	strategic emerging industry	Growth in emerging industries	Value added of strategic emerging industries/GDP
	new market	Developments in e-commerce	E-commerce sales/GDP
		Product innovation inputs	Expenditure on new product development/GDP
	ecological environment	energy efficiency	Energy consumption/GDP
		Degree of decarburisation	Energy consumption structure decarbonisation index
		Exhaust gas treatment capacity	Capacity of waste gas treatment facilities
		Greening resources	forest cover
		Environmental intensity	Expenditure on environmental protection/government expenditure on public finance
		water quality	COD emissions/GDP
		Industrial water efficiency	Industrial water/GDP
		air quality	Sulphur dioxide emissions/GDP
		Green Innovation	Number of green patent applications/number of patent applications
New labour information	New labour materials	degree of automation	Regional industrial robot installations* (regional industrial employment/national total employment)
		Level of information	Number of enterprises carrying out e-commerce trade activities/total number of enterprises
		Access to the Internet	Internet broadband access ports per capita
		Business Website Popularity	Number of websites per 100 enterprises
		Transport facilities (roads)	Miles of road
		Transport facilities (railway)	Railway mileage
		communications business	Total telecommunications services
		communications facility	Length of fibre-optic cable routes
	New production environment	business environment	Entrepreneurial activities
		Level of digitisation	Digital Economy Index
		Financial sector development	Financial sector value added

4.2. Measurement Methods and Results

In constructing the index system for new quality productivity, this study comprehensively considers multiple dimensions, including scale innovation, resource utilization efficiency,

 doi:10.20944/preprints202411.1282.v1

industrial structure, and ecological sustainability, thereby establishing a robust evaluation framework. To ensure the objectivity and accuracy of the indices, this paper employs the entropy method to conduct evaluations and calculates index weights, information entropy, and redundancy in information entropy by objectively assigning values to each indicator. The comprehensive scores obtained are reported (Liu Yi et al., 2024).

This research calculates the New Productivity Measure (NPM) levels across 30 provincial administrative regions in China from 2012 to 2022 through detailed methodologies. Furthermore, it investigates the role of new quality productivity in relation to investment dynamics, consumption patterns, and economic growth trajectories. The subsequent sections will elaborate on the specific impacts of new quality productivity on economic growth through empirical analysis.

5. Empirical analysis

5.1. Model construction

According to the simulation analysis of new quality productivity in the previous section, an empirical model is further constructed for analysis:

$$lngdp_{it} = \beta_0 + \beta_i prod_{it} + X_{control_{it}} + \mu_i + \varepsilon_t + e_{it} \quad (1)$$

where i and t represent individuals and time, respectively. *prodit* measures the level of new quality productivity of province i in year t and is the core explanatory variable of the paper.

The explanatory variable $lngdp_i$ is economic growth, which indicates the per capita GDP of each province (Qian Haizhang; 2020), and the explanatory variable *control*; is a conventional variable that affects economic growth, including:The level of human capital (*hum*), which is usually measured by the level of educational attainment or the ratio of teachers and students in colleges and universities, reflects the level of knowledge and skills of the labour force. The financial sector development (*fin*) variable can significantly affect the high quality of economic development. Industrial structure (*ind*), including the share of manufacturing and services, reflects the contribution of different industries to economic growth. Capital stock, as an important factor of production, has a significant positive effect on economic growth. Population agglomeration (*pop*), population density or degree of population agglomeration has a significant positive impact on urban economic growth. Technological progress (*tec*), indicators such as the share of knowledge-intensive industries can be used as a proxy variable to measure technological progress. Energy consumption (*ene)*, energy use efficiency and total energy consumption may have a direct or indirect impact on economic growth.

whereμ_i are individual fixed effects, andε_t is the time fixed effect to control for inherent differences between individuals and time trends, ande_{it} is the error term. Descriptive statistics for the variables are shown in Table 2.

Table 2. Descriptive statistics.

variable name	Number of observations	average value	(statistics) standard deviation	minimum value	maximum values
lngdp	270	2.8161	2.347359	2.347359	12.95136
prodit	270	0.2767628	0.1037574	0.1205158	0.6423158
hum	270	9.152827	0.5483727	7.473942	10.53859
fin	270	1994.338	1951.952	106.1	11825.76
ind	270	0.1634963	0.0261236	0.0989419	0.216552
pop	270	29763.32	55570.29	82	375218
tec	268	1.673386	1.73417	0.1592274	10.47998
ene	264	0.7287993	0.4262725	0.0075687	2.188928

 doi:10.20944/preprints202411.1282.v1

5.2. Analysis of baseline results

The empirical analyses conducted in Table 3 show that new quality productivity has a significant positive effect on GDP per capita. In model (1), the contribution of new quality productivity to economic growth remains significant even without the inclusion of control variables and fixed effects. In models (2) and (3), with the gradual inclusion of control variables and two types of fixed effects, the results remain solid, indicating that, all other things being equal, for every unit increase in *prodit*, *lngdp* will rise by 16,090,000 yuan and be highly significant.

Table 3. Regression analysis.

	(1) *lngdp*	(2) *lngdp*	(3) *lngdp*
prodit	1.5990***	1.5907***	1.6090***
	(0.1318)	(0.1382)	(0.1242)
control variable	No	Yes	Yes
time fixed	No	Yes	Yes
individual fixed	No	Yes	Yes
N	270	268	237
R^2	0.354	0.923	0.959

Standard errors in parentheses; * $p < 0.1$,** $p < 0.05$,*** $p < 0.01$.

5.3. Heterogeneity tests

This paper further conducts a heterogeneity test to further decompose the components of new quality productivity, explore the role of new workers, new labour goals and new labour materials on economic growth, and analyse the differences in the role of different components of new quality productivity on economic growth. It can be found that new workers, new labour goals and new labour materials all have a significant impact on economic growth at the 1% level, while this paper comprehensively considers key indicators in multiple dimensions such as education, technology, environment and digitalisation as control variables, with a view to constructing a comprehensive and in-depth analytical framework. Firstly, the cultivation of new labourers, as the cornerstone of the development of new quality productivity, the improvement of their education level and the refinement of their professional skills are reflected through the growth of years of education per capita and the increase of investment in education. Second, the setting of new labour targets, such as the growth of new industries and the development of e-commerce, not only broadens new paths of economic growth, but also reflects its substantial contribution to the economy through the ratio of the value-added of strategic new industries to GDP.

Further, the introduction of new means of labour, in particular the application of automated and intelligent production tools, has significantly increased productivity and reduced costs. This shift is quantified by the ratio of the number of industrial robots installed to industrial employment, which in turn reveals the positive impact of increased automation in production on economic growth. At the same time, the long-term potential of environmentally friendly labour objects, such as the use of new materials and new energy sources, cannot be ignored, especially in the context of the growing global demand for clean energy and cutting-edge materials, although they may face the challenges of long research and development cycles and high investment risks in the short term.

In addition, this study also takes into account the increase in the level of digitisation, such as the growth in the number of 5G subscribers, the increase in the number of AI enterprises, and the advancement in the level of information. The improvement of these indicators not only reflects the increase in the level of informationisation and digitisation of the society, but also provides technological support and market conditions for the development of new-quality

 doi:10.20944/preprints202411.1282.v1

productivity (Liu et al., 2017). The development of the financial sector, the optimisation of the business environment, and the improvement of the level of digitisation all provide a good external environment for the growth of new quality productivity, and together they promote high-quality economic growth.

Table 4. Impact of different elements of NQP on economic growth.

	(1)	**(2)**	**(3)**
	lngdp	*lngdp*	*lngdp*
lnhqlabor	0.0916***		
	(0.0082)		
lnhqtagart		0.1784***	
		(0.0216)	
lnhqfilss			0.1863***
			(0.0176)
control variable	Yes	Yes	Yes
time fixed effect	Yes	Yes	Yes
individual fixed effect	Yes	Yes	Yes
N	268	236	268
R^2	0.921	0.925	0.916

Standard errors in parentheses; * $p < 0.1$,** $p < 0.05$,*** $p < 0.01$

5.4. Endogeneity issues and GMM estimation

Considering the endogeneity problem and two-way causality, economic growth itself may also act on new quality productivity (Han, Wenlong and Zhang, Ruisheng; 2024). In addition to this, omitted variable bias can also lead to endogeneity by causing the explanatory variables to be correlated with the error term. In order to mitigate the estimation bias caused by the endogeneity problem mentioned above, this paper draws on Arellano and Bond (1991) and uses the first-order and second-order lagged terms of the explanatory variables as instrumental variables for the GMM estimation, and the results are shown in Table 5.After conducting the GMM regression analyses, the validity of the instrumental variables is also examined in this study.The results of Hansen's test show that the instrumental variables have no over-identification problem. Columns (1) and (2) of Table 5 provide the estimation results of the difference GMM and system GMM, respectively. The results show that *prodit* significantly contributes to economic growth despite accounting for the endogeneity problem.

Table 5. GMM Estimates.

	(1) One stage lag	(2) Two stage lag
prodit	1.7250***	1.6431***
	(0.1505)	(0.1714)
control variable	No	Yes
time fixed	No	Yes
individual fixed	No	Yes
N	240	212
Hensen test	0.378	0.363
AR(2) P-value	0.272	0.142

Standard errors in parentheses; * $p < 0.1$,** $p < 0.05$,*** $p < 0.01$.

5.5. Analysis of mechanisms

This paper tests the mechanism of new quality productivity on economic growth from two aspects. New quality productivity has a significant impact on high-quality consumption and high-quality investment, as shown in table 6, which shows that new quality productivity can

 doi:10.20944/preprints202411.1282.v1

increase consumption by 1.5528 percentage points, significant at the 5 per cent level, and increase investment by 2.1023 percentage points, significant at the 10 per cent level.

The mechanism by which new quality productivity further contributes to economic growth by fuelling consumption can be described in the following ways: product and service innovation, whereby technological innovations and product improvements enable firms to offer higher-quality and more appealing products and services, thereby enhancing consumers' consumption experience and satisfaction. For example, the continuous upgrading and functional expansion of smartphones has led to consumers' willingness to change devices frequently, fuelling consumption growth. New quality productivity enables companies to better identify and meet the diverse needs of consumers, and launch personalised and customised products and services to attract more consumers. Enhancing consumer experience Through technological innovation and product improvement, companies are able to offer higher quality and more attractive products and services, thereby enhancing consumer experience and satisfaction. For example, the continuous upgrading and function expansion of smartphones have made consumers willing to change devices frequently, driving consumption growth. Satisfying diversified needsNew quality productivity enables enterprises to better identify and satisfy diversified consumer needs, and launch personalised and customised products and services to attract more consumers. Through technological advances and production process optimisation, firms are able to reduce production costs and thus offer products and services at more competitive prices. This not only attracts more consumers, but also increases their purchasing power and boosts consumption growth. New quality productivity can also improve logistics and distribution efficiency by improving supply chain management, ensuring that products can reach consumers faster and more conveniently, enhancing consumer convenience. Through innovation and technological advances, firms are able to enter new market segments and tap new consumer groups. For example, the promotion of electric vehicles and renewable energy products has opened up new market space and attracted a large number of consumers. New qualitative productivity can also help firms to expand globally and enter international markets, increasing the number of global consumers and total consumption. Technological advances and innovations can boost consumer confidence in economic prospects and increase willingness to spend. For example, advances in health technology and medical innovation can boost consumer confidence in their future health, leading to increased spending on health and wellness. Economic growth and higher incomes brought about by new qualitative productivity can raise consumers' expectations of future incomes and living standards, thereby increasing current consumption spending.

Mechanisms by which NQP can further contribute to economic growth by promoting investment can be found in the following areas: promoting investment in technological innovation and R&D, attracting high-tech investment, and NQP's emphasis on technological innovation and R&D, which has attracted large amounts of high-tech investment. Enterprises and governments have increased investment in R&D to promote the development of new technologies, products and processes. For example, investments in areas such as artificial intelligence, the Internet of Things (IoT) and biotechnology have increased significantly, leading to the development of related industries and economic growth. Enhancing R&D efficiency, through new quality productivity, companies are able to conduct R&D activities more efficiently, shorten the R&D cycle and reduce R&D costs, thereby increasing the return on investment. This efficient R&D investment promotes technological progress and industrial upgrading, and boosts economic growth. Industrial upgrading and structural optimisation promote the upgrading of traditional industries. New quality productivity promotes technological transformation and upgrading of traditional industries, improves production efficiency and product quality, and attracts more investment. For example, the manufacturing industry, through the application of intelligent manufacturing and automation technology, has achieved the optimisation of production processes and cost reduction, attracting a large

 doi:10.20944/preprints202411.1282.v1

amount of capital investment and promoting the development of new industries. The new quality productivity promotes the development of new industries, such as new energy, environmental protection industry and digital economy. These emerging industries have high growth potential, attracting large amounts of venture capital and capital investment, and promoting the optimisation of economic structure and economic growth. Enhancement of enterprise competitiveness and profitability.

Table 6. Mechanism of action tests.

	(1) consumers	(2) investors
prodit	1.5528**	2.1023*
	(0.6042)	(1.1535)
_cons	9.4379***	13.6307***
	(0.1785)	(0.3340)
N	270	244
R^2	0.024	0.014

Standard errors in parentheses; * $p < 0.1$,** $p < 0.05$,*** $p < 0.01$.

5.6. Robustness tests

In this paper, the results of the benchmark regression are tested for robustness, as shown in Table 7, in the following ways. First, the sample data were screened and truncated at 1 per cent and 5 per cent for the new quality productivity level. Second, the explanatory variables were adjusted by replacing GDP per capita with economic development indicators. Further, the full sample was divided according to productivity levels in different quartiles of 25%,50% and 75% and empirical tests were conducted separately. The results of all the tests show a consistent and significant positive effect, indicating that the conclusion on the role of new quality productivity in promoting economic growth is robust.

Table 7. Robustness tests.

	(1) *economic development*	(2) *economic development*	(3) *economic development*
prodit	2.1526***	2.2002***	2.1081***
	(0.1616)	(0.1598)	(0.1583)
control variable	clogged	be	be
time fixed	clogged	be	be
individual fixed	clogged	be	be
N	270	268	237
N	270	268	237
R^2	0.398	0.521	0.601

Standard errors in parentheses; * $p < 0.1$,** $p < 0.05$,*** $p < 0.01$.

6. conclusions and recommendations

Drawing upon the novel quality productivity theory and extant literature, this paper formulates a comprehensive index system and employs provincial panel data spanning from 2012 to 2022 to appraise the level of novel quality productivity in China. Moreover, it investigates the transmission mechanisms through which novel quality productivity impels economic growth, as well as its implications for consumption and investment. The research outcomes encompass several pivotal aspects: Firstly, the theoretical framework elucidating how novel quality productivity contributes to economic growth is perpetually refined; commencing from the supply side, components such as newly proficient workers, innovative labor objectives, and advanced labor materials exert varying degrees of influence. Secondly, from a demand perspective, it is discerned that novel quality productivity can stimulate

 doi:10.20944/preprints202411.1282.v1

economic growth by enhancing consumption structures and expanding investment scopes. This conclusion remains robust even after accounting for endogeneity concerns and conducting robustness tests. Thirdly, this study enriches the comprehension of novel quality productivity from a demand standpoint while expanding research paradigms.

In light of these findings, this paper proffers several policy recommendations:

Firstly, there should be an augmentation in both the supply quality and allocation efficacy of innovation factors to fortify China's core competitiveness within industrial chains. On one hand, optimizing innovation elements—particularly talent supply structures—is indispensable; cultivating and attracting highly skilled innovators must align precisely with emerging industry demands. On the other hand, escalating investments in technological innovation is crucial; establishing robust national innovation platforms alongside major core technology research mechanisms will facilitate the industrialization of novel technological advancements.

Moreover, Promoting green technology innovations entails developing clean energy sources while intensifying research and development efforts related to renewable technologies such as solar power, wind energy, and hydropower—thereby reducing reliance on fossil fuels. Advocating for energy-saving technologies across various sectors—including industry, construction, and transportation—will enhance energy utilization efficiency while minimizing pollution emissions .Encouraging green consumption practices involves raising awareness through educational campaigns aimed at promoting environmentally friendly products among consumers .Fostering low-carbon lifestyles requires initiatives that popularize sustainable habits like low-carbon transport options or utilizing energy-efficient appliances.

Additionally ,it is imperative to deepen market-oriented reforms concerning factor mobility by dismantling barriers hindering free movement among innovative resources; ensuring efficient allocations across land use, capital, technology, and data within industrial networks will promote coordinated development throughout value chains while reinforcing cluster effects leading towards vertical integration and horizontal expansion. Lastly, strengthening policy guarantees and incentive frameworks necessitates improving intellectual property rights protections along with preferential tax regimes designed to motivate enterprises towards increased research and development investments and participation in international standard-setting processes, thereby enhancing China's global competitive edge within industrial landscapes.

References

1. HAN Long,ZHANG Ruisheng,ZHAO Feng. New Quality Productivity Level Measurement and New Dynamics of China's Economic Growth[J]. Research on Quantitative and Technical Economics,2024,41(06):5-25.
2. Development of new quality productivity under the perspective of digital transformation: A theoretical explanation based on the "dynamics-factors-structure" framework[J]. Zhai Yun;Pan Yunlong. E-Government,2024(04)
3. Construction and spatial and temporal evolution of new quality productivity indicators in China[J]. ZHU Fu-Xian;LI Rui-Xue;XU Xiao-Li;SUN Jia-Chang. Industrial Technology and Economics,2024(03)
4. Greatly Developing New Quality Productivity and Accelerating Chinese-Style Modernisation[J]. Cheng Enfu;Chen Jian. Contemporary Economic Research,2023(12)
5. The logic, multidimensional connotation and contemporary significance of "new quality productivity"[J]. Gao Fan. Review of Political Economy, 2023(06)
6. New Quality Productivity: Indicator Construction and Spatial and Temporal Evolution[J]. WANG Jue;WANG Rongji. Journal of Xi'an University of Finance and Economics,2024(01)
7. Internal Logic and Practical Concept of New Quality Productivity Enabling High Quality Development[J]. XU Zheng;ZHENG Linhao;CHENG Mengyao. Contemporary Economic Research,2023(11)
8. Direction and Strategy of Industrial Development under New Quality Productivity--Taking Jiangsu as an Example[J]. LIU Zhibiao;LING Yonghui;SUN Ruidong. Nanjing Social Science,2023(11)

9. On the new quality of productive forces: connotation, characteristics and important focus [J]. Zhou Wen;Xu Lingyun. Reform,2023(10)
10. Connotative Characteristics, Internal Logic and Realisation Paths of New Quality Productivity - A New Dynamic Energy for Promoting Chinese-Style Modernisation [J]. Pu Qingping;Xiang Xiang. Journal of Xinjiang Normal University (Philosophy and Social Science Edition),2024(01)
11. Promoting industrial intelligence, greening and integration, and vigorously promoting the construction of a modernised industrial system[J]. JU Xiaosheng. Red Flag Articles,2023(17)
12. Enterprise digital transformation empowers industry chain linkages: theory and empirical evidence[J]. ZHANG Hu;GAO Zi-Huan;HAN Ai-Hua. Research on Quantitative and Technical Economics,2023(05)
13. Technology disconnection and incentives for independent innovation: a vertical structure perspective[J]. Kou, Zonglai; Sun, Rui. Economic Research,2023(02)
14. International Trade, Regional Policies and Long-term Regional Economic Growth: An Examination from the "Third Frontier Construction" Region[J]. ZHONG Jia-Lin;CHEN Wen;YANG Xi. Economic Research,2022(11)
15. Digital Economy, Factor Allocation Efficiency and Urban-Rural Integration Development[J]. HUANG Yongchun;GUANG Shangjun;ZOU Chen;JIA Lin;XU Zifei. China Population-Resources and Environment,2022(10)
16. Digital transformation and labour demand in commercial banks: creation or destruction? [J]. Yu Minggui;Ma Lin;Wang Kong. Management World,2022(10)
17. Economic structural adjustment, green technology progress and China's low-carbon transition development - an empirical investigation based on the perspective of overall technology frontier and spatial spillover effects[J]. SHAO Shuai;FAN Meiting;YANG Lili. Management World,2022(02)
18. Measurement of the scale and structural analysis of the added value of China's digital economy[J]. Cai Yuezhou;Niu Xinxing. China Social Science,2021(11)
19. Development level and evolution measurement of China's digital economy[J]. WANG Jun;ZHU Jie;LUO Xi. Research on Quantitative and Technical Economics,2021(07)
20. Collaborative industrial agglomeration, spatial knowledge spillover and regional innovation efficiency[J]. Yijun Yuan;Kang Gao. Science Research,2020(11)
21. Use of industrial robots, technology upgrading and economic growth[J]. Yang Guang;Hou Yu. China Industrial Economy,2020(10)
22. Robots and Jobs: Evidence from US Labour Markets[J]. Daron Acemoglu; Pascual Restrepo. Journal of Political Economy, 2020.
23. Spectral Ensemble Clustering via Weighted K-Means: Theoretical and Practical Evidence[J]. Liu Hongfu;Wu Junjie;Liu Tongliang;Tao Dacheng;Fu Yun.IEEE Transactions on Knowledge and Data Engineering,2017
24. Using the Variance Structure of the Conditional Autoregressive Spatial Specification to Model Knowledge Spillovers[J]. Olivier Parent;;James P. Lesage.Journal of Applied Econometrics, 2008
25. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations[J]. Manuel Arellano;;Stephen Bond.The Review of Economic Studies,1991(2)