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The Influence of New Quality Productive Forces on High-Quality Agricultural Development in China: Mechanisms and Empirical Testing

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Abstract: Advancing the construction and application of new quality productive forces is an essential prerequisite for achieving high-quality agricultural development and expediting the establishment of agricultural powerhouses. This study aims to elucidate the internal mechanisms through which new quality productivity contributes to high-quality agricultural development and to explore practical pathways for enhancing agricultural quality through its promotion. Utilizing panel data spanning 2012 to 2021 from 30 provinces and municipalities in mainland China, the entropy method is employed to gauge levels of new quality productivity and high-quality agricultural development. Additionally, employing research methodologies including SYS-GMM and threshold effect models, this study empirically investigates how the advancement of new quality productivity influences high-quality agricultural development. Our research reveals the following key findings: (1) The development of new quality productive forces significantly enhances high-quality agricultural development, exhibiting a heterogeneous distribution pattern favoring the "eastern region > western region > central region" and "northern region > southern region". (2) New quality productive forces can bolster the level of high-quality agricultural development by fostering innovation, coordination, openness, and shared development within its subsystems. However, they may impede progress by inhibiting improvements in green development within the subsystems. (3) The results of the threshold effect test demonstrate that the promotion effect of the development of new quality productive forces on high-quality agricultural development escalates with the level of high-quality agricultural development. Specifically, as the level of high-quality agricultural development exceeds the first threshold value of 0.1502, the promotion effect becomes significant; crossing the second threshold value of 0.2010 further amplifies this effect. This paper's primary marginal contribution involves empirically analyzing the potential nonlinear effects of advancing new quality productivity in enhancing the level of high-quality agricultural development. This enriches empirical research on how new quality productivity fosters the development of high-quality agriculture.

Keywords: new quality productive forces; high-quality agricultural development; heterogeneity impact; threshold effect model

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1. Introduction

The report of the 20th Party Congress unequivocally underscores that expediting the establishment of a new development paradigm and attaining high-quality development constitute fundamental imperatives for the realization of Chinese-style modernization. It further underscores the imperative of prioritizing the advancement of agriculture and rural regions. Consequently, the high-quality progression of agriculture emerges as an inexorable imperative for the comprehensive advancement of a modern socialist nation and the actualization of Chinese-style modernization [1]. Therefore, the question arises: how can the high-quality advancement of agriculture be achieved? In September 2023, General Secretary Xi Jinping initially introduced the concept of "new quality productivity" during his visit to Heilongjiang. Subsequently, in December of the same year, the Central Economic Work Conference underscored the necessity of propelling industrial innovation through scientific and technological advancements, particularly by leveraging disruptive and state-of-the-art technologies to foster novel industries, methodologies, and momentum, thereby fostering the cultivation of new quality productive forces [2]. In March 2024, during the Second Session of the 14th National People's Congress held in Beijing, a proposal was made to "vigorously promote the construction of a modernized industrial system and accelerate the development of new quality productive forces", marking the first inclusion of "new quality productive forces" in the government work report. These forces have not only revolutionized industry and services but have also penetrated the agricultural and rural sectors, significantly propelling high-quality agricultural development. Historically, agricultural advancements have relied on breakthroughs in scientific and technological innovation. For instance, the widespread adoption of agricultural machinery driven by steam and internal combustion engines during the First Industrial Revolution, alongside the development of modern agricultural breeding and fertilizer technology rooted in evolutionary theory, hybrid dominance doctrine, and genetics, catalyzed substantial agricultural progress. Presently, the new technological revolution and industrial transformation have expedited the emergence of fresh agricultural productivity. The ongoing proliferation of innovative technologies in information, biology, energy, and materials, coupled with their extensive integration into agriculture and across industries, has broadened the scope of agricultural labor, expanded production boundaries, and laid a solid foundation for agricultural high-quality development. In practical terms, there is an urgent imperative to cultivate new quality productive forces to construct an efficient and ecologically sustainable agricultural powerhouse. Despite China's status as a robust agricultural producer, numerous issues and deficiencies persist in its agricultural production. Traditional productivity enhancement alone is insufficient to address these challenges; thus, accelerating the development of new quality productive forces is essential. This paper investigates the issue of high-quality agricultural development within its contextual framework. Accordingly, the research aims to elucidate and analyze in depth the mechanisms and constraints by which new quality productivity enhances high-quality agricultural development. The objective is to establish theoretical foundations and propose policy recommendations that support the achievement of high-quality agricultural development and expedite the advancement of a robust agricultural sector in the nation.

2. Literature Review

In the realm of high-quality agricultural development, scholars have conducted extensive research, particularly delving into three main areas. Firstly, the exploration of the concept of high-quality agricultural development remains a focal point. Presently, there is no universally accepted definition of this concept, leading to varying interpretations among scholars. Most definitions stem from the five fundamental principles of "innovation, coordination, green, openness, and sharing" [3]. Additionally, some scholars define high-quality agricultural development based on the distinct characteristics it embodies [4]. Secondly, researchers have delved into identifying the influencing factors of high-quality agricultural development. Factors such as resource allocation efficiency [5], urbanization level [6], rural population aging [7], agricultural financial support [8], and the digital economy [9,10] have been thoroughly investigated. Lastly, scholars have concentrated on developing methods to measure high-quality agricultural development [11]. For instance, Zhong [12] proposed assessing agricultural development quality through three dimensions: agricultural product quality, the efficiency of agricultural production and management systems, and agricultural industry efficiency. Wang [13] constructed an index system for evaluating agricultural development quality based on the "three major systems" of modern agriculture: high quality, efficiency, and effectiveness. Other scholars, such as Liu [14] and Li [15], advocate for a multi-dimensional approach to evaluating agricultural development quality, emphasizing innovation, coordination, greenness, openness, and sharing as essential dimensions to comprehend the dynamic evolution and fundamental features of high-quality agricultural development.

The concept of new quality productive forces, deemed essential for fostering a new economic development engine and advancing developmental momentum, is considered both a Chinese innovation stemming from Marx's productivity theory and a reflection of Marx's political economy principles [16]. Since General Secretary Xi Jinping introduced this concept, scholarly attention to new quality productive forces has surged. Research primarily revolves around two key areas: defining its essence and examining its driving forces. Huang [17], from a systems theory perspective, posits that new quality productive forces constitute a "factor-structure-function" system comprising interconnected productivity elements, structure, and function—a comprehensive representation of productivity evolution resulting from the scientific and technological revolution [18]. Zhai [19], focusing on political economy, asserts that these forces represent multidimensional breakthroughs in material–spiritual coordination, nature transformation, and societal progress, reflecting a systemic shift in the synergy between production technology and organization modes. Gao and Ma [20] conducted a thorough analysis from the perspective of new quality productivity in agriculture. They highlight that new quality productivity entails innovative transformations in agricultural production factors, processes, and organizational structures, including the division of labor and cooperation along the agricultural value chain. This innovation results in enhanced value creation within the agricultural sector and rural areas. Regarding its driving role, Zhang [21] highlights how advanced science and technology can empower new quality productive forces, steering economic development towards societal well-being and contributing to Chinese-style modernization and socialist country construction. Xu's research [22] suggests that these forces optimize a major productive force distribution, drive regional innovation center integration, and enhance regional industrial system cohesion, thereby fostering regional high-quality development. Lin and Dong [23] underscored the imperative and inexorable nature of new productive forces guiding China's agricultural prowess. They highlighted the critical focal points for advancing these forces in the current phase: enhancing research and implementation of advanced agricultural science and technology, diversifying new agricultural business models, and nurturing innovative agricultural talent [23]. Furthermore, scholars have conducted initial assessments of new quality productive force development, noting a continuous rise in China's levels, particularly in the eastern region, surpassing growth rates in the western and central regions from 2011 to 2022 [24]. Meanwhile, Zhu Zhiyong et al. [25] constructed a framework for evaluating new productive forces from the perspective of innovation ecosystems. They conducted empirical analysis using entropy method, Kernel density estimation, and spatial Markov chain method, revealing that China's overall level of new productive forces is relatively low but shows a year-on-year increasing trend. The eastern region exhibits significantly higher levels of new productive forces compared to the central, western, and northeastern regions.

A few scholars have also empirically studied the theme of new productive forces. For instance, Zhang [26] utilized panel data from 2010 to 2022 encompassing 41 industries in China to analyze the impact and mechanism of new productive forces on global value chain embedding. Wang [27] examined the relationship and mechanisms between new productive forces and the modernization of China's industrial chains through econometric modeling, finding that new productive forces facilitate the modernization of China's industrial chains.

Based on a comprehensive literature review, this paper identifies several deficiencies and avenues for further investigation in current research on new productive forces. Firstly, there lacks a standardized method for measuring new productive forces and an integrated index system to holistically evaluate their developmental progress. Secondly, while theoretical analyses of new productive forces are abundant, empirical studies remain inadequate. Thirdly, there is a notable scarcity of research examining the nexus between new productive forces and the high-quality development of agriculture. Although Hou [28] analyzed the role of new quality productive forces in the northeast region's agricultural high-quality development and its influence mechanisms and pathways, it was only a qualitative theoretical analysis without quantitative empirical analysis. Thus, there is a gap in empirical studies regarding the impact of new quality productive forces on agricultural high-quality development.

In conclusion, the existing literature has provided substantial theoretical and empirical groundwork for this study, establishing a solid foundation for further research. This paper makes several key contributions: (1) Despite extensive research on factors influencing the advancement of high-quality agricultural development, studies specifically examining the impact of new quality productive forces on this area are notably limited. While some conduct measurement analyses or qualitative studies on their role in empowering high-quality agricultural development, a consensus on their impact remains elusive. (2) Departing from previous approaches utilizing intermediary effect models, this paper employs the SYS-GMM regression method to investigate the intrinsic impact mechanism and enhancement effect of new quality productive forces on high-quality agricultural development across five subsystems: agricultural innovation development, agricultural coordination development, agricultural green development, agricultural open development, and agricultural shared development. (3) To delve deeper into the dynamic influence of new quality productive forces on high-quality agricultural development, this paper utilizes a threshold effect model to explore potential nonlinear effects, thereby enhancing our understanding of their role in promoting high-quality agricultural development.

3. Mechanism Analysis and Research Hypotheses

3.1. The Direct Impact of Developing New Quality Productive Forces on High-Quality Agricultural Development

The promotion effect of new quality productive forces on the high-quality development of agriculture is most evident in the enhancement of agricultural production efficiency. The utilization of advanced agricultural machinery and innovative agricultural technologies facilitates large-scale agricultural production operations, significantly reducing labor costs, and enhancing the speed and accuracy of agricultural tasks. Moreover, new quality productive forces contribute to the environmentally friendly and high-quality development of agriculture. By leveraging advanced agricultural science and technology, deeper analyses and testing of arable soils can be conducted, allowing for precision fertilization techniques to improve soil nutrient conditions effectively. This approach enables the formulation of more sustainable soil management plans, mitigating environmental issues associated with excessive fertilization and offering new avenues for soil enhancement. Additionally, new quality productive forces foster the coordinated development of agriculture through its transformative impact. As traditional agriculture transitions to modern methods, the roles and scope of agriculture expand. The integration of new quality productive forces not only enhances agricultural production efficiency and promotes digital and intelligent agricultural development but also lays the groundwork for synergistic relationships between agriculture and other industries. Furthermore, given the high input costs and low value-added nature of the agricultural industry, new quality productive forces—characterized by high technology and efficiency, supported by innovations like artificial intelligence, big data, and cloud computing—are pivotal. It not only facilitates unmanned and informatized agricultural production but also elevates production quality, efficiency, and cost-effectiveness. Moreover, it boosts agricultural product sales and fosters the emergence of new agricultural business models, such as agricultural–cultural–tourism integration. Consequently, the development of new quality productive forces is poised to significantly advance the high-quality development of agriculture. Therefore, the first research hypothesis of this paper is proposed:

Hypothesis 1 (H1). *The development of new quality productive forces contributes to the enhancement of agricultural high-quality development.*

3.2. The Non-Linear Impact of New Quality Productive Forces on High-Quality Agricultural Development

High-quality agricultural development denotes a dynamic process characterized by elevated levels of land and labor productivity, highlighting its ongoing evolution rather than a fixed outcome. Consequently, the influence of novel quality productive forces on high-quality agricultural advancement exhibits dynamic fluctuations. Various stages of high-quality agricultural development manifest distinct facets of agricultural progress. Diverse agricultural production methods, input factors, and technological applications underscore this dynamism within the production process while varying land output rates and labor productivity underscore diverse production outcomes. The impact of new quality productive forces on agricultural quality development fluctuates across different developmental stages. In the nascent phases of high-quality agricultural development, where productivity remains heavily reliant on labor inputs, the introduction of new quality productive forces may initially yield a strong adverse effect on agricultural advancement. However, when juxtaposed with the overall positive impact of these forces on high-quality agricultural development, the net effect remains significantly positive. Nonetheless, as agricultural quality progresses, the overall positive influence of new quality productive forces diminishes compared to earlier stages. Therefore, the second research hypothesis is proposed:

Hypothesis 2 (H2). *The promotion effect of new quality productive forces on high-quality agricultural development will strengthen with the improvement of the level of high-quality agricultural development.*

4. Research Design

4.1. Variable Selection

4.1.1. Dependent Variable

Agricultural high-quality development (AHIGH). Building upon prior discourse and extant research [29], the paper scrutinizes the direct determinants impacting agricultural production. It formulates an evaluation framework for agricultural high-quality development, delineating five dimensions: “agricultural innovation development”, “coordinated development of agriculture”, “green development of agriculture”, “open development of agriculture”, and “shared development of agriculture”, comprising a total of thirty variable indicators.

To ascertain the significance of these indicators, the paper employs the entropy value method. The specific evaluation index systems for each dimension are detailed in Table 1. A higher score on the agricultural high-quality development index denotes an elevated level of agricultural high-quality development, while a lower score indicates the converse.

Table 1. Comprehensive evaluation index system of agricultural high-quality development.

Primary Indicator	Secondary Indicator	Tertiary Indicators	Explanation
Innovative development of agriculture	Agricultural innovation foundation	Level of farming mechanization	The general power of agricultural mechanization
		Percentage of financial investment in agriculture	Financial expenditure on agriculture, forestry and water resources/financial expenditure
		Percentage of leisure agriculture demonstration counties	Total number of recreational agriculture demonstration counties/regional counties
		Percentage of typical counties for rural entrepreneurial and innovation	Total number of typical rural entrepreneurship and innovation counties/regional counties
	Efficiency of agricultural innovation	Productivity of labor	Gross output value of agriculture, forestry, animal husbandry and fishery/number of employees in the primary sector
		Land productivity	Gross agricultural output/area sown under crops
		Number of green food certifications	Direct data
		Per capita yield of grain	Grain production/area sown with grain
		Effective irrigated area	Direct data
Coordinated development of agriculture	Industrial coordination	Agricultural industry structural adjustment index	1—(agricultural output/agricultural, forestry and fisheries output)
	Urban and rural coordination	Binary comparison coefficient	Comparative labor productivity in primary industry/comparative labor productivity in secondary and tertiary industries
Green development of agriculture	Consumption of agricultural resources	Amount of agricultural film used per unit area	Amount of agricultural film used/area sown
		Intensity of use of agricultural diesel fuel	Volume of agricultural diesel fuel/area sown
		Per capita electricity consumption	Rural electricity consumption/primary sector employees
	Agricultural environmental pollution	Fertilizer application per unit area	Fertilizer application/area sown
		Pesticide application per unit area	Pesticide application/area sown
	Agricultural environmental protection	Percentage of area covered by forest	Direct data

Table 1. *Cont.*

Primary Indicator	Secondary Indicator	Tertiary Indicators	Explanation
Open development of agriculture	Resource optimization	Rate of rural land transfer	Percentage of agricultural land transferred from households to contracted land
		Percentage of investment in fixed assets in agriculture	Investment in fixed assets in agriculture, forestry, animal husbandry and fisheries/total investment in fixed assets
	Market optimization	Percentage of agricultural market turnover	Agricultural market turnover/value added in primary sector
		Dependence on Exports and Imports of Agricultural Products	Total agricultural exports and imports/GDP
		Leading enterprises drive efficiency	Leading enterprises/total rural population
Shared development of agriculture	Living standards of the rural population	Level of farmers' income	Per capita net income of rural residents
		Overall level of prosperity of farmers	Rural Engel coefficient
		The richness of farmers' lives	Per capita expenditure on education, culture and recreation/per capita consumption expenditure
		Degree of health care coverage for farmers	Per capita health care expenditure/per capita consumption expenditure
		Percentage of farmers with minimum subsistence allowance	Direct data
	Benefit sharing between urban and rural areas	The ratio of urban to rural incomes	Urban disposable income/rural disposable income
		The ratio of urban to rural consumption levels	Consumption expenditure per urban resident/consumption expenditure per rural resident
		Urban–rural consumption gap	Retail sales of consumer goods in towns and villages/retail sales of consumer goods in the whole society

4.1.2. Core Explanatory Variable

New quality productive forces (NEWP). New quality productive forces represent a significant facet of advanced productivity, stemming from revolutionary advancements in technology, innovative resource allocation, and comprehensive industrial transformation and upgrading. This concept encapsulates the optimization of labor, materials, and tools, emphasizing enhanced total factor productivity as its core tenet. Characterized by innovation and a paramount emphasis on quality, new quality productive forces epitomize advanced productivity. Building upon Wang's research [30] and considering China's contextual nuances and data availability, the entropy method is employed to determine the weights of each dimension within the three major categories: laborers, objects of labor, and means of production. Subsequently, the evaluation index system for new quality productive forces is computed, as detailed in Table 2. A higher level of new quality productive forces signifies greater advancement, while a lower level indicates regression.

Table 2. Comprehensive evaluation index system of new quality productive forces.

Indicator	Primary Indicator	Secondary Indicator	Tertiary Indicators	Explanation
Labor	Labor skills	Educational attainment of workers	Educational attainment per capita	Average years of schooling per capita
		Human capital structure of the workforce	Human capital structure of the workforce	The educational attainment of the labor force was categorized into five levels, measured using the vector angular measure
			Structure of students enrolled in higher education institutions	Number of university students as a proportion of the total population
	Labor productivity	Per capita output	GDP per capita	GDP/total population
		Per capita income	Wages per capita	Average wages of employed workers
	Labor awareness	Employment concept	Share of employees in the three sectors	Percentage of total employment accounted for by persons employed in the tertiary sector
			Entrepreneurial activity	Entrepreneurial activity
Object of labor	New industry	Strategic emerging industry	Percentage of emerging strategic industries	Value added in emerging strategic industries/GDP
			Number of robots	Number of robots/ total population
	Ecological environment	Environmentally friendly	Percentage of area covered by forest	Direct data
			Environmental protection	Expenditure on environmental protection/government expenditure on public finance
			Pollutant emissions	Sulfur dioxide emissions/GDP Wastewater discharge/GDP General industrial solid waste generation/GDP
		Energy conservation	Industrial waste management	Industrial wastewater treatment facilities (sets) Industrial waste gas treatment facilities (sets) Industrial solid waste

Table 2. *Cont.*

Indicator	Primary Indicator	Secondary Indicator	Tertiary Indicators	Explanation
Means of production	Material means of production	Infrastructure	Transportation infrastructure	Highway mileage Railroad mileage
			Digital infrastructure	Fiber length Number of internet broadband ports per capita
		Energy consumption	Overall energy consumption	Energy consumption/GDP
			Renewable energy consumption	Renewable energy electricity consumption/electricity consumption of society as a whole
	Intangible means of production	Technological innovation	Patents per capita	Number of patents granted/total population
			R&D investment	R&D expenditure/GDP
		Level of digitization	Digital economy	Digital economy index
			Enterprise digitization	Enterprise digitization level

4.1.3. Other Variable

This paper selects the following control variables by integrating findings from existing studies: (1) Rural human capital (REDU), quantified by the average years of education per capita in rural areas within each province. (2) Industrial structure upgrading (UIS), calculated as the sum of the value added in primary industry/GDP*1, value added in secondary industry/GDP*2, and value added in tertiary industry/GDP*3. (3) Financial development (FIN), determined by the ratio of deposit and loan balances to GDP of financial institutions. (4) Degree of marketization (MARK), assessed using the total marketization index of China's sub-provinces, drawing from the research of Fan [31] and Zhao [32]. (5) Level of opening up to the outside world (OPEN), which plays a pivotal role in agricultural technology advancement and innovation. This variable is measured by the proportion of total exports of the respective region to its total regional GDP. It represents an imperative for China's agriculture to achieve high-quality development in the contemporary era. Descriptive statistics for each variable are shown in Table 3.

Table 3. Variable descriptive statistics.

Variable Name	Sample Size	Mean	Standard Deviation	Minimum Value	Maximum Value
Agricultural High-Quality Development	300	0.180	0.052	0.072	0.411
New Quality Productive Forces	300	0.137	0.063	0.042	0.477
Rural Human Capital	300	7.784	0.603	5.848	9.732
Industrial Structure Upgrading	300	2.404	0.121	2.132	2.834
Financial Development	300	3.450	1.084	1.784	7.578
Degree of Marketization	300	8.138	1.882	3.359	12.390
Level of Opening Up to the Outside World	300	0.278	0.278	0.008	1.441

4.2. Data Sources

This study utilizes panel data from 30 provinces (municipalities and autonomous regions) in China covering the period from 2012 to 2021. Notably, Tibet and the Hong

Kong, Macao, and Taiwan regions are excluded from the sample due to data unavailability. The data are sourced from a variety of statistical yearbooks, including the "China Statistical Yearbook", "China Environmental Statistical Yearbook", "China Rural Statistical Yearbook", "China Fixed Asset Investment Statistical Yearbook", "China Agricultural Machinery Industry Yearbook", "National Rural Economic Situation Statistical Data", "China Rural Management Statistics Yearbook", "China Education Statistics Yearbook", "China Population and Employment Statistics Yearbook", as well as various provincial statistical yearbooks.

4.3. Model Setting

Firstly, to verify Hypothesis 1 and consider the potential inertia effects in high-quality agricultural development, this paper constructs the following dynamic panel model to explore the impact of new quality productive forces on high-quality agricultural development:

$$AHIGH_{it} = \beta_0 + \beta_1 NEWP_{it} + \beta_2 CONTROLS_{it} + \gamma_{it} + \delta_{it} + \varepsilon_{it} \quad (1)$$

Among them, the dependent variable is the high-quality development of agriculture, denoted as AHIGH. $AHIGH_{it}$ represents the agricultural quality development index for region i in period t. The core explanatory variable is new quality productive forces, denoted NEWP. $NEWP_{it}$ stands for the new quality productive forces for region i in period t. $CONTROLS$ represents a set of control variables, γ_{it} and δ_{it} are dummy variables for the province and year, respectively, used to control for individual and time effects. ε_{it} represents the random error term, which is assumed to follow an independent and homogeneous distribution.

Due to endogeneity issues arising from lagged dependent variables serving as explanatory variables, fixed effect models present challenges in resolution. Conversely, when the number of instrumental variables exceeds that of endogenous explanatory variables, GMM dynamic panel estimation proves more efficient for panel data analysis. Accordingly, this study employs Generalized Method of Moments (GMM) to empirically investigate endogeneity concerns in dynamic models assessing the impact of new productive forces on agriculture's high-quality development. GMM encompasses Difference GMM (DIFF-GMM) and System GMM (SYS-GMM). DIFF-GMM necessitates the exclusion of time-invariant variables, reducing sample size and potentially encountering weak instrumental variables with large T. SYS-GMM integrates advantages from both DIFF-GMM and Level GMM, thereby mitigating these drawbacks. Its two-step estimation provides standard errors that notably alleviate bias and weak instrumental variable issues. Therefore, this study predominantly utilizes SYS-GMM for empirical analysis to achieve more effective and precise estimation results while managing potential endogeneity concerns.

To assess Hypothesis 2 and determine if the promotional effect of new quality productive forces on agricultural high-quality development follows a single linear relationship, this study utilizes Hansen's threshold regression model to construct a single-panel threshold model [33]. Threshold regression models utilize threshold variable values to discern which regression equation is applicable under different conditions, thereby elucidating phenomena akin to "jumps" or "discontinuities". Building upon prior analysis indicating the potential nonlinear impact of new productive forces on agricultural high-quality development, this study aims to employ threshold effect regression to differentiate and investigate the roles of various subsystems within agricultural high-quality development affected by new productive forces. This paper examines not only agricultural high-quality development as the threshold variable but also includes the five subsystem indices. The identification of thresholds will be guided by the specific insights gleaned during the investigation.

$$\text{AHIGH} = \alpha_0 + \alpha_1 X_{it} \times I(MK_{it} \le \theta) + \alpha_2 X_{it} \times I(MK_{it} > \theta) + \alpha_3 CONTROLS_{it} + \varepsilon_{it} \quad (2)$$

Among them, MK represents the threshold variables, θ stands for the thresholds to be estimated, and $I(.)$ represents a schematic function that takes the value 1 or 0 and satisfies the condition in parentheses as 1 and 0 otherwise. α_1 represents the constant term, and α_2 and α_3 are estimated coefficients.

5. Empirical Analysis

5.1. Descriptive Analysis of Agricultural High-Quality Development and New Quality Productive Forces in Agriculture

This paper computes the agricultural high-quality development index and the level of new quality productive forces using the entropy value method based on the evaluation systems established. Subsequently, Chinese provinces (municipalities and autonomous regions) are categorized into eastern, central, and western regions based on geographic location to analyze the trends of these indices.

Figure 1 illustrates a consistent upward trajectory in the agricultural high-quality development index across all three regions from 2012 to 2021. Specifically, in the eastern region, the index surged from 0.1867 in 2012 to 0.2456 in 2021, marking a growth rate of 31.55%. Similarly, the central and western regions witnessed substantial growth, with their indices climbing from 0.1565 and 0.1256 in 2012 to 0.2024 and 0.1852 in 2021, respectively, showcasing growth rates of 29.32% and 47.45%.

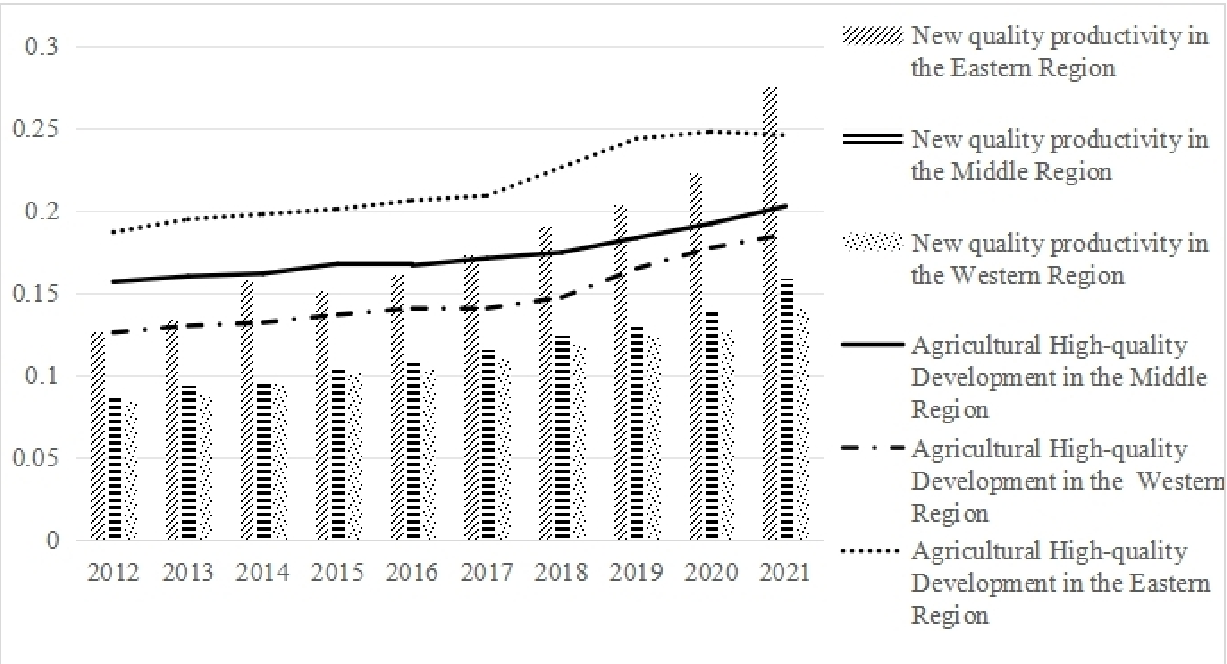

Figure 1. Trends in high-quality agricultural development and new qualitative productivity changes (2012–2021).

While the level of new quality productive forces in the eastern region experienced a slight dip in 2015 compared to 2014, the overall trend indicates a consistent annual increase. In 2012, the level stood at a mere 0.1265, escalating to 0.2749 by 2021, reflecting a remarkable growth rate of 117.31%. Similarly, the central and western regions witnessed substantial advancements, with their levels rising from 0.0888 and 0.0839 in 2012 to 0.1592 and 0.1405 in 2021, respectively, demonstrating growth rates of 79.28% and 67.46%.

5.2. Baseline Estimate

To mitigate the influence of outliers on explanatory variables such as agricultural high-quality development, the level of new quality productive forces, rural human capital, industrial structure upgrading, and the degree of marketization, logarithmic transformations were applied before conducting benchmark estimations.

Table 4 displays the results of the Pearson correlation coefficient test among these variables. Notably, the correlation coefficient between the new quality development force and the agricultural high-quality development index (lnAHIGH) is 0.614, significant at the 1% significance level, indicating a substantial correlation between them. Subsequent variable variance inflation factor (VIF) testing, as presented in Table 5, reveals a mean VIF value of only 3.11, below the critical threshold of 5, thereby dismissing concerns of multicollinearity within the model.

Table 4. Results of Pearson correlation coefficient test.

Variables	lnAHIGH	lnNEWP	lnREDU	lnUIS	FIN	lnMARK	OPEN
lnAHIGH	1.000						
lnNEWP	0.614 ***	1.000					
lnREDU	0.501 ***	0.330 ***	1.000				
lnUIS	0.440 ***	0.594 ***	0.453 ***	1.000			
FIN	0.207 ***	0.263 ***	0.318 ***	0.791 ***	1.000		
lnMARK	0.610 ***	0.706 ***	0.473 ***	0.473 ***	0.125 **	1.000	
OPEN	0.522 ***	0.536 ***	0.473 ***	0.718 ***	0.571 ***	0.578 ***	1.000

Note: *, **, and *** denote significance at the 10%, 5%, and 1% statistical levels, respectively; robust standard errors are in parentheses.

Table 5. Results of VIF test.

VIF Test	lnNEWP	lnREDU	lnUIS	FIN	lnMARK	OPEN	Mean
VIF	1.47	2.56	5.44	3.74	2.84	2.60	3.11
1/VIF	0.681	0.390	0.184	0.267	0.352	0.385	

Considering the possible impact of the endogeneity problem inherent in the dynamic panel model on the empirical estimation results, this paper chooses the systematic GMM method (SYS-GMM) to estimate the model and adopts the forward stepwise regression method to add the control variables sequentially and observe whether the estimated coefficients of the variables change to assure that the empirical estimation results in this paper are robust.

As illustrated in Table 6, prior to the inclusion of control variables, new quality productive forces significantly promoted agricultural high-quality development at the 5% significance level, with a coefficient of 0.011. Upon gradual addition of control variables, the coefficient of new quality productive forces remains significant and positive at 0.016, indicating a persistent positive impact on agricultural high-quality development. These forces, characterized by "high-tech, high-efficiency, high-quality" attributes facilitated by emerging technologies like artificial intelligence and big data, enhance agricultural production efficiency, reduce production costs, and promote energy efficiency and environmentally friendly practices. Furthermore, they facilitate the structural coordination of rural primary, secondary, and tertiary industries, fostering efficient resource and factor flow between urban and rural areas, optimizing agricultural markets, and ultimately contributing to agricultural high-quality development.

Table 6. The regression results of SYS-GMM.

	(1)	(2)	(3)	(4)	(5)	(6)
			lnAHIGH			
L.lnAHIGH	1.142 *** (151.10)	1.127 *** (131.35)	1.113 *** (82.54)	1.093 *** (85.92)	1.101 *** (79.09)	1.098 *** (105.39)
lnNEWP	0.011 ** (2.38)	0.019 *** (2.93)	0.040 *** (6.72)	0.042 *** (5.95)	0.070 *** (6.40)	0.016 *** (2.66)
lnREDU		−0.032 (−1.22)	−0.117 *** (−3.38)	−0.110 *** (−2.71)	−0.097 * (−1.94)	−0.197 *** (−4.08)
OPEN			0.134 *** (10.35)	0.122 *** (9.67)	0.130 *** (10.56)	0.075 *** (7.10)
FIN				0.012 ** (2.09)	0.009 * (1.81)	−0.035 ** (−6.75)
lnMARK					−0.089 *** (−3.17)	−0.099 *** (−6.90)
lnUIS						1.368 *** (15.18)
_cons	0.308 *** (33.72)	0.365 *** (6.24)	0.525 *** (6.93)	0.439 *** (5.36)	0.681 *** (4.05)	−0.244 *** (−3.67)
Sargan	29.054 (0.143)	28.926 (0.147)	28.872 (0.149)	28.920 (0.147)	28.593 (0.157)	29.193 (0.139)
AR(1)	0.022	0.020	0.018	0.022	0.020	0.006
AR(2)	0.476	0.471	0.455	0.444	0.457	0.617
N	270	270	270	270	270	270

Note: *, **, and *** denote significance at the 10%, 5%, and 1% statistical levels, respectively; robust standard errors are in parentheses; the null hypothesis for AR(2) is "there is no second-order autocorrelation in the disturbance term differences", while for Sargan is "all instrumental variables are valid".

Rural human capital exhibits a significant negative impact on high-quality agricultural development at the 1% significance level. Amidst industrialization and urbanization, individuals with higher education levels tend to migrate to urban areas for employment and further education, resulting in a shortage of human resources in rural areas. This shortage, coupled with a "population loss–industry collapse–low development capacity" cycle, hampers rural development and impedes agricultural high-quality development.

The coefficient for the level of openness to the outside world is 0.075, statistically significant at the 1% level. Increased openness strengthens the linkage between domestic and international markets, enhances agricultural strategy formulation, and promotes global agricultural value chain participation, thereby fostering agricultural high-quality development.

Conversely, the coefficient for financial development is −0.035, indicating deficiencies in rural finance development, including restricted market access, low financial literacy among farmers, and inadequate financial infrastructure. Similarly, the degree of marketization negatively impacts agricultural high-quality development due to insufficient market organization, short agricultural industry chains, and low industry chain returns.

Each 1% increase in industrial structure upgrading corresponds to a significant 1.368% improvement in agricultural high-quality development. Industrial structure optimization promotes rural industry integration, enhances agricultural specialization and scale, and catalyzes "industrial prosperity," thereby propelling agricultural high-quality development.

It is imperative to note that the validity of the aforementioned conclusions is contingent upon the validity of SYS-GMM estimates, ensuring instrumental variable validity and the absence of second-order correlation in random perturbation terms. The empirical results of this study satisfy these conditions, with the Sargan test for insignificance, a significant p-value for AR(1), and an insignificant p-value for AR(2).

5.3. Robustness Test

To enhance the robustness of the baseline estimation results, this study employs four methods for robustness checks. Firstly, subsample regressions are conducted to mitigate potential evaluation biases stemming from differences in regional economic development and policy biases. Samples from the four municipalities of Beijing, Tianjin, Shanghai, and Chongqing are excluded, and estimations are recalculated with adjusted sample sizes. Secondly, outlier exclusion and re-estimation are performed to reduce the influence of outliers on regression results. Variables are winsorized at the 1% level, and re-estimations are conducted. Thirdly, the dependent variable is substituted. Agricultural total factor productivity, a pivotal indicator of high-quality agricultural development [34], replaces the explanatory variable "agricultural high-quality development index" and is integrated into the SYS-GMM estimation model. Lastly, estimation models are switched. The mixed ordinary least squares (OLS) model and the two-way fixed effect (Two-FE) model are employed for secondary estimations of the mode.

The results presented in Table 7 demonstrate that following the aforementioned four robustness checks, the empirical estimation findings remain largely consistent with the baseline SYS-GMM results, albeit with slight variations in effect magnitudes. Therefore, this study confirms the empirical validation of Hypothesis 1, indicating that the advancement of new quality productive forces indeed enhances the level of high-quality agricultural development.

Table 7. Robustness tests.

	(7)	(8)	(9)	(10)	(11)
	Municipality Sample Excluded	**Outliers Excluded**	**Replacement Dependent Variable**	**Replacement Model (OLS)**	**Replacement Model (FE)**
L.lnAHIGH	0.992 *** (48.85)	1.064 *** (81.85)	0.332 *** (26.84)		
lnNEWP	0.100 *** (4.41)	0.048 *** (3.79)	0.045 * (1.75)	0.253 *** (5.71)	0.166 ** (2.56)
_cons	0.241 (1.31)	−0.167 (−1.00)	1.832 *** (9.17)	−3.128 *** (−5.81)	1.445 * (1.85)
Control Variable	Yes	Yes	Yes	Yes	Yes
F-value				51.01	70.50
Adjusted R^2				0.500	0.924
Province Fixed Effects				No	Yes
Year Fixed Effects				No	Yes
Sargan	22.915 (0.407)	29.067 (0.143)	25.776 (0.261)		
AR(1)	0.019	0.005	0.001		
AR(2)	0.6353	0.539	0.474		
N	234	270	270	300	300

Note: *, **, and *** denote significance at the 10%, 5%, and 1% statistical levels, respectively; robust standard errors are in parentheses.

5.4. Estimation Results of the Impact of New Quality Productivity on Various Subsystems of High-Quality Agricultural Development

Table 8 presents the impact of new quality productivity on various subsystems of high-quality agricultural development. Models (12)–(16), respectively, illustrate the estimation results of new quality productivity on agricultural innovation development, agricultural co-ordination development, agricultural green development, agricultural open development, and agricultural shared development.

Table 8. Estimation results of the impact of new quality productive forces on subsystem indices of high-quality agricultural development.

	(12)	(13)	(14)	(15)	(16)
	Agricultural Innovation Development	**Agricultural Coordination Development**	**Agricultural Green Development**	**Agricultural Open Development**	**Agricultural Shared Development**
L.lnAHIGH_cx	0.928 *** (83.64)				
L.lnAHIGH_xt		0.547 *** (10.05)			
L.lnAHIGH_ls			0.855 *** (97.75)		
L.lnAHIGH_kf				0.715 *** (22.95)	
L.lnAHIGH_gx					0.217 *** (6.20)
lnNEWP	0.044 * (1.69)	0.200 *** (4.25)	−0.115 *** (−8.41)	0.185 *** (9.45)	0.042 *** (2.90)
Control Variable	Yes	Yes	Yes	Yes	Yes
_cons	−2.009 *** (−10.97)	2.270 *** (5.65)	0.625 *** (2.99)	−2.155 *** (−4.35)	−0.548 ** (−2.21)
Sargan	29.428 (0.133)	26.472 (0.232)	23.801 (0.358)	26.787 (0.219)	28.677 (0.154)
AR(2)	0.545	0.645	0.917	0.559	0.227
N	270	270	270	270	270
_cons	−2.009 *** (−10.97)	2.270 *** (5.65)	0.625 *** (2.99)	−2.155 *** (−4.35)	−0.548 ** (−2.21)

Note: *, **, and *** denote significance at the 10%, 5%, and 1% statistical levels, respectively; robust standard errors are in parentheses.

The findings indicate that new quality productivity effectively promotes agricultural innovation development, agricultural coordination development, agricultural open development, and agricultural shared development. However, in Model (14), the coefficient of agricultural green development exhibits a significant negative value, suggesting that new quality productivity may hinder agricultural green development within the context of high-quality agricultural development, thereby impeding the overall improvement of agricultural quality. Agricultural green development serves as a foundational aspect of high-quality agricultural progression. Nevertheless, in light of the current agricultural landscape, challenges persist, including extensive resource utilization, reduced production efficiency due to excessive reliance on inputs, agricultural pollution, homogeneous product offerings, and underdeveloped market mechanisms. These challenges collectively hamper the pursuit of high-quality agricultural development.

5.5. Heterogeneity Analysis

Given the economic disparities across China and the notable divergence in agricultural resource distribution among provinces, this study adopts the national regional division standards to categorize the 30 provinces (municipalities and autonomous regions) into eastern, central, and western regions for regional heterogeneity analysis.

The outcomes of this analysis, depicted in Table 9, reveal that the enhancement of new quality productivity positively impacts agricultural development in both the eastern and western regions. Notably, the eastern region experiences a more pronounced positive effect attributed to its robust manufacturing sector, advanced service industries, and high degree of internationalization. Conversely, the impact in the central region is statistically insignificant, potentially due to differing regional dynamics. Although the western region trails behind the central region in new quality productivity development, national initiatives such as "Eastern Development Drives Western Development" and "Broadband Border Areas" facilitate the relocation of high-tech enterprises, stimulating new quality productivity growth. This regional strategy, bolstered by tailored policies, contributes significantly to advancing high-quality agricultural development.

Table 9. Results of the test for regional heterogeneity.

	(17)	(18)	(19)	(20)	(21)
	Eastern Region	**Middle Region**	**Western Region**	**Southern Region**	**Northern Region**
L.lnAHIGH	1.092 ***	1.094 ***	1.103 ***	0.957 ***	0.868 ***
	(77.49)	(50.89)	(68.49)	(10.25)	(10.43)
lnNEWP	0.040 ***	0.007	0.018 **	0.004	0.317 ***
	(3.20)	(1.11)	(2.29)	(0.22)	(4.60)
_cons	0.041	−0.146	−0.335 *	−0.303	0.982
	(0.19)	(−0.90)	(−1.83)	(−0.74)	(1.59)
Control variable	Yes	Yes	Yes	Yes	Yes
AR(1)	0.004	0.007	0.007	0.010	0.128
AR(2)	0.600	0.595	0.594	0.650	0.494
Sargan	26.140	26.727	28.266	9.470	11.392
	(0.246)	(0.222)	(0.167)	(0.650)	(0.969)

Note: *, **, and *** denote significance at the 10%, 5%, and 1% statistical levels, respectively; robust standard errors are in parentheses.

In recent years, the economic disparity between northern and southern China has garnered attention. Thus, this study further divides the 30 provinces (municipalities and autonomous regions) into northern and southern regions using the geographical boundary of the Qinling Mountains-Huaihe River. Separate regressions are conducted to assess the divergent impact of new quality productivity on high-quality agricultural development in these regions. The regression findings in Table 9 reveal a more substantial promotion effect of new quality productivity on agricultural development in the northern regions, characterized by lower levels of new quality productivity, compared to the southern regions with higher levels.

5.6. Threshold Effect Analysis

To identify the specific form of the threshold model, this study employs high-quality agricultural development, agricultural innovation development, agricultural coordination development, agricultural green development, agricultural open development, and agricultural shared development as threshold variables. Single-, double-, and triple-threshold models are estimated, and the bootstrap resampling method is applied with 300 samples drawn. As depicted in Table 10, the threshold effect test results reveal that only the agricultural green development threshold variable passes the single-threshold test (the p-value of the double-threshold regression is 0.4033 > 0.1). However, the remaining threshold variables pass both the single and double-threshold tests, with none of them passing the triple-threshold test. Consequently, regression models with the corresponding number of thresholds are established based on these results.

Table 11 displays the estimation outcomes derived from the single-threshold model and the double-panel threshold effect model. Initially, the model estimation results employing high-quality agricultural development as the threshold variable demonstrate that the promotional impact of new quality productivity on high-quality agricultural development intensifies as high-quality agricultural development advances. Once high-quality agricultural development surpasses its first threshold value of 0.1502, new quality productivity positively influences high-quality agricultural development. Furthermore, upon crossing its second threshold value of 0.2010, the promotion effect of new quality productivity on high-quality agricultural development significantly strengthens, with a coefficient of 0.246.

Table 10. Results of the threshold effect test.

Threshold Variables	Type of Threshold	F-Value	p-Value	Threshold Value		
				10%	5%	1%
Agricultural Innovation Development	Single-Threshold Test	56.09	0.0300	38.4761	50.8115	67.3541
	Double-Threshold Test	49.67	0.0367	29.8267	38.0616	60.9600
	Triple-Threshold Test	49.15	0.4367	110.3071	128.2368	182.8497
Agricultural Coordination Development	Single-Threshold Test	86.01	0.0067	38.9041	47.3567	80.7751
	Double-Threshold Test	50.69	0.0200	23.5015	32.4266	63.7763
	Triple-Threshold Test	31.58	0.6733	100.8116	116.0632	143.0223
Agricultural Green Development	Single-Threshold Test	170.62	0.0000	27.7440	33.9502	48.7470
	Double-Threshold Test	92.39	0.0000	18.2110	22.3001	34.4228
	Triple-Threshold Test	45.26	0.6400	93.5591	101.5645	125.7660
Agricultural Open Development	Single-Threshold Test	293.49	0.0000	27.6644	38.2183	44.5235
	Double-Threshold Test	95.31	0.4033	658.1248	741.4832	901.2921
	Triple-Threshold Test	78.01	0.3067	169.5679	211.3510	336.6449
Agricultural Shared Development	Single-Threshold Test	305.25	0.0000	28.9014	33.3519	46.2092
	Double-Threshold Test	44.55	0.0033	23.3981	27.8037	36.4817
	Triple-Threshold Test	37.25	0.1667	43.3080	48.9633	69.1680

Table 11. Estimated results of threshold effects.

		(22)	(23)	(24)	(25)	(26)	(27)
		High-Quality Agricultural Development	Agricultural Innovation Development	Agricultural Coordination Development	Agricultural Green Development	Agricultural Open Development	Agricultural Shared Development
Threshold Value	θ_1	0.1502	0.0428	0.0048	0.0999	0.0963	0.0449
	θ_2	0.2010	0.0718	0.0072		0.1215	0.0500
Threshold Range	$MK_{it} \leq \theta_1$	−0.217 ***	−0.017	−0.002	−0.061 ***	0.013	−0.013 **
		(0.068)	(0.042)	(0.001)	(0.008)	(0.008)	(0.005)
	$\theta_1 < MK_{it} \leq \theta_2$	0.072	0.126 ***	0.005 ***	−0.095 ***	0.092 ***	0.057 ***
		(0.048)	(0.036)	(0.001)	(0.020)	(0.016)	(0.008)
	$MK_{it} > \theta_2$	0.246 ***	0.270 ***	0.012 ***		0.170 ***	0.120 ***
		(0.043)	(0.044)	(0.001)		(0.012)	(0.010)
Control Variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-value	41.51	78.12	45.14	11.26	60.16	52.34	41.51
R^2	0.559	0.705	0.580	0.231	0.648	0.615	0.559
N	300	300	300	300	300	300	300

Note: *, **, and *** denote significance at the 10%, 5%, and 1% statistical levels, respectively; robust standard errors are in parentheses.

Based on the empirical test results of estimating the five subsystems of high-quality agricultural development as threshold variables, it is evident that when agricultural innovation development, agricultural coordination development, agricultural open development, and agricultural shared development exceed their respective first threshold values of 0.0482, 0.0048, 0.0963, and 0.0449, new quality productivity significantly enhances high-quality agricultural development at the 1% significance level. Moreover, as these values surpass the second threshold value, their positive impact on high-quality agricultural development demonstrates marginal increment characteristics. Thus, indicating that the higher the level of new quality productivity, the more potent its driving force on high-quality agricultural development.

Consequently, this study concludes that Hypothesis 2 is empirically validated, suggesting that the promotion effect of new quality productivity on high-quality agricultural development follows a nonlinear pattern, strengthening as the level of high-quality agricultural development increases.

6. Conclusions and Implications

This paper utilizes data from 30 provinces (municipalities and autonomous regions) in China spanning from 2012 to 2021 as the research subjects. Empirical tests are conducted using the SYS-GMM model and threshold effect model to examine the mechanism and effects of new quality productivity empowering agricultural high-quality development, based on the measurement of the constructed indicator system of high-quality agricultural development and new quality productivity using the entropy method. The findings are as follows:

(1) The baseline estimation results indicate that the development of new quality productivity significantly promotes the improvement of the level of high-quality agricultural development. This research conclusion remains robust across various robustness test methods such as subsample regression, outlier removal, replacement of explained variables, and model replacement.

(2) The estimation results of various subsystems of high-quality agricultural development demonstrate that new quality productivity can enhance the level of high-quality agricultural development by improving agricultural innovation development, agricultural coordination development, agricultural open development, and agricultural shared development. However, it may hinder the improvement of high-quality agricultural development by impeding the enhancement of agricultural green development in the subsystems.

(3) Regarding the heterogeneity analysis of eastern, central, and western regions, the promotion effect of developing new quality productivity on high-quality agricultural development is stronger in the eastern region than in the western region. However, this positive driving effect is not significant in the central region. Concerning the heterogeneity analysis of northern and southern regions, the lower level of new-quality productivity in the northern region significantly promotes high-quality agricultural development through the enhancement of new-quality productivity levels.

(4) Analysis of the threshold effect model reveals that the promotion effect of developing new quality productivity on high-quality agricultural development increases with the improvement of the high-quality agricultural development level. Specifically, when the level of high-quality agricultural development crosses the first threshold value of 0.1502, the promotion effect of new quality productivity on high-quality agricultural development becomes significant. Moreover, when this value crosses the second threshold value of 0.2010, the promotion effect of new quality productivity on high-quality agricultural development is further enhanced. Furthermore, by re-estimating the threshold effect model with the five subsystems of high-quality agricultural development as threshold variables, it is observed that the promotion effect of new quality productivity on high-quality agricultural development is influenced by the threshold effects of each subsystem, with the trend of influence generally consistent with that of using high-quality agricultural development as the threshold variable.

Drawing from the conclusions of this research, the following policy suggestions are proposed:

Firstly, there is a focus on upgrading the industrial foundation and modernizing the industrial chain. This follows a developmental strategy of "expanding the primary industry upstream, integrating both ends of the secondary industry, and advancing the tertiary industry to high-end." The aim is to address deficiencies in the industrial chain, strengthen weak links, enhance all stages comprehensively, add value throughout the chain, and integrate the entire industry to elevate the agricultural industry chain's overall value.

Secondly, there is an emphasis on prioritizing the green and high-quality development of agriculture. This includes accelerating the widespread adoption of green technologies in agricultural production, expediting the development of an agricultural circular economy, promoting the utilization of innovative fertilizers, advancing practices such as green manure planting and diverse methods of straw return, reducing fertilizer application, and achieving a sustainable ecological cycle in agricultural production, rural development, and village life.

Thirdly, while ensuring steady progress in high-quality agricultural development in the eastern region, efforts should be concentrated on elevating the level of high-quality agricultural development in the central and western regions. Especially in economically disadvantaged areas with limited fiscal resources, leveraging targeted fiscal transfer payments is essential to mobilize all favorable factors conducive to improving the level of high-quality agricultural development. Emphasis should be placed on creating a more conducive external environment and internal conditions to empower agricultural high-quality development with new-quality productivity.

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References

1. Ji, C. Spatial Differences and Driving Mechanism of High Quality Development in China's Agriculture and Rural Areas. *J. Quant. Tech. Econ.* **2021**, *38*, 25–44.
2. Zhang, J.; Xu, Z. Theoretical Review, Logical Analysis and Practical Path of New Quality Productivity in Perspective of Chinese Modernization. *Soc. Sci. Xinjiang* **2024**, 34–45.
3. Wang, X.; Qu, H. Ideas and Suggestions for Science and Technology Innovation to Promote High-Quality Agricultural Development. *Stud. Explor.* **2020**, 120–127.
4. Zhang, L.; Luo, B. Pursuing High Quality Development of Agriculture in China: Essential Regulations and Strategy Options. *Tianjin Soc. Sci.* **2020**, 84–92.
5. Yi, E.; Wang, J.; Zhu, J. Digital Economy, Resource Allocation Efficiency and High-Quality Development of Agriculture. *J. Tianjin Univ. Financ. Econ.* **2023**, *43*, 20–37.
6. Long, S.; Zhang, M. Recalculation and Influencing Factors of China s Agricultural Total Factor Productivity: From Tradition to High-Quality Development. *Res. Financ. Econ. Issues* **2021**, 40–51.
7. Tang, X.; Jiang, J. Impact of Rural Population Aging on High-Quality Agricultural Development. *J. South China Agric. Univ.* **2023**, *22*, 45–56.
8. Zhou, Q.; Li, X. Digital Economy and High-Quality Agricultural Development: Internal Mechanism and Empirical Analysis. *Reform. Econ. Syst.* **2022**, 82–89.
9. Wang, Q.; Yang, J. Research on Digital New Quality Productivity and High-quality Development of Chinese Agriculture. *J. Shaanxi Norm. Univ.* **2023**, *52*, 61–72.
10. Wang, S.; Chen, Y. How Does Digital Inclusive Finance Promote the High-quality Development of Agriculture? On Intermediary and Threshold Mechanism. *J. Manag.* **2022**, *35*, 72–87.
11. Xin, L.; An, X. Construction and Empirical Analysis of Agricultural High-quality Development Evaluation System in China. *Econ. Rev. J.* **2019**, 109–118.
12. Zhong, Y. Agricultural Development Orientation towards High Quality Stage. *Acad. J. Zhongzhou* **2018**, 40–44.
13. Wang, J. Measurement and Evaluation of China's Agricultural High Quality Development. *J. Jiangxi Univ. Financ. Econ.* **2021**, 93–106.
14. Liu, Z.; Re, Z. A Research of the Regional Disparities and Distributional Dynamic Evolution of High-quality Agricultural Development in China. *J. Quant. Technol. Econ.* **2021**, *38*, 28–44.
15. Li, X.; Xu, S. The Measurement of the Level of Agricultural High-Quality Development and the Study of the Spatial Distribution Characteristics: On the Basis of the New Development Concept. *J. Jiangxi Univ. Financ. Econ.* **2020**, 78–94.
16. Luo, S.; Qiu, Y. Core Industry Clustering in the Central Digital Economy Enables New Quality Productivity Development: Theoretical Mechanisms and Empirical Tests. Available online: http://kns.cnki.net/kcms/detail/65.1211.f.20240403.1238.002.html (accessed on 17 April 2024).
17. Huang, Q.; Sheng, F. New Productive Forces System: Factor Characteristics, Structural Bearing and Functional Orientation. *Reform* **2024**, 15–24.

18. Qiao, Z. New Quality Productivity: A Terminological Revolution in Marxist Economics. *Stud. Explor.* **2024**, 74–87.
19. Zhai, Q.; Cao, S. A Political Economy Explanation of the New Quality Productivity. *J. Xian Univ. Financ. Econ.* **2024**, *37*, 15–23.
20. Gao, Y.; Ma, J. New Quality Agricultural Productivity: A Political Economy Perspective. *Issues Agric. Econ.* **2024**, 81–94.
21. Zhang, L. New Quality Productivity and the Driving Force of Chinese-style Modernization. *Economist* **2024**, 15–24.
22. Xu, Z.; Zheng, L.; Cheng, M. The Internal Logic and Practical Concept of New Quality Productivity Empowering. *Contemp. Econ. Res.* **2023**, 51–58.
23. Lin, W.; Dong, X. Leading the Construction of Agricultural Powerhouse with New Quality Product. *J. Nanjing. Agric. Univ.* **2024**, *24*, 18–27.
24. Zhu, X.; Li, R.; Xu, X.; Sun, J. Construction and Spatiotemporal Evolution of New Productivity Indicators of China. *J. Ind. Technol. Econ.* **2024**, *43*, 44–53.
25. Zhu, Z.; Yang, F.; Li, W. Analysis of Three—Dimensional Innovation Ecosystems and Level Measurement. *J. Yunnan Univ. Financ. Econ.* **2024**, *40*, 1–14.
26. Zhang, P. Digital New Productivity and Global Value Chain Embedding: Theoretical Mechanisms and Empirical Testing. *Contemp. Econ. Res.* **2024**, 75–86.
27. Wang, J. Research on the Influence of New Quality Productivity to Enable the Modernization of Chinese Industrial Chain. *J. Ind. Technol. Econ.* **2024**, *43*, 3–11.
28. Hou, G.; Zhang, Z.; Dong, S. New Quality Productivity Enabling High-quality Agricultural Development in Northeast China: Theoretical Logic, Key Issues and Practical Paths. *Soc. Sci. Hunan* **2024**, 69–76.
29. Chen, Y.; Wang, S. Effect of Land Transfer Policy on Agricultural High-quality Development—Empirical Analysis Based on Continuous DID Method. *Contemp. Econ. Res.* **2023**, *44*, 49–57.
30. Wang, Y.; Wang, R. New Quality Productivity: Index Construction and Spatiotemporal Evolution. *J. Xian Univ. Financ. Econ.* **2024**, *37*, 31–47.
31. Fan, G.; Wang, X.; Ma, G. Contribution of Marketization to China's Economic Growth. *Econ. Res. J.* **2011**, *46*, 4–16.
32. Zhao, Y.; Zhang, Z.; Feng, T.; Tao, K. Development of Big Data, Institutional Environment and Efficiency of Government Governance. *J. Manag. World* **2019**, *35*, 119–132.
33. Hansen, B. Threshold Effects in Non-dynamic Panels: Estimation, Testing and Inference. *J. Econ.* **1999**, *93*, 345–368. [CrossRef]
34. Gong, B.; Xiao, Y.; Xu, J.; Yuan, L. Rising Labor Costs, Factor Substitution and Agricultural Total Factor Productivity. *J. Huazhong Agric. Univ.* **2024**, 28–38.