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# The Effect of Inclusive Growth on the Resilience of Agricultural Industry Chain and Supply Chain

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## Abstract

**Whether inclusive growth offers a viable avenue to strengthen the resilience of both agricultural industry chains and supply chains carries considerable practical weight for promoting common prosperity, developing a robust agricultural nation, and ensuring national food security. Based on the panel data of 31 provinces in China from 2011 to 2024, the impact and mechanism of inclusive growth on the resilience of the agricultural industry chain supply chain were empirically tested. The results indicate that: (1) Inclusive growth can significantly improve the resilience of the agricultural industry chain supply chain. After adopting the tool variable method and a variety of robustness tests, this conclusion is still valid. (2) Agricultural socialization services play a significant intermediary role in the process of inclusive growth affecting the resilience of the agricultural industry chain supply chain, and is an important transmission channel for the improvement of the resilience of inclusive growth. (3) The promotion effect of inclusive growth is obviously heterogeneous, which is more significant in areas with low digital inclusive financial development level and the central and western regions, but not in areas with high digital inclusive financial development and eastern regions. These findings provide empirical support and policy guidance on how to use inclusive growth to enhance the resilience of agricultural industry chains and supply chains.**

## Keywords

**Inclusive Growth; Resilience of the Agricultural Industry Chain Supply Chain; Agricultural Socialization Services; Digital Inclusive Finance.**

## 1. Introduction

Improving the resilience of the agricultural industry chain and making the agricultural industry stable operation is a realistic choice for China to cope with the complex situation at home and abroad. The report of the 20th National Congress of the Communist Party of China made a clear deployment, requiring anchoring the goal of building a strong agricultural country and continuously enhancing the resilience and security capabilities of the industrial chain supply chain. In 2024, the total national grain output historically stood at 1.4 trillion jin, achieving an increase in production and harvest for the 21st consecutive year, and the overall operation of the agricultural economy is stable and steady[1]. However, the current century-old change is accelerating, and multiple external challenges such as the intensification of the geopolitical game, the frequent occurrence of extreme weather, and the in-depth adjustment of the global supply chain are impacting the supply chain of China's agricultural industry chain. In the face of sudden fluctuations, some structural shortcomings in this chain are also gradually emerging - the independent innovation ability of core technologies is not strong enough, the synergy of upstream and downstream links needs to be improved, and the overall risk resistance foundation is still weak[2]. More importantly, behind these shortcomings, there are also the

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lack of inclusiveness, such as unbalanced urban and rural development, low efficiency of rural factor allocation, and insufficient participation of small farmers in the industrial chain: The income gap between urban and rural residents is still large, the coverage of rural digital infrastructure and financial services is insufficient, and the agricultural socialization service system is not yet perfect, which restricts the ability of various business entities to equally participate in the industrial chain division of labor and share development results, and also weakens the overall resilience of the agricultural industrial chain supply chain.

As a development concept that emphasizes equal opportunities and shared results, inclusive growth has gradually become an important guideline for promoting coordinated economic and social development since it was proposed by the Asian Development Bank in 2007[3]. At the practical level, China's central leadership attaches great importance to achieving inclusive growth in the rural and agricultural sectors. As early as 2021, the Outline of the Fourteenth Five-Year Plan for National Economic and Social Development and the Long-term Goals by 2035 clarified the requirement of "promoting common prosperity more actively and vigorously", thus conveying a decisive message that inclusive growth should be given to agriculture, rural communities and agricultural The tool of family power[4]. The 2023 Central Document No. 1 further emphasized " expanding avenues through which rural residents can raise their earnings and attain prosperity," while underscoring the essential role of inclusive growth in upholding national food security[5]. However, China's rural areas still face a huge gap in urban and rural development, including unequal access to basic public services and inefficient factor distribution, which exacerbates the inequality of urban and rural development and limits the inclusive growth of agriculture[6,7]. So, can inclusive growth become a new driving force to improve the resilience of the agricultural industry chain supply chain? What is its intrinsic mechanism? Are there any differences in different regions and different levels of digital financial development? Answering these questions not only helps to expand the research boundaries of the factors affecting the resilience of the agricultural industry chain from the dimension of economic and social development, but also provides an empirical basis for the formulation of more inclusive and sustainable policies to improve the resilience of the agricultural industry chain.

As China intenses its efforts to build a strong agricultural country, it is especially important to cultivate the ability of the stable operation of the agricultural system in the face of many domestic and external risks and threats that must be addressed to protect food security[8]. As an important concept to maintain the stability of the system and realize the ability of dynamic adjustment when depicting internal and external shocks, "resilience" provides an important theoretical tool for analyzing the resilience of the agricultural industry chain supply chain. The relevant literature is systematically combed around the concept of toughness. Reggiani and others introduced the concept of resilience into economic research earlier, defining economic resilience as the "evolution" ability of the economic system to restore its original state when responding to shock disturbances[9]. In the field of agriculture, the United Nations defines the resilience of the agri-food system as the ability to ensure that all people have long-term access to sufficient, safe and nutritious food in response to various disturbances, and to maintain the livelihood of agri-food system practitioners. Regarding the concept of the resilience of the agricultural industry chain, the academic community has accumulated a lot of research results. The mainstream view understands it as the comprehensive ability of the agricultural industry chain to bear risks, resume operation as soon as possible and finally achieve transformation and upgrading in the face of internal and external disturbances. Most of the relevant empirical measures are also based on this definition.

What factors will affect the resilience of the agricultural industry chain? The literature has been discussed from different angles. In terms of institutional factors, the financial support policy for farmers supports agricultural production with the help of direct input and various subsidies,

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which makes agriculture more able to withstand the impact, so it is regarded as an important tool to improve the resilience of the industrial chain[10]; let's look at the financial factors. Agricultural insurance has significantly enhanced the resilience of the agricultural economy itself with risk coverage and post-disaster compensation arrangements, which is equivalent to weaving a safety net for the smooth operation of the whole industrial chain[11]; at the infrastructure level, the construction of new infrastructure enhances the resilience of the agricultural industry chain through mechanisms such as information circulation, element allocation and technology diffusion.[12]; In addition, the technical empowerment represented by digital technology has also received wide attention. The integration of digital reality and the digital transformation of agriculture have been proven to help improve the resilience of the agricultural industry chain[13,14]. However, constrained by the dual structure of urban and rural areas and the imperfect factor market, the degree of integration of inclusive growth and agricultural industry chain is still low[15].

In summary, although the existing literature has achieved rich results in the measurement of the resilience of the agricultural industry chain supply chain, the empowerment effect of factors such as digital technology and digital villages, there is still some room for discussion in the following aspects: First of all, existing research explores the improvement path of the resilience of the agricultural industry chain supply chain from the perspective of digital economy, digital technology and other technological dimensions, and less examines its driving effect on the resilience of the agricultural industry chain supply chain from the economic and social development dimension of inclusive growth[16], ignoring the fundamental role of institutional factors such as fair income distribution and equalization of public services in the improvement of resilience. Moreover, what is the internal logic of inclusive growth on the resilience of the agricultural industry chain supply chain? At present, there is still a lack of systematic theoretical analysis and empirical evidence in this regard, especially the key transmission path of agricultural socialization services, and the academic community has not recognized it sufficiently. Another thing worth noting: will the effect of inclusive growth vary depending on the region and the level of digital financial development? The existing literature has not discussed enough about this heterogeneity, and the law behind the difference has not been excavated.

Focusing on the theory of inclusive growth, the article tries to build a theoretical analysis framework to clarify how inclusive growth affects the resilience of the agricultural industry chain supply chain, and thus deeply analyze the improvement mechanism behind the resilience. compared with the existing research, the marginal contribution of this article is reflected in three aspects: First, build an analytical framework for inclusive growth to affect the resilience of the agricultural industry chain supply chain, reveal the transmission mechanism of agricultural socialization services in the inclusive growth to improve the resilience of the agricultural industry chain supply chain, and provide empirical evidence for understanding how inclusive growth affects the resilience of the agricultural industry chain supply chain. Second, based on the different perspectives of the level of digital inclusive finance and geographical regions, we will explore the heterogeneity of inclusive growth affecting the resilience of the agricultural industry chain supply chain, and provide empirical evidence to enhance the applicability of the resilience of the agricultural industry chain supply chain to enhance inclusive growth. Third, it systematically explains the theoretical mechanism of inclusive growth to improve the resilience of the agricultural industry chain supply chain from the three dimensions of resistance, recovery ability and change ability, and expands the research perspective of factors affecting the resilience of the agricultural industry chain.

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## 2. Theoretical Framework and Hypothesis Development

### 2.1. Direct Impact

The theory of inclusive growth emphasizes that economic growth should benefit all social groups. Its core is to achieve coordinated economic and social development by improving income distribution, equal public services, promoting factor flow and enhancing development capacity. The concept of fair sharing advocated by inclusive growth is logically consistent with the multi-level enhancement of the recovery of the agricultural industry chain, which opens up a new way to strengthen the recovery of the agricultural industry and supply chain. First of all, inclusive growth promotes the equalization of basic public services in urban and rural areas, and the resulting improvement of rural infrastructure construction and public service supply can improve the quality of employment of the agricultural transfer population and the efficiency of agricultural labor allocation[17], It is conducive to breaking down the barriers to the movement of urban and rural factors, reducing the cost of agricultural production and operation, and expanding the market demand for agricultural products[18], so as to better realize the matching of supply and demand and optimize the production process, thereby reducing the impact of various shocks on the agricultural industry chain, and ultimately improving the resistance of the agricultural industry chain. Second, inclusive growth accelerates the construction of rural social security system and agricultural insurance system, provides risk guarantee and recovery support for different subjects of the agricultural industry chain, which is conducive to enhancing the coordination and cooperation of all departments in the agricultural industry chain, and enhancing the risk and recovery capacity of agricultural production[19], promoting the organic connection of the agricultural industry chain, so as to promote the division of labor in the agricultural industry chain to be more professional and refined, reduce the sensitivity of agriculture in business risks, and improve the recovery ability of the agricultural industry chain. Finally, inclusive growth accelerates the accumulation of human capital and the integration and application of innovation and entrepreneurship environment optimization and agricultural industry chain, providing key support for the adjustment of agricultural industry organization and operation mode, and injecting new momentum into the agricultural industry chain[20]. It can be seen that inclusive growth leads the transformation of the agricultural industry chain, changes the traditional agricultural production operation mode, strengthens the weak links of the agricultural industry chain, and improves the overall efficiency of the agricultural industry chain. Based on the above analysis, this paper puts forward the following research hypotheses:

H1: Inclusive growth exerts a significant positive effect on the resilience of agricultural industrial and supply chains.

### 2.2. Indirect Effect

Agricultural socialization services refer to services that provide intermediate inputs for agricultural production throughout the agricultural production chain, involving agricultural machinery operations, agricultural supply distribution, technology extension, warehousing and logistics, marketing information, and other segments. Given the fundamental national condition of "a large country with small-scale farmers," agricultural socialization services overcome the limitations of small-scale farming by means of specialized division of labor and scaled-up service provision, functioning as a key institutional mechanism that fosters the organic linkage between smallholder operations and the development of modern agriculture[21].

Inclusive growth has the potential to foster the growth of agricultural socialization services on both the demand and supply sidesOn the demand side, inclusive growth strengthens both the purchasing power and the demand for productive services among smallholder farmers and new types of agricultural business entities, achieved through lifting rural household incomes and

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reducing the urban-rural income disparity. Existing studies show that providing agricultural socialization services can greatly improve the operating income of low-income rural families. The more perfect the service system is, the more obvious the income increase effect, and the improvement of income level in turn further expands farmers' demand for professional services[22]. In terms of supply, inclusive growth reduces the entry barriers and transaction costs faced by service providers when entering rural markets, which is achieved by promoting the equal provision of basic urban and rural public services, upgrading rural infrastructure and factor markets, and supporting the expansion of socialized service entities, including agricultural machinery, agricultural technology and logistics[23]. At the same time, the principle of equal opportunities and shared benefits that supports inclusive growth has created a fair competitive environment for diversified service providers, revitalized market dynamics, and encouraged the diversified expansion of service products[24].

The development of agricultural socialization services can improve the resilience of the agricultural industry chain supply chain from multiple dimensions. First of all, social services improve the standardization level and risk resistance of agricultural production and enhance the resistance of the industrial chain by providing specialized agricultural machinery operation, pest control, warehousing and logistics and other services[25]. Secondly, social services realize the organic connection between small farmers and modern agriculture through service scale operation, reduce transaction costs and market fluctuations caused by decentralized operation, and enhance the recovery capacity of the industrial chain[26]. Finally, productive services promote the transformation and upgrading of agricultural production modes by introducing advanced technology and management experience, giving rise to new business forms such as plowing, land custody, and order agriculture, and enhance the transformation ability of the industrial chain[27].

From this, it is not difficult to see that inclusive growth, on the one hand, raises the service demand of farmers and lowers the threshold of service supply, thus driving the development of agricultural socialization services; on the other hand, agricultural socialization services take advantage of improving the degree of standardization, connecting small farmers to modern agriculture, and promoting industrial transformation and upgrading. , make the resilience of the agricultural industry chain supply chain stronger. In this way, the transmission chain of "inclusive growth → agricultural socialization services → agricultural industry chain supply chain resilience" is clear. Accordingly, the following research hypotheses are put forward in this paper:

H2: Agricultural socialization services play an intermediary role in the process of inclusive growth affecting the resilience of the agricultural industry chain supply chain.

## 2.3. Heterogeneous Effect

The impact of inclusive growth on the resilience of the agricultural industry chain supply chain may vary depending on the external environment and regional characteristics. On the one hand, as a technical empowerment tool, digital inclusive finance may have an alternative relationship with the institutional empowerment of inclusive growth; On the other hand, there are significant differences in the level of economic development, agricultural industry foundation and factor endowment in the eastern, central and western regions of China, and the marginal effect of inclusive growth may also be different.

Judging from the level of digital inclusive financial development, the empowerment effect of inclusive growth may be different. In areas with a low level of digital inclusive financial development, the problem of financial exclusion is more prominent, and agricultural business entities face strong financing constraints and information asymmetry. Inclusive growth has a greater effect on improving the resilience of the agricultural industry chain through institutional channels such as improving income distribution, improving public services, and

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optimizing factor allocation. By comparison, where digital inclusive finance has reached more advanced levels, digital technology has effectively alleviated rural financial constraints through mobile payments, online credit, and data-based risk control, and the technological empowerment of digital finance has, to a certain extent, substituted for the institutional empowerment of inclusive growth, leading to a weakened or even insignificant incremental effect of inclusive growth[28]. Research indicates that digital inclusive finance and conventional rural finance exhibit both aggregate complementarity and structural substitution; once digital finance penetration crosses a certain threshold, the marginal contribution of traditional institutional channels weakens[29].

Regarding regional variation, the effect of inclusive growth may display a pattern of "stronger impacts in central and western regions and weaker ones in the east." The eastern region enjoys more advanced economic development, comparatively mature agricultural industrial chains, and superior infrastructure, public services, and factor allocation, which leaves little scope for further marginal gains from inclusive growth; hence its promotional effect on agricultural industrial chain resilience may prove negligible. By comparison, the central and western regions feature comparatively underdeveloped agricultural bases and substantial urban-rural disparities, and the marginal enhancement effect of inclusive growth on agricultural industry chain resilience through pathways such as filling gaps in rural infrastructure, improving public service levels, and optimizing factor allocation efficiency is greater. Prior research has demonstrated that the digital economy's impact on raising rural incomes is markedly stronger in the central and western regions than in the east, precisely due to differences in marginal contributions-improvement-oriented policies have greater marginal effects in less developed regions[30]. Studies measuring inclusive growth at the county level likewise indicate that China's inclusive growth displays a gradient distribution pattern-"eastern > central > western"-with greater potential for marginal improvement in the central and western regions[31].

Hypothesis 3: The promotional impact of inclusive growth on agricultural industrial and supply chain resilience displays heterogeneity: it is more pronounced in regions where digital inclusive finance is less developed and in the central and western regions.

# 3. Study Design

## 3.1. Model Setup

### 3.1.1. Benchmark Regression Model

To investigate how inclusive growth shapes agricultural industrial and supply chain resilience, the present study establishes the subsequent two-way fixed-effects panel regression model:

$$Res_{it} = \alpha_0 + \alpha_1 L.Inc_{it} + \alpha_2 Controls_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (1)$$

where Res_it represents the agricultural industrial and supply chain resilience of province i in year t; $L1.IG_{it}$ denotes the one-period lagged inclusive growth of province i in year t; Controls_it represents a set of control variables; $\mu_i$ denotes province fixed effects, controlling for province characteristics that do not change over time; $\nu_t$ captures year fixed effects, controlling for common shocks affecting all provinces in a specific year; $\varepsilon_{it}$ denotes the random error term; and $\alpha_1$ is the core coefficient of interest, which captures how inclusive growth affects agricultural industrial and supply chain resilience.

### 3.1.2. Mediating Effect Model

To examine whether inclusive growth indirectly strengthens agricultural industrial and supply chain resilience through fostering the expansion of agricultural socialization services, the subsequent mediating effect model is established:

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$$Serv_{it} = \beta_0 + \beta_1 L.Inc_{it} + \beta_2 Controls_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (2)$$

$$Res_{it} = \gamma_0 + \gamma_1 L.Inc_{it} + \gamma_2 Serv_{it} + \gamma_3 Controls_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (3)$$

where Serv_it denotes the mediating variable, capturing the extent of development of agricultural socialization services in province i at year t; all other variables retain the same definitions as in Equation (1). The procedure for testing mediation effects proceeds as follows: initially, the significance of the coefficient in Equation (1) constitutes the primary prerequisite for establishing the presence of a mediation effect. Second, in Equation (2), $\alpha_1$ measures the impact of inclusive growth on the mediating variable agricultural socialization services; if significantly positive, it indicates that inclusive growth can significantly promote the development of agricultural socialization services. Finally, Equation (3) simultaneously includes inclusive growth and agricultural socialization services; if $\gamma_2$ is significantly positive and the absolute value or significance level of $\gamma_1$ decreases compared with $\beta_1$, this suggests that agricultural socialization services serve as a mediator in the pathway through which inclusive growth shapes agricultural industrial and supply chains, thereby confirming Hypothesis 2. The magnitude of the mediation effect is $\beta_1 \times \gamma_2$, and its proportion of the total effect is$(\beta_1 \times \gamma_2)/\alpha_1$.

### 3.1.3. Heterogeneity Analysis Model

To investigate whether the effect of inclusive growth on agricultural industrial and supply chain resilience varies with differences in digital inclusive finance development and regional attributes, the present study adopts grouped regression techniques to conduct heterogeneity analysis. More precisely, observations are split into high-digital-inclusive-finance and low-digital-inclusive-finance subsamples using the annual median of the digital inclusive finance index, and into eastern, central, and western subgroups following the classification criteria of the National Bureau of Statistics. The benchmark regression in Equation (1) is estimated independently for each subsample, and the presence of heterogeneity is assessed by contrasting the size and statistical significance of the core explanatory variable's coefficients across groups. The present study develops the subsequent regression model that incorporates interaction terms:

$$Res_{it} = \delta_0 + \delta_1 L.Inc_{it} + +\delta_2 Group_{it} + \delta_3 Controls_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (4)$$

where $Group_{it}$ is a grouping dummy variable. For the digital inclusive finance heterogeneity analysis, the high-digital-inclusive-finance group is coded as 1 while the low-digital-inclusive-finance group is coded as 0; for the regional heterogeneity analysis, two separate dummy variables are created for the central and western regions (using the eastern region as the baseline group).

## 3.2. Variable Definition

### 3.2.1. Dependent Variable: Agricultural Industry Chain and Supply Chain Resilience

Drawing on the work of Li Jian and colleagues (2026)[8], and grounded in the three-dimensional analytical framework of system resilience theory, the present paper develops an evaluation index system for agricultural industrial and supply chain resilience across three dimensions: resistance capacity, recovery capacity, and transformation capacity. Detailed indicators are presented in Table 1. Since different indicators exert either positive or negative effects on agricultural industrial and supply chain resilience, all indicators are standardized, and the entropy weight method combined with TOPSIS is employed to derive the

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comprehensive resilience index, which ranges from 0 to 1, with higher values signifying greater resilience.

**Table 1.** Evaluation Index System of Agricultural Industry Chain and Supply Chain Resilience

| First-level Indicator | Second-level Indicator | Third-level Indicator | Expected Direction |
|---|---|---|---|
| Anti-Shock Capacity | Industry Chain Foundation | Agricultural Irrigation Efficiency | + |
| | | Total Sown Area of Crops | + |
| | | Gross Output Value of Agriculture | + |
| | | Agricultural Machinery Productivity | + |
| | | Agricultural Consumer Goods Retail | + |
| | Supply Chain Foundation | Rural Road Network Accessibility | + |
| | | Railway Line Density | + |
| | | Highway Line Density | + |
| | | Proportion of Logistics Industry Value Added | + |
| | Risk Exposure | Chemical Input Intensity | - |
| | | Agricultural Plastic Film Application | - |
| | | Proportion of Disaster-Affected Area | - |
| | | Agricultural Product Production Price Index | + |
| | | Grain Production Capacity | + |
| Recovery Capacity | Risk Identification | Density of Agricultural Meteorological Station Monitoring Points | + |
| | | Telephone Penetration Rate | + |
| | | Rural Electricity Consumption | + |
| | Risk Response | Fiscal Support for Agriculture Intensity | + |
| | | Agricultural Insurance Depth | + |
| | | Agricultural Insurance Claim Rate | + |
| | | Agricultural Fixed Asset Investment | + |
| | | Agriculture-Related Loan Scale | + |
| Transformation Capacity | Innovation Input | Agricultural Scientific Research Funds | + |
| | | Agricultural Scientific Research Personnel | + |
| | Innovation Output | Number of Agricultural Patent Applications | + |
| | | Agricultural Technology Market Transaction Volume | + |
| | | Patent Output | + |

### 3.2.2. Core Explanatory Variable: Inclusive Growth

Additionally, the TOPSIS approach is applied to develop an overall evaluation index. Following established research conventions[31], an indicator system is constructed from three dimensions: economic growth, income distribution, and social equity: (1) Economic growth dimension, selecting three indicators-per capita GDP, labor productivity, and capital productivity-to reflect the aggregate level and growth momentum of regional economic development; (2) Within the income distribution dimension, four indicators are chosen: per

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capita disposable income for urban households, per capita disposable income for rural households, labor's share of GDP, and the urban-rural per capita income ratio-used to capture the equity and inclusiveness of income distribution; (3) Within the social equity dimension, nine indicators are selected: the urban registered unemployment rate, the employment share in secondary and tertiary sectors, educational investment intensity, the balance of educational resources, hospital expansion capacity, physician density, pension insurance coverage, medical insurance coverage, and unemployment insurance coverage-designed to capture the equalization of basic public services and the fairness of development opportunities.

**Table 2.** Evaluation Index System of Inclusive Growth

| First-level Indicator | Second-level Indicator | Specific Indicator | Calculation Formula | Unit of Measurement |
|---|---|---|---|---|
| Economic Growth | Economic Output | GDP per Capita | GDP / Total Population | yuan/person |
| | Economic Efficiency | Labor Productivity | GDP / Employed Population | 10k yuan/person |
| | Economic Efficiency | Capital Productivity | GDP / Fixed Asset Investment | % |
| Income Distribution | Income Level | Per Capita Disposable Income of Urban Residents | Weighted average of urban household disposable income | yuan/person |
| | Income Level | Per Capita Disposable Income of Rural Residents | Weighted average of rural household disposable income | yuan/person |
| | Income Level | Share of Labor Income in GDP | Labor Remuneration / Income Approach GDP | % |
| | Income Gap | Urban-Rural Per Capita Income Ratio | Urban Per Capita Income / Rural Per Capita Income | % |
| Social Equity | Employment Opportunity | Urban Registered Unemployment Rate | Urban Unemployed / (Urban Employed + Urban Unemployed) x 100% | % |
| | Employment Opportunity | Employment Rate in Secondary and Tertiary Industries | Employment in Secondary & Tertiary / Total Employment | % |
| | Education Opportunity | Education Support Intensity | Government Education Expenditure / GDP | % |
| | Education Opportunity | Balance of Educational Resources | Student-Teacher Ratio in Primary and Secondary Schools | % |
| | Medical Opportunity | Hospital Expansion Capacity | Hospital Beds / Total Population | beds/person |
| | Medical Opportunity | Physician Allocation Level | Number of Doctors / Total Population | doctors/person |
| | Social Security | Pension Insurance Participation Rate | Pension Insurance Participants / Total Population | % |
| | Social Security | Medical Insurance Participation Rate | Medical Insurance Participants / Total Population | % |
| | Social Security | Unemployment Insurance Participation Rate | Unemployment Insurance Participants / Total Population | % |

Note: Urban-rural per capita income ratio and urban registered unemployment rate are negative indicators.

### 3.2.3. Covariates

Building on prior research concerning agricultural industrial and supply chain resilience [32,33], the present study includes the subsequent covariates to disentangle the effect of inclusive growth: local fiscal pressure, computed as the gap between local fiscal expenditure and local fiscal revenue divided by local fiscal expenditure; urbanization rate, calculated as the share of urban permanent residents in the total population; agricultural operation scale, defined as total agricultural output value divided by the number of primary-industry

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employees; trade openness, measured as the ratio of total goods imports and exports to GDP; and green patent count, proxied by the number of granted green patents.

**Table 3.** Control Variable Indicators

| Variable Name | Variable Symbol | Calculation Method |
|---|---|---|
| Local Fiscal Pressure | Fis | (Local Fiscal Expenditure - Local Fiscal Revenue) / Local Fiscal Expenditure |
| Industrial Structure Advancement | Str | Value Added of Tertiary Industry / Value Added of Secondary Industry |
| Agricultural Operation Scale | Sca | Gross Agricultural Output Value / Number of Employees in Primary Industry |
| Degree of Openness | Ope | Total Imports and Exports of Goods / GDP |
| Number of Green Patents | Green | Number of Green Patent Grants |

### 3.2.4. Mediating Variable

Agricultural socialization services (Serv): Following the approach of Chen Weihong et al. (2025)[34], the gross output value of agricultural, forestry, animal husbandry, and fishery services is divided by total crop sown area to serve as the proxy for agricultural socialization services, capturing the intensity of agricultural socialization service inputs per unit of cultivated land.

### 3.2.5. Heterogeneity Grouping Variables

The first dimension is regional classification: the eastern, central, and western regions are delineated in line with National Bureau of Statistics criteria. The eastern region comprises eleven provincial-level units: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. The central region covers eight provinces: Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. The western region spans twelve provincial-level units: Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.

The second dimension splits observations into high- and low-level digital inclusive finance groups: measurement draws on the Digital Inclusive Finance Index developed by the Institute of Digital Finance at Peking University. Adopting the method of Zhao Xianghao and colleagues[35], given that the index's latest update covers 2023 and that the effect of digital financial services on agricultural industrial chains operates with a lag, the empirical analysis employs the one-period lagged value, drawing data from the Peking University Digital Inclusive Finance Index (2011–2023).

### 3.2.6. Data Sources

The present study employs panel data spanning 31 Chinese provinces over 2011–2024 as its estimation sample. Data are drawn primarily from the China Statistical Yearbook, the China Rural Statistical Yearbook, the China Fiscal Yearbook, the China Insurance Yearbook, the China Regional Economic Statistical Yearbook, the China Population and Employment Statistical Yearbook, as well as provincial-level statistical yearbooks. Digital inclusive finance figures come from the Peking University Digital Inclusive Finance Index published by the Institute of Digital Finance at Peking University. All price-related variables are deflated to 2011 constant prices so as to remove the confounding influence of price changes.

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# 4. Empirical Findings and Discussion

## 4.1. Descriptive Statistics

Table 4 presents the summary statistics for the key variables. Since the core explanatory variable is the one-period lagged inclusive growth, the effective sample after constructing the lag term is 403 observations. As indicated by the estimates, the average values of agricultural industry chain and supply chain resilience and inclusive growth are 0.1495 and 0.2772, respectively, with standard deviations of 0.0735 and 0.0867, indicating that there are certain regional differences in the two core variables across provinces. Among the control variables, each variable exhibits varying degrees of regional differences, providing the necessary sample variation basis for subsequent empirical analysis.

**Table 4.** Descriptive Statistics Results

| Variable Symbol | N | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Res | 403 | 0.1495 | 0.0735 | 0.0451 | 0.4012 |
| L.Inc | 403 | 0.2772 | 0.0867 | 0.1175 | 0.5966 |
| Fis | 403 | 0.5294 | 0.1941 | 0.0686 | 0.9307 |
| Scale | 403 | 1058.9620 | 1208.7391 | 19.1855 | 6683.2286 |
| Open | 403 | 0.2609 | 0.2667 | 0.0076 | 1.4123 |
| Urban | 403 | 0.6082 | 0.1254 | 0.2286 | 0.8958 |
| Green | 403 | 7374.7469 | 10000.8500 | 6.0000 | 56200.0000 |

Note: N is the effective number of observations after constructing the one-period lag of inclusive growth; standard deviation is sample standard deviation.

## 4.2. Spatiotemporal Analysis

### 4.2.1. Agricultural Industry Chain and Supply Chain Resilience

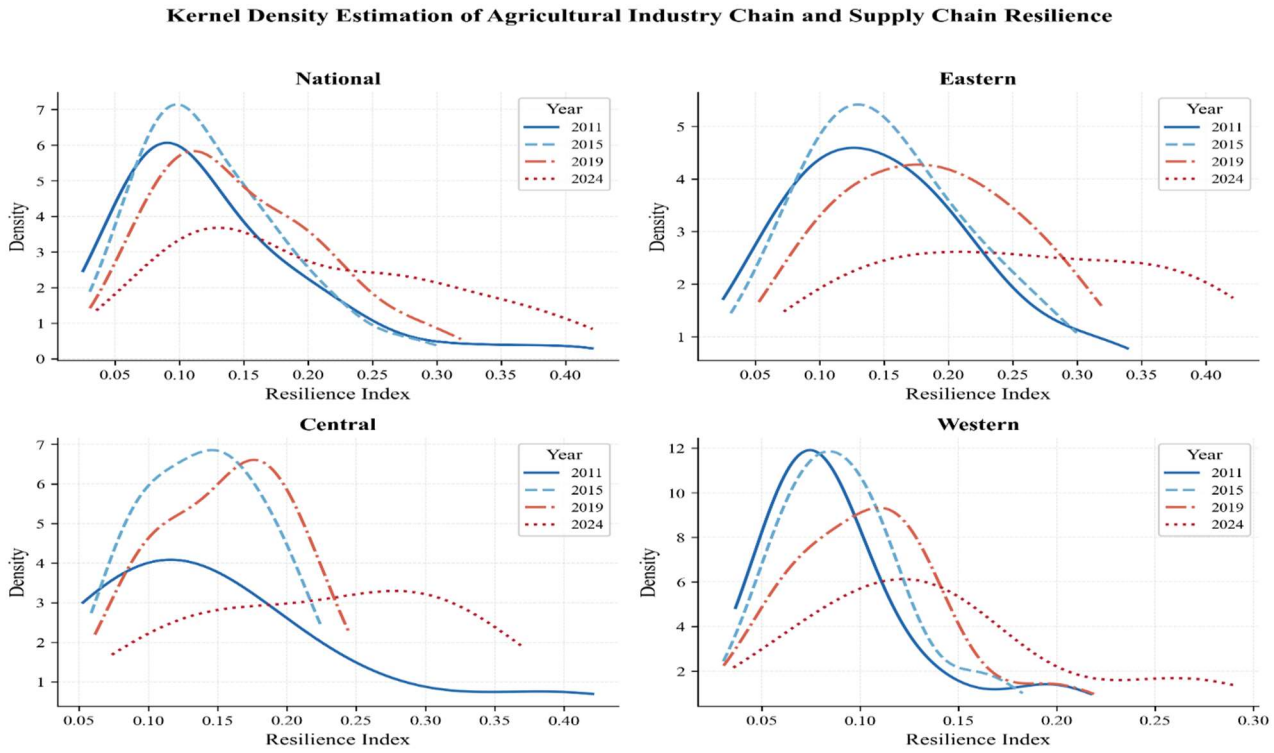



**Figure 1**. Spatiotemporal Evolution of Agricultural Industry Chain and Supply Chain Resilience

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Figure 1 presents the kernel density estimation of agricultural industry chain and supply chain resilience from 2011 to 2024. Nationally, the distribution curve shifts steadily rightward with a declining peak and widening dispersion, indicating overall resilience improvement alongside growing inter-provincial disparities. Regionally, the eastern region maintains the highest level with the longest right tail, the central region shows accelerated catching-up with emerging bimodality, and the western region remains lowest but exhibits initial convergence signs.

### 4.2.2. Inclusive Growth Level

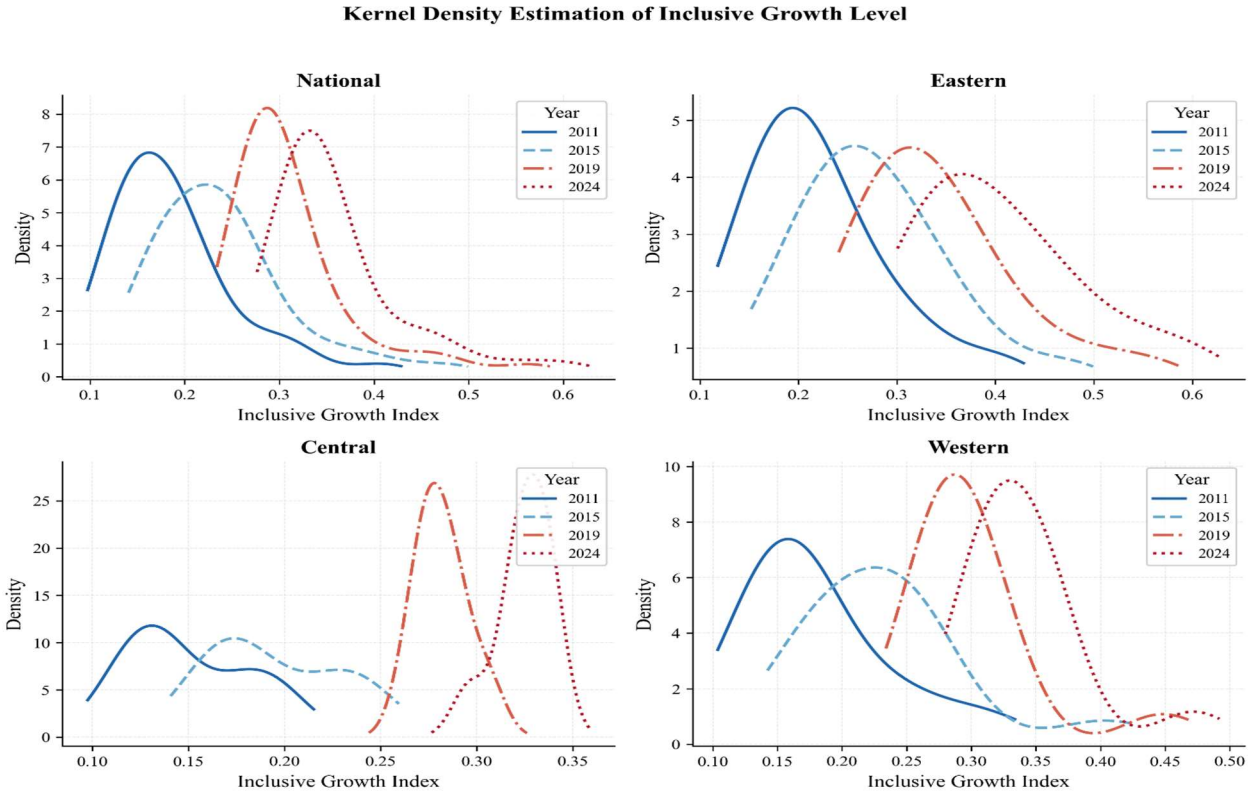



**Figure 2.** Spatiotemporal Evolution of Inclusive Growth Level

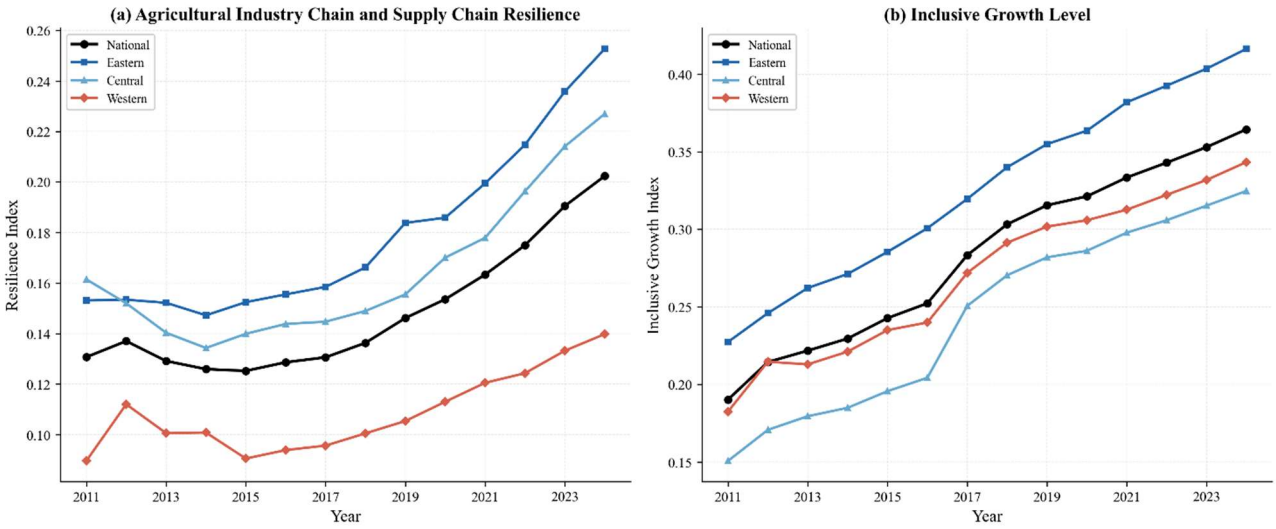



**Figure 3.** Growth Trends of Agricultural Industry Chain Supply Chain and Inclusive Growth Level

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Figure 2 shows that inclusive growth also shifts rightward nationally but with greater distributional concentration and higher peaks, suggesting stronger regional convergence than resilience. The eastern region leads consistently, while the central region demonstrates the most pronounced catching-up momentum.

Figure 3 further confirms that both indicators exhibit synchronized upward trends over the sample period. Resilience displays a clear pattern of "eastern leading, central catching up, western lagging," whereas inclusive growth shows relatively smaller regional gaps with more evident convergence.

## 4.3. Benchmark Regression

Table 5 shows the baseline regression results of inclusive growth affecting the resilience of the agricultural industry chain supply chain. Among them, column (1) is the regression result without adding control variables, and column (2) is the result of adding all control variables. Under the two settings, the coefficients of one-period lagged inclusive growth are positive and statistically significant at the 5 % level. After adding control variables, the coefficient decreases slightly but is still significant at the 5 % level, indicating that inclusive growth can significantly improve the resilience of the agricultural industry chain supply chain, providing empirical support for hypothesis 1. From the perspective of control variables, the coefficient of the number of green patents was significantly negative at the 10 % level, and the remaining control variables did not pass the significance test, which may be related to the fact that the two-way fixed effect model absorbed most of the inter-group variation.

**Table 5.** Benchmark regression results table

| Variable | (1) | (2) |
|---|---|---|
| L.Inc | 0.528*** | 0.500** |
| | (0.215) | (0.211) |
| Fis | | -0.054 |
| | | (0.114) |
| Ln Scale | | 0.003 |
| | | (0.007) |
| Open | | 0.006 |
| | | (0.006) |
| Urban | | -0.242 |
| | | (0.278) |
| Ln Green | | -0.025* |
| | | (0.014) |
| Constant | -0.011 | 0.366 |
| | (0.066) | (0.225) |
| Province FE | Yes | Yes |
| Year FE | Yes | Yes |
| Observations N | 403 | 403 |
| Within $R^2$ | 0.322 | 0.266 |

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

## 4.4. Endogeneity Checks

Considering that there may be a reverse causal relationship between inclusive growth and the resilience of the agricultural industry chain supply chain, this paper selects the second-order lag term of inclusive growth as the instrumental variable, and further introduces the Bartik

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instrumental variable for expansion test. Specifically, the level of inclusive growth in the early stage is highly correlated with the inclusive growth in the current period, which meets the correlation requirements of instrumental variables ; the second-order lag term has a weak direct impact on the resilience of the current agricultural industry chain, mainly through the current inclusive growth to meet the exclusive constraints.

The regression results are shown in Table 6. In the OLS benchmark regression, due to the limitation of the availability of instrumental variable data, the sample size is 372, and the coefficient of one-period lag of inclusive growth is 0.501, which is significant at the 1 % level. The estimated coefficients of 2SLS using L2.Inc and L2.Inc + Bartik as instrumental variables are 1.016 and 0.995, respectively, and the estimated coefficient of IVGMM is 0.969, both of which are significant at the 1 % level. The first-stage F statistics are 180.32 and 93.97, both of which well exceed the empirical threshold of 10, suggesting that weak-instrument concerns are absent. This shows that after controlling endogeneity, the promotion effect of inclusive growth on the resilience of agricultural industry chain supply chain is still robust, and Hypothesis 1 is further verified.

**Table 6**. Endogeneity Test Results

| Variable | OLS Baseline | 2SLS: L2.X | 2SLS: L2.X+Bartik | IVGMM: L2.X+Bartik |
|---|---|---|---|---|
| L.Inc | 0.501*** | 1.016*** | 0.995*** | 0.969*** |
| | (0.177) | (0.374) | (0.371) | (0.369) |
| Fis | -0.066 | -0.054 | -0.055 | -0.060 |
| | (0.109) | (0.112) | (0.112) | (0.110) |
| Ln Scale | 0.002 | 0.005 | 0.005 | 0.005 |
| | (0.007) | (0.008) | (0.008) | (0.007) |
| Open | 0.006 | 0.004 | 0.004 | 0.004 |
| | (0.005) | (0.006) | (0.006) | (0.006) |
| Urban | -0.309 | -0.269 | -0.271 | -0.283 |
| | (0.241) | (0.194) | (0.195) | (0.191) |
| Ln Green | -0.017 | -0.011 | -0.011 | -0.012 |
| | (0.013) | (0.011) | (0.011) | (0.010) |
| Constant | 0.359* | 0.135 | 0.146 | 0.170 |
| | (0.204) | (0.229) | (0.223) | (0.214) |
| Instrumental Variable | — | L2.IG | L2.X + Bartik | L2.X + Bartik |
| First-Stage F Statistic | — | 180.32 | 93.97 | 93.97 |
| Province FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations N | 372 | 372 | 372 | 372 |
| Within $R^2$ | 0.285 | — | — | — |

## 4.5. Robustness Test

To verify the reliability of the findings, the present study carries out robustness checks across three dimensions: estimation standard errors, lag periods, and variable measurement. FFirst, Driscoll-Kraay standard errors are substituted for province-clustered robust standard errors so as to account for both cross-sectional dependence and serial correlation; the core coefficient continues to be significantly positive; second, the core explanatory variable is replaced with a two-period lag, and the coefficient increases and is significant at the 1% level; third, only the entropy weight method is used to recalculate agricultural industry chain and supply chain resilience as the dependent variable, and the core coefficient is significant at the 5% level. All

three robustness tests support the positive driving effect of inclusive growth on agricultural industry chain and supply chain resilience.

**Table 7.** Robustness Test Results

| | (1) Baseline Regression | (2) Driscoll-Kraay | (3) Two-Period Lag | (4) Entropy Weight Recalculation |
|---|---|---|---|---|
| L.Inc | 0.4994** | 0.4994*** | 0.6063*** | 0.2667** |
| | (0.2110) | (0.1923) | (0.2246) | (0.1200) |
| Control Variables | Yes | Yes | Yes | Yes |
| Province FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations N | 403 | 403 | 372 | 403 |
| $R^2$ | 0.154 | 0.154 | 0.217 | 0.144 |

## 4.6. Mediation Effect Test

In order to test whether inclusive growth indirectly improves the resilience of agricultural industrial chain supply chain by promoting the development of agricultural socialized services, this paper uses stepwise regression method to test the mediating effect, and the results are shown in table 8. Column ( 1 ) is the benchmark regression, and the total effect is significant at the 5 % level. In Column ( 2 ), the estimated coefficient of inclusive growth on agricultural socialized services is significant at the 1 % level, and the path a is established. After both are included in Column ( 3 ), the coefficient of agricultural socialized services is significantly positive at the 1 % level, and path b is established. The coefficient of inclusive growth has decreased and the significance level has decreased, which is in line with the characteristics of partial mediation.

The mediation effect decomposition shows that the Sobel test of the indirect effect is significant at the 5% level, and the 95% confidence interval obtained by province-cluster Bootstrap does not contain 0, further confirming the robust existence of the mediation effect. The intermediary effect accounts for about 1/3 of the total effect, indicating that about 1/3 of the driving effect of inclusive growth on the elasticity of the agricultural industry chain and supply chain is achieved through the path of promoting the development of agricultural social services. Hypothesis 2 is verified.

**Table 8.** Mediation Effect Test Results

| Variable | (1) Res | (2) Serv | (3) Res |
|---|---|---|---|
| L.Inc | 0.4994** | 0.3208*** | 0.3370* |
| | (0.2142) | (0.0938) | (0.2036) |
| Serv | | | 0.5059*** |
| | | | (0.1953) |
| Control Variables | Yes | Yes | Yes |
| Province FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| Observations N | 403 | 403 | 403 |
| $R^2$ | 0.8696 | 0.8272 | 0.8836 |
| Indirect Effect a×b | 0.1623** | | |
| Sobel Z (p-value) | 2.065 (0.0389) | | |
| Bootstrap 95% CI | [0.0306, 0.3701] | | |
| Mediation Effect Proportion | 32.51% | | |

Note: Bootstrap uses 2000 province-cluster resamples.

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Finally, in order to ensure the reliability of the intermediary path identification, this paper conducts a robustness test from six dimensions : First, the intermediary variable is replaced with a lag period to alleviate the simultaneous concerns ; second, do not shrink the tail processing, the use of the original data ; the third is to eliminate the samples of Beijing, Tianjin, Shanghai and Chongqing ; the fourth is to eliminate the most concentrated samples in 2020 impacted by the new coronavirus epidemic ; the fifth is to replace the core explanatory variables with the inclusive growth lag phase II ; the sixth is to use the Newey-West standard to mishandle sequence correlation. The results show that the path coefficient a is always significantly positive at the 1 % level, and the path coefficient b is always significantly positive at least at the 5 % level. The intermediary path has not changed substantially under various settings, indicating that the transmission mechanism of "inclusive growth→agricultural socialized service →agricultural industrial chain supply chain resilience " has strong robustness.

**Table 9.** Robustness Test of Mediation Pathway

| Test Method | a-path (Serv~L.Inc) | b-path (Res~Serv) |
|---|---|---|
| Mediating Variable Lagged One Period | 0.3327*** (0.0008) | 0.5647*** (0.0043) |
| No Winsorization | 0.3206*** (0.0006) | 0.4859** (0.0126) |
| Excluding Four Municipalities | 0.2493*** (0.0055) | 0.4435** (0.0347) |
| Excluding 2020 COVID-19 Shock | 0.3265*** (0.0005) | 0.5326** (0.0113) |
| Explanatory Variable Lagged Two Periods | 0.3004*** (0.0055) | 0.4803*** (0.0013) |
| Newey-West Standard Errors | 0.3208*** | 0.5059*** |

## 4.7. Heterogeneity Analysis Results

### 4.7.1. Digital Inclusive Finance Heterogeneity

Given that the Digital Inclusive Finance Index's latest update covers 2023 and that the effect of digital financial services on agricultural industrial chains operates with a lag, the one-period lagged value is used in the empirical analysis, with data sourced from the Peking University Digital Inclusive Finance Index (2011–2023). Observations are subsequently split into "high-digital-inclusive-finance" and "low-digital-inclusive-finance" subgroups according to the annual median of this index. Columns (1) and (2) in Table 10 present the heterogeneity test results for digital inclusive finance. The findings indicate that, in regions where digital inclusive finance is less developed, inclusive growth exerts a significant positive effect on agricultural industrial and supply chain resilience, whereas in regions with more advanced digital inclusive finance, the effect of inclusive growth proves insignificant. This indicates that the promoting effect of inclusive growth on agricultural industry chain and supply chain resilience mainly exists in regions with lower levels of digital inclusive finance development, while in regions with higher levels of digital inclusive finance development, the technological empowerment of digital finance has already played a substitution role, weakening the marginal effect of inclusive growth's institutional empowerment.

### 4.7.2. Regional Heterogeneity

This paper divides the sample into eastern, central, and western groups according to National Bureau of Statistics standards. Columns (3) to (5) of Table 10 report the regional heterogeneity test results. The results show that in the central region, the promoting effect of inclusive growth on agricultural industry chain and supply chain resilience is the most significant, followed by the western region, while in the eastern region, the impact of inclusive growth is not significant. This indicates that the promoting effect of inclusive growth on agricultural industry chain and supply chain resilience is significant in central and western regions, with the strongest effect in the central region, but not significant in the eastern region. A possible reason is that agricultural industry chains in the eastern region are already relatively complete, leaving limited marginal

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room for improvement through inclusive growth; while in central and western regions with relatively weak agricultural foundations, the marginal enhancement effect of inclusive growth on agricultural industry chain resilience through improving basic conditions and factor allocation is greater.

In general, the heterogeneity analysis shows that the promotion effect of inclusive growth on the resilience of agricultural industry chain supply chain has obvious heterogeneity : it is more significant in regions with low level of digital inclusive financial development and central and western regions, while it is not significant in regions with high level of digital inclusive financial development and eastern regions, indicating that there is a certain substitution effect between the institutional empowerment of inclusive growth and the technical empowerment of digital finance.

**Table 10.** Heterogeneity Analysis

| Variable | Low Digital Inclusive Finance | High Digital Inclusive Finance | Eastern | Central | Western |
|---|---|---|---|---|---|
| L.Inc | 0.6858*** (0.2543) | 0.2742 (0.2533) | 0.1072 (0.3208) | 1.0373*** (0.3012) | 0.5737* (0.3072) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Province FE | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| N | 195 | 208 | 143 | 104 | 156 |
| $R^2$ | 0.3341 | 0.1597 | 0.2853 | 0.2772 | 0.2822 |

# 5. Conclusion and Implications

## 5.1. Main Conclusion

Drawing on provincial-level panel data from China over 2011–2024, the present study examines how inclusive growth affects agricultural industrial and supply chain resilience, together with its underlying mechanism. The key findings are as follows: (1) On the whole, inclusive growth exerts a significant positive effect on agricultural industrial and supply chain resilience, and has emerged as a key driver for safeguarding the security of China's agricultural industrial and supply chains and for elevating the resilience level of these chains. After considering endogeneity and robustness tests, this conclusion still holds, and heterogeneity analysis finds that the impact of inclusive growth on agricultural industry chain and supply chain resilience exhibits significant heterogeneity. (2) The mediation analysis indicates that, beyond its direct effect, inclusive growth also exerts a positive influence on the resilience of agricultural industrial and supply chains through fostering the expansion of agricultural socialization services, with such services serving as a partial mediator. ( 3 ) The results of heterogeneity analysis show that there are significant regional and digital financial differences in the impact of inclusive growth on the resilience of agricultural industry chain supply chain, which is more significant in regions with low level of digital inclusive finance and central and western regions, but not in regions with high level of digital inclusive finance and eastern regions, indicating that there is a certain substitution effect between the institutional empowerment of inclusive growth and the technical empowerment of digital finance.

## 5.2. Policy implications

Based on the above conclusions, this paper puts forward the following policy recommendations :

(1) Continue to promote inclusive growth and consolidate the support system of the supply chain resilience of the agricultural industry chain. First, we must increase the central

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government 's transfer payments to rural areas in the central and western regions, focus on basic public services such as rural education, medical care, and old-age care, narrow the gap between urban and rural public services, and consolidate the social foundation of the resilience of the agricultural industry chain. Second, we should establish a linkage mechanism for the simultaneous growth of farmers ' income and economic growth. By improving the price formation mechanism of agricultural products, expanding the coverage of agricultural insurance, and broadening the channels of farmers ' property income, we should continuously improve the income level of rural residents and enhance the ability of agricultural business entities to resist risks. Third, in view of the regional heterogeneity of inclusive growth effect, we should implement the " short board " inclusive growth policy in the central and western regions, focusing on improving rural infrastructure and factor market environment. In the eastern region, it explores the inclusive growth path of ' quality improvement ' and promotes the extension of the agricultural industry chain to the high end of the value chain.

(2) Focus on the development of agricultural socialization services, and promote inclusive growth to empower the resilience of the agricultural industry chain supply chain. First, financially, it is necessary to support the agricultural socialized service organization. We can make good use of these policy tools such as service subsidies, tax relief, and agricultural machinery purchase subsidies to support a number of professional and large-scale service entities-whether it is agricultural machinery operations, pest control, or warehousing and logistics, they must be able to make the service supply more sufficient. Second, to set up a regional agricultural social service platform. The scattered service resources are brought together, the service standards are unified, and the service information is released in time. When small farmers find services, they spend less money on searching and trading, and the service scale operation is also pushed away.Third, innovate the "inclusive growth + socialization services" linkage mechanism, encouraging local governments to coordinate planning and co-construction and sharing of rural public service facilities and agricultural socialization service outlets, so that infrastructure improvements brought by inclusive growth are directly transformed into service supply capacity, effectivelyexerting the mediating role of agricultural socialization services in resilience enhancement.

(3) Break through the constraints of digital inclusive finance and regional development, and stimulate the momentum for improving agricultural industry chain and supply chain resilience. First, in central and western rural areas with low digital inclusive finance levels, accelerate the construction of digital infrastructure such as 5G base stations and fiber-optic networks, reduce the operating costs of digital services for financial institutions, and promote the downward penetration of digital financial products such as mobile payments, online credit, and agricultural insurance, forming a synergistic empowerment effect with inclusive growth. Second, establish an east-central-west agricultural industry chain collaboration mechanism, encouraging agricultural leading enterprises and service organizations in eastern regions to carry out cross-regional cooperation with central and western regions through technology output, brand sharing, and channel co-construction, driving the upgrading of agricultural industry chains in central and western regions. Third, implement differentiated resilience enhancement policies for major grain-producing areas and ecologically fragile areas: major grain-producing areas should focus on enhancing resistance and recovery capacities, while ecologically fragile areas should focus on cultivating transformation capacity and industrial transformation momentum.

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