Can the development of advantageous and characteristic industry clusters narrow the urban-rural income gap? Evidence from China

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Abstract

Purpose – The clustered development of advantageous characteristic industries is crucial for narrowing the urban-rural income gap and achieving common prosperity. This study investigates the impact of the development of advantageous characteristic industrial clusters on the urban-rural income gap from a whole-industry-chain perspective, and comparing differential effects across high-value agricultural product clusters versus grain crop clusters, eastern versus central-western regions, and areas with higher versus lower financial development levels.

Design/methodology/approach – Based on county-level panel data covering 1287 Chinese counties (cities/districts) from 2012 to 2022, and using China's Advantageous Characteristic Industrial Clusters Development Policy as a quasi-natural experiment, this study utilizes a multi-period difference-in-differences (DID) method to examine its effect on urban-rural income gap.

Findings – The results show that the development of advantageous characteristic industrial clusters significantly narrows the urban-rural income gap, and enhancing agricultural technological level, extending and expanding industrial chains, cultivating agricultural product brands are important mechanisms. Furthermore, compared to high-value agricultural product clusters, central-western regions, and areas with relatively underdeveloped financial level, the mitigating effect on urban-rural income gap is more pronounced in grain crop clusters, eastern regions, and areas with more developed financial level.

Originality/value – This study constructs a large-sample county dataset based on manually compiled list of counties covered by China's Advantageous Characteristic Industrial Clusters Development Policy, providing the first evaluates the impact of agro-clusters policy implementation on the urban-rural income gap. The research findings can provide insights for policymaking intended to develop advantageous characteristic industrial clusters in line with local conditions and narrow the urban-rural income gap.

Keywords: advantageous characteristic industrial clusters; urban-rural income gap; whole industrial chain; high-value agricultural product clusters; grain crop clusters

Study type Research study

1. Introduction

Achieving common prosperity for all citizens is an essential requirement of socialism and one of the defining features of Chinese-style modernization. To advance common prosperity on the path of Chinese-style modernization, it is imperative to eliminate polarization and address income inequality between urban and rural areas (Wan and John, 2023). According to the National Bureau

of Statistics of China, while the ratio of urban-rural income disparity narrowed from 2.75 in 2014 to 2.34 in 2024, the absolute income gap widened from 18,355 yuan to 31,069 yuan during the same period, and the "pyramid-shaped" income distribution structure remains fundamentally unchanged (Li and Luo, 2010). Effectively increasing rural incomes and narrowing the urban-rural income gap have become the primary tasks in promoting common prosperity in China at this stage.

The agro-clusters development strategy is widely regarded as a critical initiative for narrowing the urban-rural income gap and achieving common prosperity (Otsuka and Mubarik, 2020; Dureti et al., 2023). Many developing countries, particularly China, are cultivating agro-clusters as a pivotal measure to integrate into global agricultural value chains and establish modern agricultural industrial systems (Wardhana et al., 2017). In 2020, China's Ministry of Agriculture and Rural Affairs and the Ministry of Finance jointly issued the Notice on Launching the Development of Advantageous Characteristic Industrial Clusters [1], which aims to transform rural characteristic resources into economic advantages through agro-clusters development. Theoretically, advantageous characteristic industrial clusters regarded as a "new tool" to strengthen modern agricultural competitiveness and innovation-hold greater potential for creating employment opportunities and improving income levels for smallholder farmers and rural migrant workers (Otsuka and Mubarik, 2020; Tabe-Ojong et al., 2023). However, in practice, whether these clusters can effectively drive farmer income growth and subsequently narrow urban-rural income gap remains underexplored, particularly through large-sample quantitative studies. If these clusters indeed contribute to narrowing the income gap, what are the underlying mechanisms? Furthermore, do their effects vary across regions and between high-value agricultural clusters and grain crop clusters? Against the backdrop of China's vigorous promotion of rural characteristic industries and rural industrial revitalization, addressing these questions holds significant practical relevance for steadily advancing common prosperity and ensuring inclusive development outcomes.

Existing literature has extensively discussed the relationship between agro-clusters, economic development, and income growth. Studies indicate that agricultural clusters can improve smallholder economic integration and commercialization in many developing countries, as they are a suitable avenue for implementing development projects, disseminating extension services, connecting farmers to input and output markets and providing farmers with access to capacity building and innovations (Joffre et al., 2019; Dureti et al., 2023). agro-clusters are defined as a concentration of agricultural activities creating income and employment opportunities in and around a particular region (Galvez-Nogales and Webber, 2017). They can be effective in linking smallholder farmers to emerging food value chains and markets, enhancing their incomes, reducing the incidence of poverty, and promoting sustainable rural development (Wardhana et al., 2017; Tabe-Ojong et al., 2023). such as, Zhang and Hu (2014) show the success of a potato agro-cluster in boosting potato production and fostering rural development in China. In northern Thailand, clusters of high-value agricultural products have proven to be an effective means of enhancing market competitiveness and provides additional income for farmers in remote areas (Khunthonthong, 2013).

While The aforementioned literature provides valuable references for this study, there remains scope for further expansion. On one hand, existing research has confirmed that agro-clusters can drive employment growth and agricultural development, serving as an effective approach for farmers to escape poverty and achieve development (Wardhana et al., 2017; Tabe-Ojong et al., 2023; Dureti et al., 2023). However, they offer limited insight into how advantageous characteristic industrial clusters narrow the urban-rural income gap to facilitate the transition from income growth

to shared prosperity. On the other hand, current studies on agro-clusters predominantly rely on theoretical analyses and case study summaries (Khunthonthong, 2013; Joffre et al., 2019), lacking quantitative analyses based on large-sample data. Although a few studies have quantitatively identified the income-enhancing effects of agro-clusters (Zhang and Hu, 2014), their focus is often confined to single clusters in specific regions, resulting in conclusions that lack generalizability and fail to provide generalizable insights into the income effects of agro-clusters.

Based on county-level panel data covering 1287 Chinese counties (cities/districts) from 2012 to 2022, and using China's Advantageous Characteristic Industrial Clusters Development Policy as a quasi-natural experiment, this study utilizes a multi-period difference-in-differences (DID) method to examine its effect on urban-rural income gaps from the perspective of the whole-industry-chain, and further investigate the underlying mechanisms and heterogeneity effects. Compared to existing studies, the marginal contributions of this study are as follows: First, we manually compile a comprehensive list of counties covered by China's Advantageous Characteristic Industrial Clusters Development, constructing a large-scale county-level dataset, and for the first time evaluates the impact of implementing the "China's advantageous characteristic industrial clusters " agro-clusters policy on the urban-rural income gap. Through rigorous causal identification strategies and extensive robustness checks, we provide scientifically reliable evidence for the role of advantageous characteristic industrial clusters in narrowing the urban-rural income gap. Second, while existing literature primarily discusses the farmer-benefiting effects of agro-clusters from agricultural development and employment perspectives, we further expand the research on these effects by examining the urban-rural income gap perspective. Third, based on the perspective of the entire agricultural industrial chain, this study investigates the mechanisms through which the development of advantageous characteristic industrial clusters affects the urban-rural income gap from three aspects: agricultural technology level, industrial chain extension and expansion, and the cultivation of agricultural product brands. Furthermore, it conducts a heterogeneity analysis from three dimensions: cluster type, geographical location, and financial development level, offering practical insights and theoretical references for local governments to develop rural characteristic industries, build characteristic industrial clusters tailored to local conditions, narrow the urban-rural income gap, and achieve common prosperity.

2. Institutional background and theoretical hypothesis

2.1 Development of advantageous characteristic industrial clusters

China has long accumulated numerous unique industrial resources in agriculture, leveraging its abundant natural resources and profound agrarian heritage. The country boasts a diverse array of distinctive agricultural products with significant regional advantages. however, from an industrial layout perspective, China's agriculture, though widely distributed, generally exhibits characteristics of being "small-scale, fragmented, and weak." Many distinctive agricultural products suffer from limited production scale and insufficient market competitiveness, making it difficult to form industrial agglomeration effects. On March 11, 2020, China's Ministry of Agriculture and Rural Affairs, in conjunction with the Ministry of Finance, issued the "Notice on Developing Advantageous and Characteristic Industrial Clusters," formally launching the creation of national-level advantageous and characteristic industrial clusters. Since May 15, 2020, following applications from provinces (autonomous regions, municipalities) and subsequent review by the Ministry of Agriculture and Rural Affairs and the Ministry of Finance, the approval was granted to

construct 50 competitive and distinctive industrial clusters. Additional clusters have been established annually since then, expanding to a total of 220 by 2024[2]. These clusters now cover all 31 provincial-level regions of China and the Xinjiang Production and Construction Corps.

In terms of industrial selection, the initial phase of creating advantageous and characteristic industrial clusters primarily focused on high-value agricultural products such as livestock and poultry, fruits, and medicinal herbs. Subsequently, the scope expanded to include grain crops like rice, soybeans, and wheat. regarding development requirements, the policy for building these clusters mainly supports key provincial-level industries with strong foundations, large scale, distinctive features, and significant comparative advantages. These industries must achieve a total output value exceeding 5 billion yuan across the entire industrial chain and must have initially formed a concentrated and contiguous development pattern with substantial growth potential. The key construction measures emphasize coordinated efforts in establishing standardized production bases, developing agricultural product processing and marketing, improving agricultural industrial operation systems, strengthening the aggregation of advanced production factors, and establishing sound benefit-sharing mechanisms. Guided by the approach of whole industrial chain development and whole value chain enhancement, this initiative aims to create agro-clusters characterized by rational structures, complete industrial chains, high agglomeration levels, and strong competitiveness.

2.2 Theoretical hypothesis

For a long time, socio-economic systems oriented towards urban development needs have led to a widening urban-rural income gap in China (Yang, 1999). Consequently, the current focus of achieving common prosperity in China lies in expanding income channels for rural residents and accelerating the growth of their income (Wan and John, 2023). In reality, however, rural residents' income lags significantly behind that of urban residents due to factors such as short industrial chains and low agricultural efficiency (Chen and Ma, 2022). Advantageous and characteristic industrial clusters serve as new vehicles for agricultural transformation and industrial convergence, adhering in policy formulation to the fundamental principles of whole-industry-chain construction and promoting the integrated development of production, processing, and sales. Their development goal is to transform competitive and characteristic industries into major industries that drive sustained income growth for farmers. Therefore, this study examines the intrinsic mechanisms through which the development of advantageous and characteristic industrial clusters affects the urban-rural income gap. It conducts a comprehensive and in-depth analysis focusing on three critical aspects of agricultural industry chain development: agricultural technology level, industrial chain extension and expansion, and agricultural product brand cultivation.

2.2.1 Agricultural technology level. Industrial cluster theory posits that clusters facilitate the flow of knowledge and technology, and enhance agricultural technological levels (Luciana et al., 2012). In local agricultural development, agro-clusters are recognized as regions with the most intensive technological advancement and diffusion (Zeng et al., 2019). first, cluster development promotes the scaling up of regional agricultural production, creating operational space for large-scale, efficient agricultural machinery such as combine harvesters, smart irrigation systems, and drone-based crop protection. The adoption of automation technologies, epitomized by agricultural mechanization, substitutes for simple manual labor, reducing production costs and enhancing agricultural efficiency (Wardhana et al., 2017; He et al., 2020). This shift also facilitates the release of rural surplus labor, encouraging farmers to transition into secondary and tertiary industries to

secure higher wage incomes (Guo et al., 2022; Tabe-Ojong et al., 2023). Secondly, the policy for advantageous characteristic industrial clusters specifically emphasizes "strengthening ties with scientific research institutions, establishing expert teams for advantageous characteristic industrial clusters, accelerating the promotion of integrated technologies, and elevating production technology and equipment standards." Clusters attract substantial capital, skilled professionals, and advanced equipment to converge within specific industries, contributing to increased agricultural output and farmers' operational incomes (Khunthonthong et al., 2013). Third, from the perspective of knowledge spillovers and learning effects, the geographical proximity of farmers, cooperatives, agricultural enterprises, and research institutions within clusters facilitates the rapid dissemination of experiential technologies, such as soil improvement and pest control, through field demonstrations and technical training (Chatterjee and Anand, 2016; Ng et al., 2017). Moreover, leading enterprises, demonstration bases, and cooperatives can serve as "showcases" and "testing grounds" for new technologies, enabling surrounding businesses and farmers to translate innovations into productivity through learning-by-doing (Joffre et al., 2019), thereby enhancing agricultural output and quality, boosting farmers' incomes, and narrowing the urban-rural income gap.

2.2.2 Extension and expansion of industrial chains. The development of advantageous characteristic industrial clusters facilitates the extension and expansion of industrial chains (Hui et al., 2022). On one hand, a key objective of cluster development is to "drive the processing and circulation segments of advantageous and characteristic industries down to rural areas, ensuring that value-added benefits from these segments are retained within rural communities." Consequently, cluster development explicitly mandates the vigorous development of processing and marketing for competitive and characteristic agricultural products, supporting primary processing activities such as storage, freshness preservation, drying, grading, and packaging. It also encourages leading enterprises to engage in intensive processing of agricultural products, promoting comprehensive development and utilization, thereby extending industrial chains and enhancing added value. On the other hand, cluster development guides and promotes the aggregation of capital, technology, talent, land, and other factors into industrial clusters (Qie et al., 2023), providing crucial support for transitioning characteristic agriculture from pure production to integrated development spanning processing, distribution, and services across the entire industrial chain (Poulton et al., 2010). Additionally, cluster development helps attract and catalyze numerous related industries, such as warehousing and logistics, packaging and printing, and leisure tourism, to achieve the expansion of agricultural functions (Zeleke and Wordofa, 2024).

Narrowing the urban-rural income gap requires not only increasing the absolute income of rural residents but, more importantly, improving their relative income (Molero-Simarro, 2017). The extension of industrial chains through the development of advantageous characteristic industrial clusters enables farmers participating in these chains to secure incomes not only from the production phase but also from value-added benefits derived from processing, circulation, and sales (Zeleke and Wordofa, 2024). Specifically, in terms of employment opportunities, the development of advantageous characteristic industrial clusters emphasizes the enhancement of product added value through intensive processing, attracting numerous high-quality processing enterprises (Briones, 2015; Otsuka and Mubarik, 2020). This influx creates abundant local employment opportunities for rural residents, fostering income growth through employment that allows them to remain in their hometowns. From the perspective of income diversification, the extension and expansion of the

industrial chain redirect farmers' attention from traditional agricultural production to obtaining operational income from auxiliary or service industries such as agricultural input services, logistics and transportation, agricultural e-commerce, and rural tourism (Zeleke and Wordofa, 2024). Consequently, the diversified production and operational activities stemming from industrial chain extension and expansion not only optimize farmers' income structures but also facilitate a rapid rise in their earnings.

2.2.3 Cultivating agricultural product brands. The development of advantageous characteristic industrial clusters is conducive to developing agricultural product brands. Firstly, these clusters are inherently established around regional characteristic industries with competitive advantages, naturally carrying distinct geographical labels. Leveraging the unique regional culture and product characteristics of these clusters enables the creation of a differentiated brand image (Frick and Simmons, 2013), forming the core asset of the regional agricultural product brand. Secondly, advantageous characteristic industrial clusters are typically promoted by industry associations or leading entities to establish unified production technical regulations, product quality standards, grading standards, and packaging specifications, ensuring consistent quality of agricultural products within the region (Otsuka and Mubarik, 2020), and serving as a crucial guarantee for brand reputation. Furthermore, these clusters aggregate numerous enterprises of the same type or from upstream and downstream sectors of the industrial chain, generating scale effects (Briones, 2015) that reduce the barriers and costs for individual participants. particularly smallholder farmers and medium-sized enterprises to participate in brand building. The policy of advantageous characteristic industrial clusters places particular emphasis on agricultural brand cultivation, aiming to leverage the scale, standardized production, and distinctive advantages of these clusters to nurture agricultural product brands, establish efficient marketing systems, and ensure value appreciation for the industry and income growth for farmers.

Developing agricultural product brands can effectively increase farmers' income and narrow the urban-rural income gap. On one hand, brand-building initiatives are market-oriented, guiding farmers to shift from quantity-driven to quality-oriented production (Rathee et al., 2023). This encourages them to produce high-quality, distinctive products that meet market demands, such as green, organic, and Geographical Indication (GI) products, enhancing the competitiveness of agricultural products in the sales market and ensuring stable growth in farmers' income. on the other hand, agricultural product branding serves as a critical tool to break homogeneous competition and achieve price premiums (Neeman et al., 2019). Specifically, brands built on advantageous and characteristic industries embody unique quality attributes and regional cultural connotations, giving them a price advantage over ordinary agricultural products. Leveraging brand equity, these products can enhance consumers' willingness to pay premium prices (Castriota and Delmastro, 2015), allowing farmers to capture greater value through brand appreciation and elevate their income levels. Additionally, branding enhances product visibility and expands sales channels, facilitating access to large supermarkets, high-end fresh food e-commerce platforms, and even international export markets (Menapace and Moschini, 2012). Furthermore, agricultural product brands enable farmers to utilize emerging channels, such as live-streaming e-commerce and community marketing, to connect directly with consumers, reducing intermediaries and securing higher profit margins.

Based on this, this study proposes the following research hypotheses:

Hypothesis 1 (H1): The development of advantageous and characteristic industrial clusters can narrow the urban-rural income gap.

Hypothesis 2 (H2): The development of advantageous and characteristic industrial clusters narrows the urban-rural income gap through enhancing agricultural technological level, extending and expanding the industrial chain, and cultivating agricultural product brands.

3. Data, variable and methodology

3.1 Data source

This study investigates the impact and mechanism of advantageous characteristic industrial cluster development on the urban-rural income gap using a balanced panel dataset across 1,287 Chinese counties (cities/districts) from 2014 to 2022. The data utilized in this study primarily originate from three sources: First, Research Group-Curated Data. The research team manually compiled information on China's advantageous and characteristic industrial clusters by referencing the lists publicly released by the Ministry of Agriculture and Rural Affairs in May 2020, April 2021, and April 2022. This involved manually searching official websites of provincial governments and departments of agriculture and rural affairs to identify county-level coverage of nationally recognized advantageous characteristic industrial clusters for each respective year. Second, Zhejiang University's China Academy for Rural Development-Qiyan China Agricultural Research Database (CCAD). Data related to auxiliary industries in agriculture, forestry, animal husbandry, and fisheries, agricultural processing enterprises, and Geographical Indication (GI) agricultural products were sourced from this database. Third, Publicly Available Data. Additional macroeconomic data and administrative regional area statistics were obtained from the annual issues of the China County Statistical Yearbook spanning 2014-2022.

3.2 Variable

4.2.1 *Explained variable: The urban-rural income gap (Gap).* The main indicators used to measure the urban-rural income gap in the existing literature are the ratio of urban per capita disposable income to rural per capita disposable income, the Gini coefficient, and the Theil index (Molero-Simarro,2017; Yu and Lu, 2021; Zhang et al.,2023). however, the urban-rural income ratio is insufficiently comprehensive for measuring the urban-rural income gap as it overlooks issues such as changes in the urban and rural population proportions. In contrast, the Gini coefficient provides a comprehensive assessment of relative income disparities across all income strata and their changes (Shahid et al., 2024), while the Theil index can simultaneously account for both income distribution dynamics and demographic structural variations, providing a more accurate and rational measurement of the urban-rural income gap (Theil, 1967). Therefore, referring to the practice of most studies (Guo et al., 2022; Zhang et al., 2023), this study chooses the Theil index to quantify the urban-rural income gap. Additionally, in robustness tests, the Gini coefficient is used as a proxy variable for the urban-rural income gap to enhance the robustness of the conclusions. The calculation formulas for the Theil index and Gini coefficient are as follows:

$$theil_{it} = \sum_{j=1}^{2} \left(\frac{I_{ij,t}}{I_{i,t}}\right) \ln\left(\frac{I_{ij,t}}{I_{i,t}} / \frac{P_{ij,t}}{P_{i,t}}\right) \quad (1)$$

$$gini_{it} = m_{i1t} m_{i2t} \left| \frac{u_{i1t} - u_{i2t}}{u_{it}} \right| \quad (2)$$

In equations (1) and (2), j=1and 2 denote urban and rural areas, respectively, $I_{ij,t}$ represents the total income of urban or rural residents in county i during year t, while I_{it} denotes the total income

of all residents in county *i* during year *t*. $P_{ij,t}$ represents the population size of urban or rural residents in county *i* during year *t*, and $P_{i,t}$ represents the total population of county *i* during year *t*. m_{i1t} and m_{i2t} indicate the population shares of rural and urban areas in county *i* during year *t*, respectively, while u_{i1t} and u_{i2t} represent the corresponding per capita disposable incomes of rural and urban residents, respectively. u_{it} denotes the overall per capita disposable income of all residents in county *i* during year *t*. $Theil_{it}$ and $Gini_{it}$ represent the Theil index and Gini coefficient of county *i* during year *t*, respectively, a higher value of either index indicates a larger urban-rural income gap within the county.

3.2.2 *Explanatory variable: DID.* The explanatory variable (DID) in this study is the product of a regional dummy variable (Treat) indicating areas covered by the Advantageous Characteristic Industrial Clusters Development Policy and a time dummy variable (Post) marking policy implementation. In the regional dummy variable (Treat), pilot counties (cities/districts) implementing the policy in the treatment group are assigned a value of 1, while the control group is assigned 0. In the time dummy variable(Post), years during and after policy implementation in the pilot areas of the treatment group are assigned a value of 1, and 0 otherwise. The product of Treat and Post is ultimately defined as DID.

3.2.3 Intermediary variables. Based on the theoretical analysis in this study, the development of advantageous characteristic industrial clusters primarily promotes rural income growth and subsequently narrows the urban-rural income gap through three mechanisms: enhancing agricultural technological level, extending and expanding industrial chains, and cultivating agricultural product brands. Consequently, this study introduces three mechanistic variables to analyze these pathways:

Agricultural Technological Level (ATL). This study chooses per capita total agricultural machinery power (calculated as the ratio of total agricultural machinery power to the rural population) as a proxy indicator for agricultural technological level.

Industrial Chain Extension and Expansion (Chain). This study utilizes the natural logarithm of the number of newly added agricultural processing enterprises and the natural logarithm of the number of newly added agriculture, forestry, animal husbandry, and fishery auxiliary industry enterprises (AFAF- auxiliary industry enterprises) as quantitative measures for industrial chain extension and expansion.

Agricultural Product Brand Cultivation (Agri-brand). This study adopts the number of geographical indication (GI) agricultural products as an indicator of agricultural product brand development.

3.2.4 Control variables. To control for the influence of other factors on the urban-rural income gap, referring to existing research (Yu and Lu 2021; Zhang et al. 2023), this study also selected the following control variables: economic development level (Pgdp), per capita grain output (Pgra), industrial upgrading (Ind), service sector development (Serv), fiscal dependence (Fiscal), education development (Edu), financial development (Financial), and communication infrastructure (Com).

Table 1reports the definitions and summary statistics of the main variables.

Table 1. Main variables definition and summary statistics

Variable type	Variable	Definition	N	Mean	Std. Dev.
Explained variable	Gap	Using the Theil index to calculate the urban-rural income gap	11,583	0.356	0.186

Explanatory variable	DID	Treat ×Post	11,583	0.086	0.281
Control variables	Pgdp	Per capita GDP	11,583	5.286	4.350
	Pgra	Total grain production/total population at end of year	11,583	585.045	585.671
	Ind	Proportion of the added value of the secondary industry in regional GDP	11,583	0.401	0.146
	Serv	Proportion of the added value of the tertiary industry in regional GDP	11,583	0.426	0.108
	Fiscal	Local general public budget revenue/local general public budget expenditure	11,583	0.333	0.230
	Edu	The percentage of the number of students in regular secondary schools in the registered population	11,583	0.050	0.017
	Financial	Total loans from financial institutions at the end of year/ GDP	11,583	0.837	0.569
	Com	Number of fixed-line telephone subscribers/total population at the end of year	11,583	0.088	0.074
	ATL	Total power of agricultural machinery/total rural population	11,583	1.438	1.445
Intermediary variables	Chain	The natural logarithm of the number of new agricultural, forestry and fishing auxiliary industry enterprises	11,583	3.633	1.068
		The natural logarithm of new agro-processing enterprises	11583	2.704	1.071
	Agri-brand	The number of geographical indications for agricultural products	11583	1.687	2.140

Source(s): Author's own work

3.3 Methodology

This study uses China's policy on the development of advantageous characteristic industrial clusters as a quasi-natural experiment, categorizing counties (cities/districts) participating in this program as the treatment group and non-participating counties as the control group. Considering that the development of advantageous characteristic industrial clusters in various regions is carried out in batches, referring to the research of Li et al. (2016), this study constructs the following multi-period DID model as the baseline regression model:

$$Y_{it} = \alpha_0 + \beta_0 DID_{it} + \theta_0 Control_{it} + county_i + year_t + \varepsilon_{it} \quad (3)$$

In equation (3), i denotes the county and t denotes the year; Y_{it} represents the dependent variable, which is the urban-rural income gap of county i in year t; DID_{it} is the interaction term between the regional dummy variable and the time dummy variable, serving as the policy dummy variable representing the development of advantageous characteristic industrial clusters; $Control_{it}$ represents the control variables; α_0、β_0 and θ_0 are coefficients to be estimated; $county_{it}$ denotes county fixed effects; year denotes year fixed effects; and ε_{it} is the random disturbance term.

To further examine the mechanism through which the development of advantageous characteristic industrial clusters affects the urban-rural income gap, this study constructs the following model:

$$M_{it} = \alpha_1 + \beta_1 DID_{it} + \theta_1 Control_{it} + county_i + year_t + \varepsilon_{it} \quad (4)$$

In equation (4), M_{it} represents the mechanistic variables through which the development of advantageous characteristic industrial clusters influences the urban-rural income gap, including agricultural technological level, industrial chain extension and expansion, and agricultural product

brand cultivation. α_1, β_1, and θ_1 are coefficients to be estimated, and the definitions of other variables are consistent with equation (3).

4. Estimation results

4.1 Baseline regression results

Table 2 presents the baseline regression results of the impact of advantageous characteristic industrial cluster development on the urban-rural income gap. Column (1) reports the regression results including only the core explanatory variable. The preliminary findings indicate that, irrespective of other influencing factors, cluster development significantly narrows the urban-rural income gap, with statistical significance at the 1% level. Columns (2) and (3) progressively incorporate control variables and year-county fixed effects based on column (1). This study adopts column (3) as the baseline regression result, which reveals that the estimated coefficient is statistically significant at the 1% level. This indicates that, compared to counties not participating in cluster development, participation leads to a 3.3% reduction in the urban-rural income gap. Therefore, Hypothesis H1 proposed in this study is supported.

Table 2. Benchmark regression results

Variables	（1）	（2）	（3）
DID	-0.186***	-0.171***	-0.033***
	(0.006)	(0.006)	(0.004)
Pgdp		-0.009***	0.004***
		(0.000)	(0.001)
Pgra		0.000	-0.000***
		(0.000)	(0.000)
Ind		-0.145***	0.263***
		(0.020)	(0.035)
Serv		-0.376***	0.326***
		(0.024)	(0.040)
Fiscal		-0.126***	0.003
		(0.009)	(0.009)
Edu		-1.148***	-0.034
		(0.094)	(0.101)
Financial		-0.026***	0.029***
		(0.003)	(0.004)
Com		0.009	-0.279***
		(0.022)	(0.033)
Constant	0.372***	0.754***	0.135***
	(0.002)	(0.017)	(0.031)
County FE	No	No	Yes
Year FE	No	No	Yes
N	11,583	11,583	11,583
R^2	0.080	0.237	0.827

Note(s): Standard errors clustered at the county level are in parentheses; *p < 0.1, **p < 0.05, ***p < 0.01

Source(s): Author's own work

4.2 Parallel trend test

The prerequisite for adoption of the multi-period DID is that the variation trend of the processing group and the variation trend of the control group are parallel before the policy implementation. Following the approach of Beck et al. (2010), this study sets the year before the implementation of the advantageous characteristic industrial cluster development policy as the base period. Time dummy variables representing periods before and after cluster development (-7, -6, -5, -4, -3, -2, 0, 1, 2) are constructed and used to replace the core explanatory variable in equation (3) to conduct the Parallel trend test. the results are shown in Figure 1. From Figure 1, it can be seen that before the implementation of the policy of developing advantageous characteristic industrial clusters, there is no significant difference in the dynamic trend of urban-rural income gap between the treatment group counties and the control group counties. however, following the policy implementation, the explanatory variable exhibits statistical significance with a negative coefficient. This finding confirms that the multi-period DID model used in this study satisfies the parallel trends assumption.

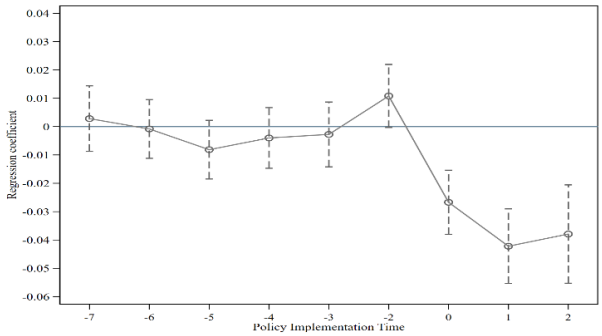

Figure 1. Parallel trend test results

Source(s): Author's own work

4.3 Endogeneity test

While the aforementioned tests confirm that the development of advantageous characteristic industrial clusters significantly narrows the urban-rural income gap, an alternative explanation could exist: the magnitude of urban-rural income gap might influence the establishment of these industrial clusters. To address potential reverse causality concerns, referring to existing research (Zhang et al., 2023), this study uses county-level terrain ruggedness as an instrumental variable (IV) and utilizes a two-stage least squares (2SLS) regression for instrumental variable estimation. This choice is justified on two grounds. Firstly, terrain ruggedness provides unique natural ecological resources that create irreplaceable comparative advantages for industrial cluster development. it fundamentally shapes the types and growth potential of these clusters. Crucially, natural conditions and resource endowments are key determinants in governmental site selection for cluster development, as regions with richer natural resources are more conducive to cultivating characteristic agriculture and forming characteristic industrial clusters. Thus, this IV satisfies the relevance condition. Secondly, terrain ruggedness results from geological historical processes and represents a geographic characteristic that remains unaffected by contemporary human economic activities, satisfying the exogeneity requirement. Notably, given that terrain ruggedness is a time-invariant cross-sectional measure, the interaction term between terrain ruggedness and time trends serves as the final IV in the regression analysis.

Table 3 reports the regression results using instrumental variables. Column (1) presents the first-stage estimation outcomes, which indicate that the instrumental variable is statistically significant at the 1% level with a positive coefficient. This suggests that regions with greater terrain

ruggedness are more likely to develop advantageous characteristic industrial clusters, which aligns with theoretical expectations. Furthermore, the Cragg-Donald Wald F-statistic substantially exceeds the critical value of the Stock-Yogo weak instrument test, indicating the absence of a weak instrument problem. The Kleibergen-Paap rk LM statistic is 28.987 (p-value < 0.001), strongly rejecting the null hypothesis of underidentification. This confirms that the instrumental variable satisfies the relevance condition. Column (2) displays the second-stage estimation results, where the explanatory variable remains statistically significant at the 1% level with a negative coefficient. This finding demonstrates that after addressing endogeneity concerns through the instrumental variable method, the development of advantageous characteristic industrial clusters continues to significantly reduce the urban-rural income gap.

Table 3. Endogeneity test results

Variables	（1） First Stage: advantageous characteristic industrial clusters	（2） 2SLS Estimation: the urban-rural income gap
Terrain ruggedness	0.009***	
	（0.002）	
DID		-0.772***
		（0.152）
Control variables	Yes	Yes
County FE	Yes	Yes
Year FE	Yes	Yes
N	11583	11583
Cragg-Donald Wald F	43.041	
Kleibergen-Paap rk Wald F	28.987	

Note(s): Standard errors clustered at the county level are in parentheses; Control variables remain consistent with the baseline regression; *p < 0.1, **p < 0.05, ***p < 0.01

Source(s): Author's own work

4.4 Robustness tests

4.4.1 Placebo test. To ensure the reliability of the estimation results and verify that the impact of advantageous characteristic industrial clusters development on the urban-rural income gap is not driven by omitted variables or other unobservable stochastic factors, this study referring the approach of Li et al. (2016), this study conducts a placebo test by setting up a "pseudo treatment group" through 1000 random samples. Specifically, we first randomly selected non-overlapping samples matching the treatment group's size across multiple periods from the dataset, hypothetically assigning these "pseudo-treatment groups" to participate in the industrial cluster program. We then re-estimated the baseline regression model (equation 3) using these fabricated groups and repeated this process 1000 times. The distribution of the estimated coefficients and p-values from these 1,000 random samplings is shown in Figure 2. As expected, the mean of the estimated coefficients for the pseudo-treatment groups lies near zero and follows a normal (bell-shaped) distribution, while the actual estimated coefficient (solid line) significantly deviates from the placebo test distribution region. These results mitigate concerns that omitted variables or other unobservable stochastic factors drive our main findings.

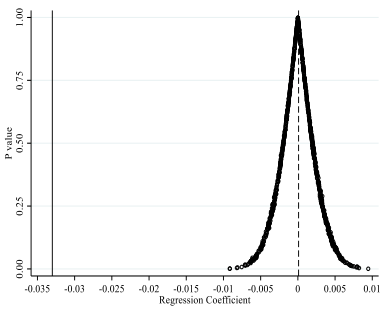

Figure 2. Placebo test results

Source(s): Author's own work

4.4.2 Replacement of explained variable. This study uses the Gini coefficient as an alternative measure of urban-rural income gap and re-estimates the baseline regression model (equation 3) to conduct robustness checks. The estimation results are presented in column (1) of Table 4. The results show that the core explanatory variable remains statistically significant at the 1% level with a negative coefficient, indicating that the development of advantageous characteristic industrial clusters significantly narrows the urban-rural income gap. This demonstrates the robustness of the baseline regression results.

4.4.3 Mitigating the Influence of Outliers. To exclude potential interference from outliers in the sample, this study applies a 1% winsorization treatment to continuous variables and re-estimates the model. The results are presented in column (2) of Table 4. As shown, neither the sign nor the statistical significance of the coefficients changes substantially after this adjustment, providing further evidence for the robustness of our empirical findings.

Table 4. Robustness test results

Variables	（1） Replacement of explained variable	（2） Mitigating the Influence of Outliers	（3） PSM-DID	（4） Mitigating Interference from Other Policies
DID	-0.013*** （0.004）	-0.034*** （0.004）	-0.032*** （0.004）	-0.032*** （0.004）
SAPAAs	——	——	——	Yes
Control variables	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Y
N	11583	11583	11403	11583
R^2	0.923	0.827	0.827	0.827

Note(s): Standard errors clustered at the county level are in parentheses; Control variables remain consistent with the baseline regression; *p < 0.1, **p < 0.05, ***p < 0.01

Source(s): Author's own work

4.4.4 PSM-DID. This study uses multi-period DID model to evaluate the impact of advantageous characteristic industrial cluster development on the urban-rural income gap. However, since this policy is not a strictly randomized natural experiment, potential endogeneity issues may arise due to sample self-selection. To mitigate the possible influence of sample selection bias on the estimation results, this study adopts the PSM-DID to correct for selective bias. specifically, we first utilize the control variables from the baseline regression model as matching covariates, applying nearest-neighbor matching to exclude observations that fail to meet the matching criteria. This

process ensures no systematic differences in observable characteristics between the treatment and control groups in the resulting matched sample. We then re-estimate the policy effect using the multi-period DID on this balanced dataset. Column (3) of Table 4 reports the PSM-DID results, which show that the core explanatory variable retains its statistically significant negative coefficient. This finding reaffirms the robustness of our baseline regression outcomes.

4.4.5 Mitigating Interference from Other Policies. Concurrently with the promotion of advantageous and characteristic industrial clusters, the Chinese government implemented multiple policies supporting characteristic agriculture development. Among these, the most influential and representative was the certification and development of Characteristic Agricultural Product Advantageous Areas (CAPAAs). In April 2017, the Ministry of Agriculture and Rural Affairs formally launched the establishment of CAPAAs, with an initial batch of 62 zones designated and announced in December 2017, followed by subsequent annual designations. By 2021, a cumulative total of 310 CAPAAs had been designated [3]. the policy of CAPAAs aims to optimize the production layout of characteristic agricultural products and transform local agricultural specialties and minor varieties into large-scale industries driving income growth for rural households. Therefore, the policy of CAPAAs may affect the urban-rural income gap, and interfere with the policy effectiveness of advantageous characteristic industrial clusters. to address this concern, drawing on the official CAPAAs certification list published by China's Ministry of Agriculture and Rural Affairs, this study incorporates a CAPAAs policy dummy variable into Equation (3) as an additional control variable [4]. This allows us to control for the potential confounding effects of the CAPAAs policy on our research findings. the regression results, presented in column (4) of Table 4, demonstrate that after accounting for the influence of the CAPAAs policy, the coefficient of the explanatory variable remains significantly negative, consistent with the baseline regression results. This further confirms the robustness of our research conclusions.

4.5 Mediation effect test

Based on the preceding theoretical analysis, the development of advantageous characteristic industrial clusters primarily narrows the urban-rural income gap through three channels: enhancing agricultural technological level, extending and expanding industrial chains, and cultivating agricultural product brands. Accordingly, this study uses Equation (4) to further examines the mechanism through which the development of advantageous characteristic industrial clusters narrows the urban-rural income gap. The estimation results are presented in Table 5.

4.5.1 Agricultural technology level. To verify that the development of advantageous characteristic industrial clusters narrows the urban-rural income gap through agricultural technology level, we use the ratio of total agricultural machinery power to rural population as a proxy for agricultural technology level and conducts regression analysis with this as the dependent variable. The results, presented in column (1) of Table 5, show that the estimated coefficient is statistically significant at the 1% level and positive, demonstrating that the establishment of such industrial clusters significantly enhances agricultural technology levels, promoting both production expansion and quality improvement of agricultural products. As regions with the most intensive technological advancements and diffusion, the development of advantageous characteristic industrial clusters has not only driven the large-scale production of regional agriculture within their regions, enabling automation technologies represented by agricultural mechanization to replace certain manual labor, reduce farmers' production costs, and enhance agricultural efficiency (Wardhana et al., 2017; He et al., 2020), but also facilitate "learning-by-doing" among farmers, enabling the conversion of new

technologies into productive capacity. This improves agricultural product quality and farmers' operational income, ultimately narrowing the urban-rural income gap.

4.5.2 Extension and expansion of industrial chains. To verify that the development of advantageous characteristic industrial clusters narrows the urban-rural income gap through industrial chain extension and expansion, this study uses the number of newly added agricultural processing enterprises and newly added agriculture, forestry, animal husbandry, and fishery auxiliary industry enterprises (AFAF- auxiliary industry enterprises) as measures of industrial chain extension and expansion. We regress these indicators against the development of advantageous characteristic industrial clusters. The regression results, presented in columns (2) -(3) of Table 5, reveal that the estimated coefficients are statistically significant at the 1% and 10% levels respectively, both with positive signs. This indicates that following the implementation of industrial cluster policies, counties experienced significant growth in newly registered agricultural product processing enterprises and AFAF- auxiliary industry enterprises This development has retained value-added benefits from agricultural processing and distribution within rural areas while diversifying farmers' income sources. On one hand, the establishment of advantageous characteristic industrial clusters has attracted an influx of agricultural product processing enterprises, vertically extending the industrial chain and providing rural residents with numerous local employment opportunities (Otsuka and Mubarik, 2020). On the other hand, industrial cluster development has driven the horizontal expansion of traditional agriculture into supporting sectors such as agricultural input services, logistics, e-commerce, and rural tourism. This enables farmers participating in the industrial chain to capture value not only from production activities but also from value-added segments including processing, distribution, and sales (Zeleke and Wordofa, 2024), accelerating rural income growth.

4.5.3 Cultivating agricultural product brands. To verify that the development of advantageous characteristic industrial clusters narrows the urban-rural income gap through cultivating agricultural product brands. we use the number of geographical indications (GIs) for agricultural products as a proxy for brand development. Regression analysis with this indicator as the dependent variable is conducted, and the results are presented in column (4) of Table 5. the estimated coefficient is statistically significant at the 5% level with a positive coefficient, indicating that the establishment of such industrial clusters significantly promotes the cultivation and development of agricultural product brands. This suggests that advantageous characteristic industrial clusters provide a stronger platform for creating agricultural brands with unique quality attributes and regional cultural connotations. Moreover, the standardized production systems established within these industrial clusters ensure consistent product quality (Rathee et al., 2023), forming a critical foundation for building brand reputation, helping farmers share profits through brand value-added, expand sales channels, and thus obtain more profits and increase income levels.

Table 5. Mediation effect test results

Variables	Agricultural technological level	Industrial chain extension and expansion		Agricultural product brand cultivation
	（1）	（2）	（3）	（4）
	Per capita total agricultural machinery power	The number of newly added AFAF- auxiliary industry enterprises	The number of newly added agricultural processing enterprises	The number of geographical indications for agricultural products
DID	0.073***	0.105***	0.043*	0.071**

	（0.018）	（0.023）	0.024	（0.035）
Control variables	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	11583	11583	11583	11583
R^2	0.929	0.816	0.787	0.871

Note(s): Standard errors clustered at the county level are in parentheses; Control variables remain consistent with the baseline regression; *p < 0.1, **p < 0.05, ***p < 0.01

Source(s): Author's own work

Based on the aforementioned empirical findings, it can be concluded that the development of advantageous characteristic industrial clusters narrows the urban-rural income gap through three pathways: enhancing agricultural technology levels, extending and expanding industrial chains, and cultivating agricultural product brands. This validates hypothesis H2 of this study.

4.6 Heterogeneity analysis

4.6.1. Heterogeneity analysis based on cluster types. The selection of dominant industries within advantageous characteristic industrial clusters reveals that initial cluster establishment primarily focused on high-value agricultural products such as livestock, fruits, and medicinal herbs, later expanding to include grain crops like rice, soybeans, and wheat. This raises the question: do different types of advantageous characteristic industrial clusters exhibit varying impacts on the urban-rural income gap? To address this, we categorize the clusters into grain crop clusters and high-value agricultural product clusters, conducting subgroup regressions on equation (3)[5]. The results are presented in columns (1) and (2) of Table 6. Both regression columns show the explanatory variables are both statistically significant at the 1% level with negative coefficients, Specifically, the coefficient for high-value agricultural product cluster samples is -0.036, while the coefficient for grain crop clusters samples is -0.084. This indicates that the income gap-narrowing effect is more pronounced in grain crop clusters. The likely explanation lies in the relatively standardized and scalable nature of grain crop value chains, where processing segments (e.g., flour, rice, and feed production) are typically localized within or near county areas. Cluster development in this sector more readily drives large-scale cultivation, storage, logistics, and primary/deep processing within counties, creating numerous stable employment opportunities suited to rural labor. This directly increases rural wage income and narrows the urban-rural income gap. In contrast, high-value agricultural production demand higher labor quality, production technology, and capital investment (Birthal et al., 2020). Cluster development in this domain tends to benefit leading enterprises, cooperatives, and large-scale growers first, while offering comparatively limited operational income growth opportunities for smallholder farmers (Negi et al., 2018). Consequently, high-value agricultural clusters demonstrate a less pronounced effect in narrowing the urban-rural income gap compared to grain crop clusters.

4.6.2. Heterogeneity analysis based on geographical location. Given the substantial disparities in factor endowments such as natural resources, infrastructure, technological capabilities, and market scale across Chinese regions, the impact of advantageous characteristic industrial cluster development on the urban-rural income gap may vary with geographical location. To examine this heterogeneity, we divide the full sample into eastern region counties and central-western region counties, conducting subgroup regressions on equation (3). The results are presented in columns (3)

and (4) of Table 6. Both regression columns show the explanatory variables are both statistically significant at the 1% level with negative coefficients, where the coefficient for county-level samples in eastern regions is -0.041, and the coefficient for county-level samples in central and western regions is -0.021. this indicates that the income gap-narrowing effect is more pronounced in eastern regions. The likely explanation lies in the earlier economic development of eastern counties, which have established more mature industrial chain support systems capable of attracting greater concentrations of capital, technology, and talent. This facilitates rural employment opportunities and income growth. Conversely, underdeveloped industrial foundations in central-western counties constrain the spillover effects of industrial clusters due to limited local market capacity and inadequate supporting capabilities, resulting in weaker rural labor absorption (Qi et al., 2024) and diminished income gap reduction outcomes.

4.6.3. Heterogeneity analysis based on financial development level. The development of advantageous characteristic industrial clusters not only relies on their inherent resource endowments but also demands support from external environments, particularly the financial ecosystem. A robust financial environment can attract greater social capital and facilitate industrial cluster upgrading (Sehrawat and Giri, 2016). Consequently, the impact of advantageous characteristic industrial clusters on the urban-rural income gap may vary with county-level financial development levels. To investigate this heterogeneity, we categorize the sample into counties with high financial development subsample and low financial development subsample using the median value of outstanding loans of financial institutions (2014-2022) as the threshold [6]. subgroup regressions on equation (3) were conducted, with results presented in columns (5) and (6) of Table 6. The findings reveal that compared to counties with lower financial development levels, the inhibitory effect of advantageous characteristic industrial clusters on the urban-rural income gap is more pronounced in counties with higher financial development levels. This divergence arises because counties with advanced financial levels leverage well-developed markets to optimize resource allocation, direct capital toward high-value segments, and reduce urban-rural resource misallocation. Simultaneously, robust financial ecosystems attract talent and investment, providing critical funding for cluster development and upgrading, thereby expanding local non-agricultural employment (Gao et al., 2024) and narrowing the income gap. Conversely, counties with underdeveloped financial levels face constraints in credit availability, capital accumulation, and funding supply, limiting the growth potential of advantageous characteristic industrial clusters and preventing them from fully realizing their policy-driven effects.

Table 6. Heterogeneity analysis results

Variables	（1） High-value agricultural product clusters	（2） Grain crop clusters	（3） Eastern region	（4） Central-western region	（5） High financial development level	（6） Low financial development level
DID	-0.036***	-0.084***	-0.041***	-0.021***	-0.050***	-0.019***
	（0.004）	（0.013）	（0.006）	（0.004）	（0.006）	（0.005）
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	10800	782	4446	7137	5,756	5,752
R^2	0.829	0.828	0.829	0.847	0.852	0.846

Note(s): Standard errors clustered at the county level are in parentheses; Control variables remain consistent with the baseline regression; *p < 0.1, **p < 0.05, ***p < 0.01

Source(s): Author's own work

6. Conclusions and Implications

The clustered development of advantageous characteristic industries is crucial for narrowing the urban-rural income gap and achieving common prosperity. Based on county-level panel data covering 1287 Chinese counties (cities/districts) from 2012 to 2022, and using China's Advantageous Characteristic Industrial Clusters Development Policy as a quasi-natural experiment, this study utilizes a multi-period DID method to examine its effect on urban-rural income gaps from a whole-industry-chain perspective, and comparing differential effects across high-value agricultural product clusters versus grain crop clusters, eastern versus central-western regions, and areas with higher versus lower financial development levels. The findings show that development of advantageous characteristic industrial clusters can significantly narrow the urban-rural income gap. This conclusion remains valid after a series of robustness tests and treatments for endogeneity concerns. The mechanism analysis reveals that the development of advantageous characteristic industrial clusters narrow the urban-rural income gap by enhancing agricultural technological level, extending and expanding industrial chains, and cultivating agricultural product brands. Additional heterogeneity analysis reveals that the impact of cluster development on the urban-rural income gap varies significantly based on geographic location, financial development level, and cluster type. Compared to high-value agricultural product clusters, central-western regions, and areas with relatively underdeveloped financial level, the mitigating effect on urban-rural income gap is more pronounced in grain crop clusters, eastern regions, and areas with more developed financial level.

Based on the above conclusions, this study puts forward relevant policy recommendations:(1): Strengthen policy support for the development of advantageous characteristic industrial clusters to stimulate their endogenous momentum. Tailor support measures based on local resource endowments, market demands, and industrial foundations to strategically invest in and nurture dominant industries with unique features. Build integrated agro-clusters encompassing production, processing, distribution, technology, and services to effectively empower the development of advantageous characteristic industries, promote deep industrial integration, and transform these industries into major drivers of sustained income growth for farmers. (2): Strengthen the development of the entire industrial chain for advantageous characteristic industrial clusters to achieve comprehensive development across the entire industrial chain and value chain enhancement. On the one hand, it is essential to increase investment in agricultural technology research and development, promote the adoption of advanced cultivation and breeding technologies, and enhance agricultural production efficiency and product quality. On the other hand, vigorous efforts should be made to develop value-added activities such as processing, marketing, and brand-building for competitive characteristic agricultural products, thereby ensuring that value-added benefits from processing, distribution, and sales remain within rural areas and contribute to sustainable rural economic development. (3): Enhance financial services and strengthen the agglomeration support of advanced factors of production. Further refine the financial service ecosystem, encouraging various financial institutions to actively engage with the development of advantageous characteristic industrial clusters. Centering on the whole-industry-chain development of these industries, increase financial support for key areas such as agricultural technology R&D, industrial chain extension, and

agricultural product brand building. Simultaneously, channel and guide more capital, technology, talent, land resources, and other essential factors toward these industries to support their expansion, strengthening, and qualitative elevation.

Notes:

1. http://www.jcs.moa.gov.cn/trzgl/202003/t20200311_6338705.htm
2.https://www.gov.cn/zhengce/zhengceku/2020-05/22/content_5513870.htm
3.https://www.gov.cn/xinwen/2017-10/31/content_5235803.htm
4.If a county (city/district) is designated as a characteristic agricultural product advantageous area, the policy dummy variable is assigned a value of 1 for the year of designation and all subsequent years, and 0 otherwise.
5.Grain crop cluster clusters include rice, soybeans, wheat, sorghum, highland barley, dryland millet, and miscellaneous coarse grains. All others are classified as high-value agricultural product clusters.
6.Counties with year-end financial institution loan balances above the median are defined as high financial development level counties, while those below the median are classified as low financial development level counties.

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