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How does distinctive rural development promote farmers' sustainable income growth? Empirical analysis from northern Jiangsu, China

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Introduction: Rural areas have actively invested in distinctive rural development by leveraging distinctive rural resources to enhance the vitality and sustainability of farmers' income growth. However, the pathway to achieve this objective remains uncertain.

Methods: This study focuses on the distinctive rural development in the northern region of Jiangsu Province via a dynamic configurational perspective across three dimensions—agricultural development, tourism cultivation, and cultural infrastructure—within the distinctive industrial system framework on farmers' income enhancement.

Results and discussion: The findings reveal that a single factor is not a necessary condition for promoting farmers' sustainable income growth; however, low levels of annual income from specialized industries constitute a necessary condition for the maintenance of low-income levels among farmers. There are four combination pathways that drive farmers' sustainable income growth: Composite Value-Added Driven Type, Agriculture-Oriented E-Commerce Driven Type, Agriculture-Oriented Chain-Based Collaborative Type, and Innovation-Driven Agriculture-Tourism Co-Driven Type. Distinctive rural development not only mitigates the factor constraints associated with traditional income growth pathways but also expands new avenues for increasing income, thereby enhancing farmers' capacity for income sustained growth. This study advances configurational theory by applying dynamic fsQCA to rural development, highlighting nonlinear factor interactions over isolated variables through a holistic lens on resource endowments and innovations in rural economic systems.

KEYWORDS

rural revitalization, distinctive villages construction, farmers' income growth, configurational analysis, sustainability

1 Introduction

Since the 1970s, governments across Asia have enacted a series of policies aimed at promoting rural regional economic development. For example, Japan's "Village Creation Campaign" focused on establishing value chains around single agricultural products to enhance regional economic vitality (Shoyama et al., 2022); Thailand's OTOP program supported traditional rural handicraft industries to boost farmers' income (Luangpaiboon, 2017); and South Korea's Saemaeul Movement

initiatives fostered the development of rural industries by developing the specialty agriculture (Huang and Tan, 2023). These policies are typically characterized by leveraging unique regional resource endowments to develop distinctive industries and thereby promote farmers' income growth. However, these policies overlook the sustainability of economic development and farmers' income growth, which has hindered their long-term effective implementation (Nildam et al., 2024). Similar to the national strategies noted above, in 2003 the Chinese government launched the *Ten-Thousand Villages* project in Zhejiang Province. This initiative promoted farmers' sustainable income growth by developing village-based ecological economies, with the explicit aim of preventing a large-scale relapse into poverty. The project's economic target was achieved by the end of 2015. Its distinguishing feature, however, was the explicit emphasis on sustainability, which helped secure the long-term continuity of both policy implementation and its outcomes. Drawing on Zhejiang's experience, in 2017 the Chinese government launched the *Distinctive Pastoral Villages* project in Jiangsu Province, emphasizing the development of village-based agricultural economies. The economic objective thus shifted from short-term poverty alleviation toward enhancing the autonomy, stability, and long-term sustainability of farmers' income. Because these initiatives were implemented at the village level and focused on distinctive village industries, they are collectively referred to as "distinctive villages." Compared with policies in other Asian countries, China's approach is characterized by phased implementation and a long-term orientation. In particular, its focus on sustainable farmers' income growth aligns closely with United Nations Sustainable Development Goals (SDG) 1 and SDG 3. Therefore, studying the construction of distinctive villages in China has clear practical significance and policy relevance. This raises a critical question: through which developmental pathways have distinctive village construction promoted sustainable growth in farmers' income?

Existing research on distinctive villages has predominantly adopted a geographical perspective, emphasizing the development of such villages around local specialty resources (e.g., historical, cultural, or natural assets) (Gao and Wu, 2017; Yang et al., 2022). This approach, however, often overlooks the economic objective of increasing farmers' income. From a causality perspective, other studies have examined the relationship between single specialty-industry final products (e.g., agricultural produce, farmstay tourism) and farmers' income (Li et al., 2019; Yang, 2023), but they have not clarified the specific pathways through which distinctive village construction promotes farmers' income. Two practical considerations should inform pathway research. First, government policy documents indicate that achieving economic objectives depends on the synergistic interaction of multiple factors, such as industrial development and cultural initiatives, and that implementation pathways are complex and systemic. Second, distinctive village development emphasizes place-based adaptation, so the pathways to economic outcomes vary across villages. For example, Lakeside Huaiyuan Village in Xuzhou has leveraged "Sophora culture" to revitalize rural tourism; Juxian Village in Suqian has developed a billion-yuan e-commerce industry through the deep processing of horticultural products; and Gaoqiao Village in Huai'an has constructed a full agricultural industry chain via land management reforms. These cases illustrate the diversity of pathways. In light of the above, this study draws on 18 representative cases of distinctive villages in northern Jiangsu and employs dynamic fuzzy-set qualitative comparative analysis (fsQCA) to systematically investigate how multi-factor synergies in distinctive village construction promote

sustainable income growth among farmers. The research objectives are: (a) to develop a theoretical framework for analyzing the complex, systemic relationship between distinctive village construction and sustainable farmers' income growth; and (b) to examine the multiple pathways, their configurational characteristics, and their temporal evolution.

The contributions of this study are as follows: (a) By adopting a village-level focus, it addresses the current shortage of micro-level research in the field. (b) By emphasizing the sustainability of farmers' income growth, the findings substantially support the SDGs 1 and 3 and offer relevant policy guidance. (c) We develop a theoretical framework to investigate the pathways through which distinctive village development promotes sustainable income growth among farmers. The framework accounts for the complexity, systemic characteristics, and diversity of real-world pathways, thereby providing decision-support information for villages implementing distinctive village initiatives or yet to achieve sustainable income growth; consequently, the study enriches theoretical literature and carries important practical implications. (d) From a dynamic perspective, the traditional static fsQCA is extended to a dynamic version using multi-period cross-sectional data, thereby enhancing the method's explanatory power in analyzing dynamic phenomena. The remainder of the paper is structured as follows. Section 2 develops the theoretical framework based on situational analysis and a literature review. Section 3 introduces the dynamic fsQCA method and describes the selection criteria for the outcome variable, condition variables, and sample cases. Section 4 presents the empirical results on configurational pathways. Section 5 discusses the applicability of fsQCA in the research on distinctive villages, and puts forward policy recommendations as well as directions for future research. Section 6 summarizes the key findings and conclusions of this study.

2 Construction of the theoretical framework

This study focuses on established social phenomena, therefore, constructing an appropriate theoretical framework is necessary. A theoretical framework provides the conceptual tools and analytical perspectives needed to interpret complex social phenomena, and it defines analytical pathways and methodological rationales that reduce arbitrariness and subjectivity, thereby underpinning subsequent methodological choices and empirical analysis. In this study, the theoretical framework is constructed in three steps. First, we analyze strategies of distinctive village development in northern Jiangsu to identify and systematize key variables. Second, the causal relationships between these variables and farmers' income growth are examined with reference to existing literature. Third, we introduce the symbiosis theory to develop a framework in which multiple factors interact to promote sustained income growth among farmers.

2.1 Development model of distinctive villages in northern Jiangsu

The rural economy is a complex system in which multiple elements interact to promote rural development (Zhou et al., 2025). In northern Jiangsu, distinctive village practices aim to achieve

sustainable income growth for farmers through the coordinated use of these elements. The model has two prominent features. First, element diversity: unlike other Asian countries where distinctive village development often relies on a single distinctive industry (Huang and Tan, 2023; Luangpaiboon, 2017; Shoyama et al., 2022), northern Jiangsu integrates resources from agriculture, tourism, and culture. It strengthens agricultural production, processing, and e-commerce, leverages agricultural and cultural assets to promote tourism, and encourages tourism to support agriculture. Together, these activities form a distinctive industrial system spanning tourism, processing, and retail that is largely self-sustaining and supports sustained income growth among farmers. Second, income sustainability: unlike exogenous development models that depend on continuous policy subsidies, this model fosters sustained farmers' income growth through the development of locally distinctive industries (Agosin and Retamal, 2021). Distinctive rural resources are therefore critical, and avoiding homogeneous competition is a salient feature of this development path (Geng et al., 2023). Mechanism analysis suggests that distinctive industries facilitate the industrialization and branding of niche products; brand diffusion then becomes a core capability that propels continuous expansion and sustained income growth (Mihailović et al., 2020). Notably, forms of distinctive industries vary considerably: some villages rely on a single agricultural or tourism industry, others combine two industries, and some integrate multiple industries. Consequently, potential multicollinearity may arise among industry variables.

Based on the above characteristics, the construction elements of distinctive villages in Northern Jiangsu can be categorized into three dimensions: (a) agricultural development, including agricultural production, agricultural processing, and agricultural e-commerce; (b) tourism development; and (c) cultural development. Existing scholars have conducted extensive research on the relationship between these elements and farmers' income growth.

2.1.1 Agricultural development and farmers' income growth

With regard to agricultural development, yield enhancement is regarded as the foundational condition for promoting farmers' sustainable income growth and is influenced primarily by farmers' income aspirations and technological advancement. Farmers' income aspirations give rise to an endogenous incentive mechanism through adjustments in labor and material input intensities, which drives increases in agricultural productivity and translates into sustainable income-growth pathways (Chen et al., 2022). Technological advancement is manifested in improvements in agricultural mechanization levels and crop yield per unit area, through the continuous enhancement of production efficiency and production inputs, rural residents' incomes are thereby increased (Zhou et al., 2020). The development of the agricultural processing industry is identified as a critical factor for enhancing the added value of agricultural products, through a dual-driven mechanism, it promotes farmers' sustainable income growth: on one hand, as a labor-intensive sector, processing expands land-use intensification, releases agricultural labor, and, via subsequent industrial expansion, reabsorbs this labor force, ultimately elevating farmers' wage incomes (Ding, 2023); on the other hand, by extending directional procurement of raw materials to farmers during processing, it establishes pathways for increases in farmers' operating incomes (Hamilton et al., 2024). The cultivation of

new agricultural e-commerce formats represents an important means of broadening farmers' income channels, by compressing intermediary links between farmers and consumers, it continuously reduces circulation costs while expanding product distribution channels, thereby facilitating farmers' sustainable income growth (Liu et al., 2021).

2.1.2 Tourism development and farmers' income growth

With regard to rural tourism development, the transformation of distinctive agricultural, ecological, and cultural resources into economic value is leveraged to establish a "Resource-Service-Income" industrial chain model. This model supports the coordinated growth of farmers' wage and operational income through the ongoing refinement and expansion of the industrial chain (Wang et al., 2024; Zhang J., 2023). Tourism sectors with varying resource endowments exhibit heterogeneous income-generation mechanisms: for example, the gastronomy-oriented model drives sustainable income growth by leveraging consumption and market expansion to achieve economies of scale (Wondirad et al., 2021); the leisure-agriculture model, in contrast, relies on policy instruments such as land transfer compensation and fiscal subsidies to boost farmers' income (Tang et al., 2024).

2.1.3 Cultural development and farmers' income growth

The value conversion of distinctive cultural resources has also spawned new cultural industry formats that promote farmers' sustainable income growth by facilitating the non-agriculturalization of the labor force (Liu et al., 2022). However, the intangible and location-specific nature of cultural resources makes the degree of their economic value conversion difficult to measure (Zhang et al., 2023). Existing studies predominantly employ the tangible indicator "Intangible Cultural Heritage" to measure the richness of regional cultural resources, examining how its quantity and classification affect farmers' income growth (Dong et al., 2024).

Although the above studies have demonstrated causal links between individual factors and farmers' income growth and confirmed the effectiveness of these factors in promoting sustainable income growth within distinctive-village construction in northern Jiangsu, conventional regression methods remain inadequate for analyzing the synergistic interactions of multiple factors. Moreover, causal-inference approaches do not fully capture the complexity and systemic character of the pathways by which interacting factors foster sustained income growth among farmers (Pappas and Woodside, 2021). This issue is discussed in detail in Section 5.1.2. To address it, Section 2.2 introduces symbiosis theory. Drawing on prior studies and this theoretical perspective, we develop a practical theoretical framework tailored to distinctive village construction in northern Jiangsu that provides theoretical underpinning and methodological guidance for subsequent analysis.

2.2 A theoretical framework for promoting sustainable income growth among farmers through coordinated elements

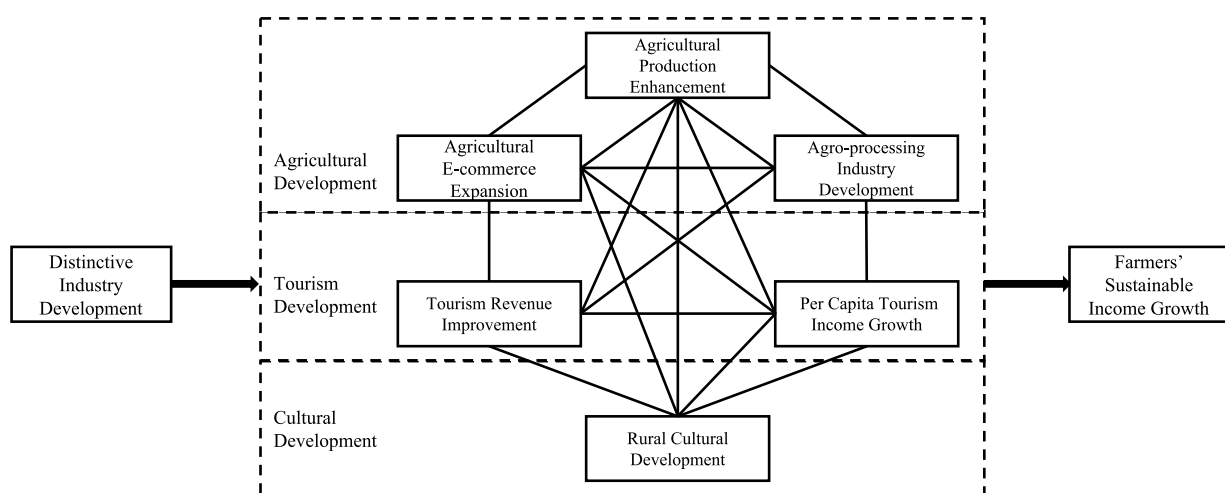
Symbiosis theory posits that rural systems are not isolated components but integrated wholes shaped by reciprocal interactions

As shown in [Figure 1](#), the elements related to distinctive village construction discussed in Section 2.1 are organized into three symbiotic units: agricultural development, tourism development, and cultural development. Each unit is further divided into specific subcategories. For example, the agricultural development unit is subdivided into Agricultural E-commerce Expansion, Agricultural Production Enhancement, and Agro-processing Industry Development; the tourism development unit is subdivided into Tourism Revenue, Per Capita Tourism Income Growth. Theoretically, these symbiotic units interact with one another. Empirically, the distinctive village initiatives described in Section 2.1 also demonstrate such interrelationships. This allows the study to construct pairwise associations between subcategories of the symbiotic units and to show that the synergistic interactions of these configurations contribute to farmers' sustainable income growth. Consequently, we can characterize the multi-factor synergies that promote farmers'

This theoretical framework is founded on two hypotheses: (H1) Farmers' sustainable income growth arises from the collaborative interactions of multiple factors. (H2) Although the framework is broadly applicable to the analysis of individual rural systems, the specific circumstances of distinctive villages differ. Accordingly, the framework's applicability and empirical validity will be tested via model verification in subsequent sections.

3.1 Research scope and date sources

This study selects northern Jiangsu as the research area for three main reasons. First, the integrity and practicality of the policy system: Jiangsu Province has implemented the *Distinctive Pastoral Villages* project to promote the construction of distinctive villages with the aim of achieving sustained income growth for farmers. The policy not only guides local practice but also establishes an evaluation mechanism, designating exemplary cases as “Provincial Distinctive Pastoral Villages,” which provide typical examples under an institutional framework. By contrast, although other Chinese provinces have experimented with distinctive-village initiatives, they generally lack provincial-level policy norms and promotion (Guo and Li, 2024). Second, alignment and advancement of policy objectives: unlike Zhejiang Province, which emphasizes the goal of “avoiding a return to poverty,” Jiangsu places greater emphasis on strengthening farmers’ autonomy and endogenous capacity for sustained income growth. This orientation aligns more closely with current rural revitalization



trends that prioritize local self-development capacity and therefore offers greater research value. Third, typicality and representativeness: northern Jiangsu is a priority area for distinctive-village construction and benefits from concentrated policy support. The region is endowed with abundant agricultural resources, a rich cultural heritage, and a rapidly developing rural tourism sector. These endowments and development trends make northern Jiangsu an ideal case-study setting for examining how distinctive village construction can promote sustained income growth among farmers. The definition of northern Jiangsu follows the classification standard of the competent authority for the *Distinctive Pastoral Villages* project, namely the Jiangsu Province Department of Housing and Urban–Rural Development.

Data for this study were primarily obtained from statistical bulletins published by the sampled village committee. The *Distinctive Pastoral Villages* project in Jiangsu Province provides an institutional framework and a performance-evaluation mechanism that requires villages undertaking construction to submit standardized project data to the Jiangsu Provincial Department of Housing and Urban–Rural Development and to disclose summary information to residents in the form of statistical bulletins. These requirements supply targeted data for distinctive villages and help ensure consistency and comparability of reported formats across villages. Nevertheless, given the generally limited public disclosure of detailed village-level economic information in China (Ma, 2025), primary data collection via fieldwork was necessary. The data-collection process proceeded as follows. First, the research team conducted on-site visits and field investigations in villages where distinctive village construction was ongoing or completed, identifying 19 sample villages (selection criteria and the sample list are provided in Section 3.3.3). Second, the study variables were defined based on government documents, empirical information gathered during fieldwork, and existing literature (see Section 3.3). Third, economic indicators for the relevant periods were extracted from the village committees' statistical bulletins. Fourth, aggregated figures were cross-checked with the Jiangsu Provincial Department of Housing and Urban–Rural Development where possible to assess their consistency and authenticity.

It should be noted that the available data have two main limitations. First, there is no control group, because villages that have not initiated or completed distinctive-village construction generally do not disclose detailed economic data. Second, the sample size is limited: given the time required for distinctive-village construction in northern Jiangsu, relatively few villages have completed the process. Nonetheless, these limitations do not materially undermine the robustness or validity of this study's findings. A detailed discussion is provided in Section 5.1.1.

3.2 Method selection

This study employs the dynamic fsQCA to examine how multiple factors synergistically promote sustained income growth among farmers in distinctive village construction. fsQCA is an asymmetric, set-theoretic method grounded in Boolean algebra, suitable for exploring how different configurations of conditions produce particular outcomes (Ragin, 2008; Ragin and Strand, 2008). Its core advantage lies in addressing causal complexity: by calibrating variables into fuzzy membership scores ranging from 0 to 1, fsQCA identifies

diverse condition configurations and supports the analysis of conjunctural causation and equifinality (Pappas et al., 2020). Compared with conventional regression methods, fsQCA uncovers heterogeneous pathways across cases and is especially well suited to configurational analysis with small-to-medium samples (Pappas and Woodside, 2021). Traditional fsQCA is typically applied to static cross-sectional data and thus neglects temporal dynamics in condition configurations. To incorporate time, Garcia-Castro and Ariño (2016) proposed a dynamic variant of fsQCA that uses panel (longitudinal) data to capture temporal changes in configurations. Operationally, the procedures of dynamic fsQCA are broadly similar to those of the traditional method; the principal distinction lies in sample selection and the incorporation of the temporal dimension. In this study, we follow the standard fsQCA logic and procedures while integrating the temporal criteria of the dynamic approach. Specifically, we analyze two time points (pre- and post-construction) from the sample villages, thereby treating the data as multi-period cross-sectional data. This application demonstrates that dynamic fsQCA can capture evolutionary processes even when temporal coverage is limited to a small number of waves.

This study adopts the dynamic fsQCA for three main reasons. First, with respect to research-objective alignment: as illustrated in the theoretical framework in Figure 1, sustainable income growth for farmers arises from multidimensional interactions among agricultural development, tourism development, and cultural development. Conventional regression methods estimate the net effect of single predictors; by contrast, dynamic fsQCA is better suited to explicate complex, collinear relationships among multiple factors and the distinct configurational pathways that emerge from them (Du and Jia, 2017). This point is discussed in detail in Section 5.1.2. Second, regarding sample and data characteristics: the study utilizes a small-to-medium sample of 19 representative distinctive village cases, which is appropriate for dynamic fsQCA analysis. Third, concerning scientific applicability: fsQCA has been widely applied to rural development problems characterized by systemic complexity (Shi et al., 2025; Wei et al., 2024); its configurational results offer precise diagnostic insights and provide a solid basis for proposing optimization strategies.

3.3 Variable selection

This study selected 19 typical provincial-level distinctive villages in 17 counties across 5 prefecture-level cities in Northern Jiangsu as samples, collecting two periods of data before (2017) and after (2023) the construction of distinctive villages. This study explored the configurational paths and dynamic changes of distinctive rural development in promoting farmers' sustainable income growth. The outcome variable was measured by the per capita disposable income of villagers, with data sourced from the bulletins of relevant villages. The selection of conditional variables followed these steps: First, key elements influencing farmers' income growth through distinctive village construction were identified via literature review, categorized into four dimensions—distinctive industry construction (measured by annual income of dominant distinctive industries), agricultural development (covering agricultural production, agricultural processing, and agricultural e-commerce), tourism development (assessed by tourism revenue levels and tourism revenue per visitor),

and cultural development (evaluated by the richness of cultural resources). Second, data were collected from the bulletins of relevant villages and aggregated into comprehensive indicators to provide data support for subsequent configurational path analysis.

3.3.1 Outcome variable

This study selected “farmers’ income level” as the outcome variable, measured by the per capita disposable income of villagers in each village before and after the implementation of distinctive rural development. This choice was based on the fact that per capita disposable income of residents (villagers), serving as an important economic indicator for assessing farmers’ income growth (Huang, 2023). However, relying solely on “per capita disposable income of farmers” as direct evidence of “sustainable income growth among farmers” is unconvincing. Although official documents on distinctive village construction explicitly state that such initiatives contribute to the sustained growth of farmers’ income, they do not provide clear measurement criteria. Therefore, it is necessary to substantiate these official assertions through empirical analysis. From an economic perspective, this study operationally defines “sustainable income growth among farmers” as encompassing two core characteristics: (a) stability and continuity of growth, meaning that income follows a steady upward trajectory over the long term rather than short-term fluctuations; (b) diversification of income sources, reflected in the continuous expansion of industries or channels that increase villagers’ income, such as agricultural product processing, rural e-commerce, rural tourism, and non-agricultural employment (Lin et al., 2010). Based on this definition, a dual standard is adopted to empirically substantiate sustainable growth. First, temporal persistence requires evidence that per capita disposable income at the village level achieved substantial improvement during the seven-year period before and after the implementation of distinctive village construction. Following the outcome-oriented principle of the fsQCA method (Pappas and Woodside, 2021), the case selection in Section 3.3.3 ensures this criterion. Second, structural robustness requires evidence that, following construction, villages experienced either an expansion of income-generating channels or a relaxation of factor constraints. If the results of dynamic fsQCA indicate such conditions within the configurational pathways leading to the outcome variable, this provides supplementary evidence of structural robustness. It should be noted that this study adopts a configurational perspective to provide a retrodictive explanation of established social facts, rather than employing conventional regression methods to test causal relationships. Therefore, the above criteria can serve as indicators of sustainable income growth among farmers and provide supplementary evidence for government assessments.

3.3.2 Condition variables

As shown in Table 1, based on the theoretical framework presented in Figure 1 and field research findings, this study selected four primary factor indicators to examine the configurational pathways for farmers’ sustainable income growth: distinctive industry development, agricultural development, tourism development, and cultural development. It is noteworthy that, although Figure 1 delineates agricultural development, tourism development, and cultural development as three distinct dimensions under the framework of distinctive industry construction. In order to examine

within a dynamic configurational analysis whether the annual income of distinctive industries constituted one of the conditions for a high level of farmers’ income, it was therefore necessary during empirical implementation to establish distinctive industry construction as a parallel dimension. Each primary factor was further divided into secondary indicators, which are selected based on a comprehensive literature review and on-site field visits. The corresponding data were obtained from the bulletins of relevant villages.

3.3.3 Sample cases

Sample selection was a critical foundation for the implementation of the fsQCA method, directly influencing the scientific validity and explanatory power of the research findings. Based on the technical characteristics of configurational analysis and the research objectives, this study followed three main principles in selecting cases from the northern region of Jiangsu Province: (a) a result-oriented case selection criterion. In line with the “outcome-oriented, backward reasoning” logic of configurational analysis, cases were strictly required to meet two conditions: having been officially approved and designated as typical “Provincial Distinctive Pastoral Villages,” and having achieved a per capita disposable income for farmers exceeding the regional average by more than 10% for three consecutive years. (b) Coverage of heterogeneity in development paths. To avoid failure of configurational analysis due to case homogeneity, significant differences across cases were ensured through field investigations, specifically in terms of industrial foundations, policy implementation, historical and cultural background, and farmers’ income growth. (c) Availability of dynamic data. To accommodate the application of the dynamic fsQCA method, special attention was given to the temporal completeness of the data during case selection, ensuring that each case possessed data points from two time periods: before and after the implementation of characteristic pastoral village construction. As shown in Table 2, 19 typical provincial-level distinctive villages in 17 counties across five prefecture-level cities in Northern Jiangsu were included in the sample.

3.4 Variable calibration

The purpose of variable calibration is to transform raw data into fuzzy-set membership scores, that is, to convert the value into degrees of membership in the target set. This process defines the degree to which each case belongs to the target fuzzy set, allowing the calibrated values to serve as input for fsQCA. In this process, the selection of fuzzy-set thresholds should follow two guiding principles: First, from a theoretical perspective, the choice should avoid the risk of numerical divergence in probability logit calculations (Pappas et al., 2016; Ragin, 2008; Woodside, 2019). Because fsQCA is grounded in set theory, directly using the extreme values of 1 and 0 as thresholds would cause the corresponding log odds of membership to approach positive and negative infinity, respectively, leading to model failure. Therefore, an approximate value should be selected as the threshold. Second, in practice, the specific threshold parameters should be determined on the basis of empirical evidence or expert judgment.

According to the findings of Pappas et al. (2020) and Pappas and Woodside (2021), this study employed the direct method to calibrate

TABLE 1 Components and measurement methods of factors contributing to farmers' sustainable income growth.

Primary indicator	Secondary indicator ^a	Measurement method	Typical references
Distinctive industry construction	Annual Income of Leading Characteristic Industry	Annual income of the leading characteristic industry (10,000 yuan)	Cei et al. (2018) and Mihailović et al. (2020)
Agricultural development	Level of Agricultural Production	Primary industry output per mu (10,000 yuan/Chinese acre)	Chen et al. (2022) and Zhou et al. (2020)
	Agricultural Processing Level	Value of agricultural processing industry as a percentage of total agricultural output (%)	Ding (2023), Hamilton et al. (2024) and Kinkpe et al. (2024)
	Level of Agricultural E-commerce	Proportion of agricultural products sold via e-commerce (%)	Liu et al. (2021), Ma and Komatsu (2024) and Wang B. et al. (2025)
Tourism development	Tourism Income Level	Total tourism revenue of each village	Wang et al. (2024) and Zhang et al. (2023)
	Per-Visitor Tourism Revenue	Total tourism revenue / total number of tourists	He et al. (2022) and Ye et al. (2023)
Cultural development	Cultural Resources	Total number of cultural heritage sites at the world, national, provincial, municipal, and county levels	Dong et al. (2024) and Liu et al. (2022)

^aDue to table length constraints and to enable a more concise presentation of the experimental results in subsequent sections, the secondary indicator names have been abbreviated, as shown in Table A1.

TABLE 2 Sample cases in northern Jiangsu.

No.	Name
1	Caiwo Village, Xuzhou City
2	Xuzhuang Village, Xuzhou City
3	Niyuan Village, Xuzhou City
4	Chenyoufang Village, Xuzhou City
5	Shouxian Village, Xuzhou City
6	Juxian Village, Suqian City
7	Sancha New Village, Suqian City
8	Denglonghu Community, Suqian City
9	Babao Village, Suqian City
10	Taiping Village, Lianyungang City
11	Qianji Village, Lianyungang City
12	Hanli Village, Lianyungang City
13	Xiaoqiaoxu Village, Lianyungang City
14	Xinmin Village, Lianyungang City
15	Gaoqiao Village, Hua'an City
16	Jiafu Village, Yancheng City
17	Hengbei Village, Yancheng City
18	Wangcun Village, Yancheng City
19	Lanzhi Village, Yancheng City

variables into fuzzy-set membership scores, converting quantitative data into membership values ranging between 0 and 1. Calibration anchors were set at the 95th percentile (upper quartile), median (50th percentile), and 5th percentile (lower quartile), corresponding, respectively, to full membership, the crossover point, and full non-membership. This threshold selection is theoretically justified by its approximation to the extreme values of 1 and 0 and has demonstrated practical effectiveness through widespread application (Beynon et al., 2024; Ding et al., 2025; Fan and Wang, 2024; Fu et al., 2024; Perdomo-Verdecia et al., 2024). Together, these considerations validate the approach used in this study. The Result as shown in Table 3.

4 Results

4.1 Necessity analysis of single condition variables for farmers' sustainable income growth

Prior to conducting configurational analysis, the necessity test of individual condition variables was employed to determine whether a single condition could produce the outcome, with the criterion being whether the consistency score for a necessary condition exceeds 0.9 (Schneider and Wagemann, 2012). As shown in Table 4, before and after distinctive rural development, the consistency scores of individual condition variables with respect to high-level farmers' income are all below 0.9, indicating that no single element of distinctive rural development can foster an increase in villagers' per capita disposable income. Therefore, Hypothesis 1 (H1) is supported: farmers' sustainable income growth arises from the collaborative interactions of multiple factors; rather, farmers' sustainable income growth depends on the synergistic interaction among multiple factors; With regard to non-high-level farmers' income, the consistency level for “~AILCI” exceeds 0.9, indicating that “~AILCI” constitutes a necessary condition for non-high-level farmers' income; in other words, a low level of distinctive industry construction leads to non-high farmers' sustainable income levels.

4.2 Sufficiency analysis of the promotion of farmers' sustainable income growth through distinctive rural development

The consistency level for sufficiency serves as the standard for determining how antecedent conditions influence the occurrence of an outcome (Crilly et al., 2012). Schneider proposed that the threshold should not be lower than 0.75 (Schneider and Wagemann, 2012), and subsequent studies further suggested that when the consistency-adjusted distance is less than 0.1, the solution precision is considered high (Zhang J., 2023). Accordingly, as shown in Table 5, this study sets the consistency and PRI thresholds for the periods before and after the distinctive rural development as follows. Conditions appearing in

TABLE 3 Variable calibration and descriptive statistics.

Element		Fuzzy-set calibration			Descriptive statistics			
		Full membership	Crossover point	Full non-membership	Mean	Standard deviation	Minimum	Maximum
Pre-construction								
Outcome variable	PCDIV	3.56	1.87	1.106	2.14	0.89	0.80	3.9
Condition variables	AILCI	8,520	132	0.00	2,093.68	3,975.43	0.00	15,000
	LAP	1.37	0.25	0.02	0.53	0.58	0.02	2
	APL	65.86	10	0.00	17.10	21.63	0.00	70
	LAE	30.5	1	0.00	7.74	12.71	0.00	35
	TIL	494	10	0.00	107.58	217.86	0.00	800
	PTR	270	16.67	0.00	59.65	94.03	0.00	300
	CR	3.30	0.00	0.00	0.53	1.50	0.00	6
Post-construction								
Outcome variable	PCDIV	4.35	2.90	2.25	3.15	0.77	2.20	4.80
Condition variables	AILCI	16,200	361.00	17.68	3,038.16	5,428.57	14.80	1,800
	LAP	3.25	0.50	0.05	1.00	1.36	0.05	5.50
	APL	85.00	25.00	0.00	30.53	27.52	0.00	85
	LAE	52.50	15.00	0.00	20.76	21.75	0.00	75
	TIL	786	50.00	2.70	192.21	315.08	0.00	1,200
	PTR	210	28.57	0.27	59.11	78.77	0.00	300
	CR	11.50	0.00	0.00	2.37	4.44	0.00	16

TABLE 4 Analysis of necessary conditions for farmers’ sustainable income growth.

Element	Pre-construction		Post-construction	
	YRJ*	~YRJ	YRJ	~YRJ
AILCI	0.72	0.37	0.68	0.35
~AILCI	0.56	0.91	0.58	0.92
LAP	0.74	0.46	0.64	0.43
~LAP	0.51	0.79	0.57	0.79
APL	0.53	0.49	0.61	0.55
~APL	0.66	0.71	0.64	0.70
LAE	0.69	0.35	0.66	0.46
~LAE	0.54	0.88	0.53	0.74
TIL	0.57	0.36	0.68	0.45
~TIL	0.58	0.80	0.60	0.82
PTR	0.53	0.49	0.55	0.58
~PTR	0.68	0.72	0.71	0.68
CR	0.76	0.78	0.80	0.80
~CR	0.66	0.64	0.59	0.60

*YRJ denotes the consistency score of the outcome variable in necessity analysis.

both the intermediate solution and the parsimonious solution are identified as core conditions, while those appearing only in the parsimonious solution are identified as peripheral conditions.

The results of the sufficiency tests are presented separately in [Tables 6, 7](#). Prior to distinctive rural development, the pathways promoting farmers’ sustainable income growth were limited to the Agriculture-Oriented E-Commerce Driven type and Agriculture-Oriented Chain-Based Collaborative type. Following the construction of distinctive pastoral villages, two additional pathways emerged: the Composite Value-Added Driven type and the Innovation-Driven Agriculture-Tourism Co-Driven type. The specific results are as follows.

4.2.1 Path one: agriculture-oriented E-commerce driven type

As shown in [Tables 6, 7](#), the sufficiency analysis indicates that configurations C1, C2, C5, and C6 all consist of the following condition elements: high annual income from leading distinctive industries, high levels of agricultural e-commerce, high tourism revenue levels, and abundant cultural resources, thereby constituting high farmers’ income levels. These configurations are collectively referred to herein as Path one.

As presented in [Table 8](#), the prototypical case for configurations C1, C2, and C5 is Hengbei Village in Yancheng City. Prior to distinctive village development, the village was characterized by large-scale cultivation of early crisp pears and had developed corresponding agricultural e-commerce and farm-stay-focused tourism, thereby forming a distinctive industry system. In Configurations C1 and C2, this manifested as the presence of AILCI, LAP, and LAE as core conditions. Despite these features, the village still faced the practical

TABLE 5 Consistency threshold parameters for the sufficiency analysis.

Parameter threshold	Pre-construction	Post-construction
Raw consistency threshold	0.80	0.80
PRI threshold	0.75	0.80

issues of low agricultural processing levels and unclear development pathways. Specifically, the low level of agricultural processing is manifested by APL's peripheral absence in configuration C1 and by its omission as a condition in Configuration C2. The unclear development pathways are evidenced by the village's adoption of two equivalent pathways, represented by Configurations C1 and C2. Configuration C1 is characterized by the peripheral absence of high agricultural processing levels, whereas Configuration C2 is defined by the peripheral presence of high per-visitor tourism revenue. The equivalence of these pathways suggests that tourism development can compensate for deficiencies in processing capacity, while their duality underscores the issue of unclear development trajectories. In response, during the distinctive rural development process, the village clarified its strategy for scaling tourism development by establishing the "Pear Orchard" agro-tourism site and hosting the "Pear Cultural Festival" centered on pear culture. This initiative yielded a 60.9% increase in total tourism revenue, elevating "high tourism revenue levels" from a peripheral to a core condition and excluding the condition of low agricultural processing level from the configuration set. Ultimately, Configuration C5 emerged as the sole configuration driving income growth among the farmers in this village. The reduction in the number of configurational pathways and the alteration of the condition set in this case indicate that while distinctive rural development clarifies the sustainable income-growth pathways for farmers, it simultaneously relaxes the factor constraints on these pathways.

Configuration C6 represents a novel configuration emerging after distinctive rural development, reflecting the expansion of sustainable income-growth pathways facilitated by Distinctive Village Construction. In contrast to Configurations C1, C2, and C5, Configuration C6 is distinguished by the core presence of a high level of agricultural processing. As presented in Table 8, taking Juxian Village, it is a prototypical case for Configuration C6 during the development process. The village developed a "Floriculture + E-Commerce" distinctive industry based on its floriculture sector, while proactively promoting the development of supporting agricultural processing industries to bolster agriculture-e-commerce, resulting in a 50% increase in the proportion of processed agricultural products. Simultaneously, leveraging the peripheral condition of abundant cultural resources—specifically, floriculture industry—the village vigorously developed agro-tourism, increasing annual tourism revenue from CNY 3 million before the development to CNY 5 million. Based on the above analysis, the village exhibits four core conditions: high annual income from leading characteristic industries, high agricultural processing levels, high agricultural e-commerce levels, and high tourism revenue levels. These correspond to Configuration C6, in which the presence of core conditions—AILCI, APL, LAE, and TIL—collectively constitutes a configurational pathway to high farmers' income.

Although the four configurations exhibit different emphases, they share a common mechanism for promoting farmers' income growth:

relying on agriculture to establish a leading distinctive industry. By enhancing e-commerce channels and developing cultural resources, they drive the development of both agriculture and its associated tourism sector, achieving synergies between industry-chain extension and farmers' sustainable income growth. Accordingly, this configuration type is designated as the Agriculture-Oriented E-Commerce Driven Type.

4.2.2 Path two: agriculture-oriented chain-based collaborative type

Based on Configurations C3 and C7, the combination of high annual income from leading distinctive industries, high levels of agricultural production, high proportions of agricultural processing, high proportions of agricultural e-commerce, abundant cultural resources, and low tourism performance constitutes a sufficient condition for achieving high farmers' income levels. These configurations are herein categorized as Path two.

As shown in the analysis of Table 8, the prototypical case of Lanzhi Village exemplifies the characteristics of Configurations C3 and C7. Before the development of the distinctive village, the village cultivates watermelon as its primary cash crop and relies on agricultural e-commerce sales, effectively reducing intermediary links between producers and consumers and thereby increasing per-Chinese arce yields. Moreover, the standardization requirements imposed by agricultural e-commerce on product packaging have driven the development of the agricultural processing industry. In configuration C3, AILCI and LAE are manifested as the presence of core condition, while APL is manifested as the presence of peripheral condition. Meanwhile, the village faced peripheral constraints such as low tourism revenue levels and low per-visitor tourism income, which limited further income growth among farmers. In Configuration C3, TIL and PTR are manifested as the absence of peripheral condition. To overcome these constraints, during the construction process the village actively promoted regional tourism activities, including pick-your-own experiences, thereby alleviating the issue of insufficient economies of scale in tourism; this change is reflected in Configuration C7 by the exclusion of the low tourism revenue level condition. Additionally, leveraging the peripheral condition of high cultural resources embodied by the "Dongtai Watermelon" brand, the village upgraded watermelon varieties and packaging, resulting in a 66.7% increase in processing industry output value—reflected in Configuration C7 by the transition of high agricultural processing level from a peripheral to a core condition.

Based on the above cases and the results of Configurations C3 and C7, we conclude that, prior to distinctive village development, the village was primarily agriculture-oriented, accompanied by the development of e-commerce and agricultural processing industries to increase farmers' income. After distinctive village development, interventions focused on leveraging existing agricultural and cultural resources to remedy weaknesses in the tourism sector. These interventions fostered a synergistic relationship among agricultural e-commerce, processing, and production, thereby enhancing farmers' income. The collaborative dynamics and the resulting distinctive industrial system align with the assumptions of the theoretical framework shown in Figure 1. Accordingly, this income-growth

TABLE 6 Sufficiency analysis of conditions for farmers’ sustainable income growth before distinctive village construction.

Element	Path one		Path two
	Configuration C1	Configuration C2	Configuration C3
AILCI	●	●	●
LAP	●	●	●
APL	⊙		●
LAE	●	●	●
TIL	●	●	⊙
PTR		●	⊙
CR	●	●	●
Raw coverage	0.29	0.30	0.16
Unique coverage	0.02	0.04	0.03
Consistency	0.99	0.99	0.98
Overall solution coverage	0.37		
Overall solution consistency	0.99		

● indicates the presence of a core condition; ⊙ indicates the absence of a core condition; ● indicates the presence of a peripheral condition; ⊙ indicates the absence of a peripheral condition. The same notation applies to Table 7 and Table 9.

TABLE 7 Sufficiency analysis of conditions for the promotion of farmers’ sustainable income growth through distinctive village construction.

Element	Path three	Path one		Path two	Path four
	Configuration C4	Configuration C5	Configuration C6	Configuration C7	Configuration C8
AILCI		●	●	●	●
LAP		●		●	●
APL	●		●	●	●
LAE	●	●	●	●	
TIL	●	●	●		●
PTR	⊙			⊙	⊙
CR	●	●	●	●	●
Raw Coverage	0.24	0.33	0.25	0.21	0.22
Unique Coverage	0.04	0.12	0.02	0.04	0.05
Consistency	1	1	1	0.98	1
Overall solution coverage	0.51				
Overall solution consistency	0.99				

pathway is designated as the Agriculture-Oriented Chain-Based Collaborative Type.

4.2.3 Path three: composite value-added driven type

Configuration C4 indicates that the core conditions for achieving high levels of villagers’ disposable income are high agricultural processing levels, high agricultural e-commerce levels, high tourism revenue levels, and low per-visitor tourism income, with abundant cultural resources serving as a peripheral condition.

As shown in the analysis of Table 8, a prototypical case analysis reveals that the development model of Niyuan Village conforms to the characteristics of Configuration C4. Under the coordination of the villagers’ committee, the village employed a business alliance model to

promote farmers’ sustainable income growth. Specifically, farmers invested capital in cooperatives, which in turn attracted specialized vendors and facilitated the development of processing industries such as winemaking and textile crafts to enhance the tourism experience. Concurrently, villagers were guided to invest in boutique homestays and dining services, and a tourism sightseeing sector was established based on tea culture. Given that tea culture provided only resource support to this model and indirectly contributed to farmers’ income growth, it was identified as the presence of a peripheral condition in configuration C4. During the operation of this model, annual tourism revenue increased from CNY 100,000 to CNY 800,000. Although per-visitor tourism revenue remained low (CNY 0.3) and PTR was absent as a core condition in Configuration C4, the surge in tourist arrivals significantly boosted the proportion of e-commerce sales, achieving a breakthrough

TABLE 8 Distribution of typical cases across configurational pathways.

Path	Configuration	Typical case
Path one	C1	Jiafu Village, Yancheng City; Hengbei Village, Yancheng City
	C2	Caiwo Village, Xuzhou City; Hengbei Village, Yancheng City
	C5	Hengbei Village, Yancheng City; Jiafu Village, Yancheng City; Wangcun Village, Yancheng City
	C6	Taiping Village, Lianyungang City; Juxian Village, Suqian City
Path two	C3	Lanzhi Village, Yancheng City
	C7	Lanzhi Village, Yancheng City
Path three	C4	Niyuan Village, Xuzhou City
Path four	C8	Caiwo Village, Xuzhou City

from 0 to 50%. Moreover, to comply with e-commerce standardization requirements and support tourism development, the agricultural processing industry underwent continuous optimization and upgrading, ultimately forming processing industry clusters and raising the proportion of processed agricultural products from 3 to 11%. This development model engendered a farmers' sustainable income-growth mechanism characterized by tourism-driven e-commerce expansion and quality-enhancement of processed products supporting both e-commerce and tourism market extension. Therefore, in Configuration C4, APL, LAE, and TIL are manifested as the presence of core conditions.

This model, which promotes farmers' sustainable income growth through a business alliance approach, operates primarily by leveraging capital and implementing equity-based incentives to diversify and strengthen farmers' income sources (Liu et al., 2023). In addition, the business alliance comprises firms from multiple sectors—agricultural processing, agricultural e-commerce, and tourism—that together contribute to farmers' income growth. This finding is consistent with the theoretical framework shown in Figure 1. Unlike other configurations, C4 is distinguished by the absence of annual income from leading distinctive industries as a core condition; instead, it constructs a composite income-growth pathway through industry-chain extension (agricultural processing), channel innovation (e-commerce), and resource development (tourism). Accordingly, this pathway is designated the Composite Value-Added Driven Type.

4.2.4 Path four: innovation-driven agriculture-tourism co-driven type

Configuration C8 indicates that the core conditions of high annual income from leading distinctive industries, high levels of agricultural production, high tourism revenue levels, and low per-visitor tourism income, together with the peripheral conditions of high agricultural processing proportions and abundant cultural resources, constitute a sufficient configuration for high farmers' income levels. This configuration is hereafter referred to as Path four.

A prototypical case analysis demonstrates that Caiwo Village's development model aligns with the characteristics of Path four (see Table 8). The village has realized farmers' sustainable income growth by establishing an innovative model of distinctive industry development and by facilitating the economic valorization of cultural resources. The

innovation in the industry model is primarily reflected in the creative utilization of existing specialty forestry and fruit resources. On one hand, the under-forest economy was expanded: the scale of free-range chicken farming increased and associated deep-processing products were developed, thereby enhancing per-unit-area output and raising the added value of agricultural products, which in turn promoted both farmers' income and processing industry development. On the other hand, based on the specialty forestry and fruit sector, new distinctive agricultural projects such as watermelon cultivation were introduced to further diversify farmers' income channels. The economic valorization of cultural resources relied on the medicinal and historical assets of Zhuyu Mountain to create an integrated tourism-resort complex, alongside the development of outdoor activities such as mountaineering and skiing, which spawned supporting industries including farm stays and homestays. Although the per-visitor tourism income remained low due to the nature of the tourism offerings, the overall tourism revenue level was high and effectively contributed to farmers' sustainable income growth. Therefore, in Configuration C8, AILCI and LAP are manifested as the presence of core conditions, APL, TIL and CR are manifested as the presence of peripheral conditions, whereas PTR is manifested as the absence of a core condition.

The mechanisms underlying farmers' income growth in the cases above can be summarized as innovation in distinctive agricultural industries combined with the economic valorization of cultural resources. The synergy between these two drivers and their impact on income growth is consistent with the theoretical framework presented in Figure 1. Moreover, the results for Configuration C8 indicate that, unlike Configurations C1–C7, Path four depends primarily on upstream innovation within distinctive industries and the economic valorization of cultural resources to drive the synergistic development of agriculture and tourism, rather than depending on enhancements in agricultural e-commerce. Therefore, this income-growth pathway is designated the Innovation-Driven Agriculture-Tourism Co-Driven Type.

All four pathways demonstrate that multiple factors synergistically promote farmers' sustainable income growth. The typical cases within these pathways reveal interrelationships among factors and their collaborative effects, providing strong support for Hypothesis 2 (H2). These results are consistent with the conceptual scenario in Section 2 and thus confirm the framework's broader applicability. Moreover, the case analysis of Pathway 1 suggests that distinctive village construction has relaxed factor constraints on farmers' sustainable income growth, consistent with the principles discussed in Section 3.3.1. Accordingly, the four pathways can be regarded as configurational patterns for achieving sustainable income growth among farmers.

4.3 Sufficiency analysis of non-high levels of farmers' sustainable income growth in distinctive village development

This study further conducted a configurational analysis of the distinctive rural development environments associated with non-high farmers' income levels to validate the robustness of the necessity and sufficiency analysis results.

The analysis revealed that there were three configurations associated with non-high farmers' income levels prior to distinctive rural development and four such configurations following Distinctive Village Construction. As shown in Table 9, the configurational

analysis indicates that, according to Configurations F2 through F7, low annual income from leading distinctive industries constitutes one of the factors leading to non-high farmers' income levels. This finding corroborates the conclusion of the necessity analysis that low income from leading distinctive industries is a necessary condition for non-high farmers' income levels—underscoring the importance of distinctive industry construction in the Distinctive Village Construction process for promoting farmers' sustainable income growth. However, according to Configuration F1, even if the village exhibits high annual income from leading distinctive industries, the constraints of low agricultural production levels, low agricultural processing levels, low agricultural e-commerce levels, low tourism revenue levels, and low per-visitor tourism income will still result in non-high farmers' income levels. According to Configurations F3 and F7, although the village may have high tourism revenue levels, high per-visitor tourism income, and high agricultural production levels, low annual income from leading characteristic industries, low agricultural processing levels, and low agricultural e-commerce levels will remain core conditions for non-high farmers' income levels. Therefore, the results of Configurations F1, F3, and F7 further demonstrate that achieving high farmers' income levels requires the synergistic development of distinctive industry construction, agricultural development, tourism development, and cultural development, rather than the development of any single industry.

4.4 Robustness test

Robustness tests are crucial to the validity of conclusions derived from the fuzzy-set Qualitative Comparative Analysis (fsQCA) method, as they help eliminate issues of randomness and sensitivity arising from parameter and model specifications (Krogslund et al., 2015). Previous studies have proposed approaches for robustness testing from two perspectives: set-theoretic (Schneider and Wagemann, 2012) and statistical (Kim, 2013). The set-theoretic approach verifies robustness by altering the set membership status of different configurations and adjusting fit parameters—corresponding to the deletion or supplementation of cases and the modification of consistency threshold, respectively. In contrast, the statistical approach focuses on altering the data source, for instance, by measuring and analyzing the same cases across different time periods. Accordingly, to ensure the robustness of the conclusions, this study conducts robustness tests from both set-theoretic and statistical perspectives. If the results of the sufficiency analysis and the robustness test exhibit a clear subset relationship, the results can be considered robust (Schneider and Wagemann, 2012).

From the perspective of set-theoretic analysis, drawing on the approach proposed by Schneider and Wagemann (2012), the robustness of the conclusions is verified using two main strategies. First, a case-deletion test is performed. While keeping the calibration thresholds constant, one case is randomly removed from the original set of 19 cases, and the robustness test is repeated using the remaining 18 cases. This process is conducted 19 times in total. The resulting configurational paths are consistent with those reported in Tables 6, 7, indicating the robustness of the findings. Second, the consistency threshold is varied. In the aforementioned study, the original consistency threshold and PRI (Proportional Reduction in Inconsistency) consistency threshold for the sufficiency analysis

before distinctive rural development were adjusted to 0.85 and 0.8, respectively; the configurational paths, consistency levels of the overall solutions, and coverage remained largely consistent with those in Table 6. For the sufficiency analysis after distinctive rural development, both the original consistency threshold and PRI consistency threshold were adjusted to 0.85, with configurational paths, consistency levels of the overall solutions, and coverage remaining largely consistent with those in Table 7. Both sets of results were robust. Additionally, as shown in section 4.3, the sufficiency analysis of non-high levels of farmers' income growth in distinctive rural development, in essence, serves as a robustness test of the conclusions from a counterfactual perspective.

The existing dynamic perspective has indirectly examined the robustness of the configurational results from a statistical standpoint. As discussed in Section 4.2, the findings indicate that, from a configurational path perspective, distinctive rural development not only retained the original sustainable income growth paths observed prior to its implementation but also introduced two new paths. Therefore, the income growth paths before and after the implementation of distinctive rural development exhibit a clear subset relationship, demonstrating the robustness of the results. From the case-based perspective, take Hengbei Village in Yancheng City as an example. It serves as a typical case for configurations C1, C2, and C5. The aforementioned analysis reveals a clear subset relationship among these configurations: C1 and C2 correspond to the period before the implementation of distinctive rural development, while C5 pertains to the post-implementation phase. The configurational results of the same case across different time periods also exhibit a nested relationship. A similar pattern is observed in Lanzhi Village, Yancheng City, further corroborating the robustness of the results.

5 Discussion

5.1 Applicability of fsQCA method in distinctive villages analysis

5.1.1 fsQCA as a solution to existing data constraints

The data exhibit three primary characteristics. First, the sample size is limited; in northern Jiangsu, only 19 villages have been officially designated as typical "Provincial Distinctive Pastoral Villages." Second, control groups are absent, since villages that fail to meet the distinctive village standards typically do not disclose relevant economic data. Third, data acquisition is difficult: information disclosure within China's administrative system remains incomplete (Ma, 2025), requiring researchers to collect data manually from publicly available village bulletins. These characteristics render the fsQCA method particularly suitable, with its advantages primarily reflected in the following aspects:

First, the fsQCA method imposes relatively modest sample-size requirements (Du and Jia, 2017). It is applicable to small-N studies (≤ 10 –15 cases) (Han and Kim, 2025), medium-N studies (15–50 cases) (Zhang and Chen, 2025), and even large-N studies (> 100 cases) (Ragin and Strand, 2008; Crilly et al., 2012; Li S. et al., 2025). Given that the development of distinctive villages in China remains in its nascent stages, the available sample is limited, rendering mainstream econometric approaches with large-sample demands impractical. Moreover, China

TABLE 9 Sufficiency analysis for non-high levels of farmers’ sustainable income growth.

Element	Pre-construction			Post-construction			
	Configuration F1	Configuration F2	Configuration F3	Configuration F4	Configuration F5	Configuration F6	Configuration F7
AILCI	●	◉	◉	◉	◉	◉	◉
LAP	◉	◉	●	◉	◉	●	●
APL		●	◉		●	◉	◉
LAE	◉	◉	◉	◉	◉	●	◉
TIL	◉		●	◉	◉	◉	●
PTR	◉	◉	●	◉		●	●
CR	●	●	●	●	●	●	●
Raw Coverage	0.27	0.33	0.22	0.37	0.37	0.23	0.25
Unique Coverage	0.11	0.17	0.12	0.07	0.06	0.05	0.07
Consistency	0.99	1	1	0.96	0.95	0.93	0.94
Overall solution coverage	0.57			0.61			
Overall solution consistency	0.99			0.95			

has yet to establish an online disclosure platform for village-level data; relevant information must still be obtained via offline consultation of original bulletins (Ma, 2025). Therefore, employing fsQCA addresses the challenges posed by small samples, reduces data-collection workload, and produces robust, reliable findings.

Second, the fsQCA method's result-oriented approach compensates for the limitation posed by the absence of control groups in the sample data. In essence, the method starts from the outcome and works backward to unravel the complex configuration of conditions underlying it (Woodside, 2019). It addresses the absence of control groups through three strategies: (a) its result-oriented analytical logic enables researchers to focus on successful cases (Li L. et al., 2025) and, by deconstructing multiple representative instances, to identify the key condition configurations driving the development of distinctive villages. Even without control-group data, optimal pathways to the research objectives can be effectively extracted. (b) Counterfactual analysis (as shown in Section 4.3) is employed to explore scenarios in which the observed outcomes do not occur. This strategy parallels the logic of including control groups, as both approaches validate the robustness of the conclusions from an opposing perspective (Pappas et al., 2016). Thus, the absence of control groups in the sample can be effectively compensated. (c) Robustness checks via parameter adjustments further confirm the reliability and scientific rigor of both the primary findings and the counterfactual results.

5.1.2 fsQCA's comparative advantages over traditional regression analysis

Compared to conventional regression analysis techniques, fsQCA is better suited for investigating contemporary challenges in distinctive villages for three reasons: First, as noted above, the scarcity of village-level data renders the sample sizes required for regression-based causal inference infeasible.

Second, although numerous studies have examined the causal impact of single factors on farmers' income (Chen et al., 2022; Ding, 2023; Hamilton et al., 2024; Zhou et al., 2020). However, both provincial-level policymakers and village-level practitioners currently need inductive insights into distinctive models of village development. Such research should delineate the optimal configuration of factors for achieving economic objectives across various scenarios, thereby offering practical guidance to villages that have yet to attain sustainable income growth, rather than merely reiterating established causal inferences.

Third, regarding the research subjects, the complexity and systemic characteristics of distinctive villages render the fsQCA method especially suitable for such investigations (Berg-Schlosser and De Meur, 2009). As shown in Figure 1, the practice of distinctive villages clearly exhibits inter-dependence among variables, which collectively drive outcome generation and reflect their systemic nature. It is therefore evident that the conventional regression approach, which emphasizes the "net effect" of individual factors on outcomes, is not suitable for this context (Li L. et al., 2025; Tang et al., 2023). In terms of causality, the causal relationships in distinctive village practices are asymmetric (see Sections 4.2 and 4.3), reflecting the system's complexity and manifested in the differing configurations that lead to sustainable income growth for low-income versus high-income farmers. Such causal asymmetry cannot be accommodated within the framework of traditional regression analysis (Pappas and Woodside, 2021). Although interaction terms in traditional regression

can partially account for variable inter-dependence, when their number exceeds three, as in this study, which includes seven variables, the explanatory power deteriorates markedly and model robustness becomes difficult to guarantee (Du and Jia, 2017).

5.1.3 Comprehensive consideration of case heterogeneity

Although well suited for analyzing issues in distinctive village construction, case selection underpins the fsQCA methodology, directly shaping its outcomes and the generalizability of its results (Pappas et al., 2020; Pappas and Woodside, 2021), and must therefore take into account the following two key factors:

First, Heterogeneity among cases from different regions. Regional distinctive industries constitute a decisive condition for constructing distinctive villages; however, these industries vary markedly across China's regions (Xu et al., 2025), affecting the generalizability of their research findings. For example, rural areas in northern Jiangsu possess a relatively strong industrial infrastructure (Feng et al., 2025). Their distinctive industries include agricultural processing and rural tourism, supported by abundant natural resources, high agricultural productivity, and cultural heritage assets, conclusions drawn from the northern Jiangsu region studied here may be applicable to similar areas, such as those in the neighboring Zhejiang Province (Yan et al., 2025). By contrast, the Agriculture-Oriented Chain-Based Collaborative Type discussed in Section 4.2.2 does not apply to some ethnically themed villages in southwest China, and the Composite Value-Added Driven Type discussed in Section 4.2.3 is also inapplicable to the construction of distinctive villages in the Tibet Autonomous Region (Fang and Yang, 2025), where the processing industry remains underdeveloped. Owing to its result-oriented logic (Pappas et al., 2020; Pappas and Woodside, 2021), combining such heterogeneous cases in the fsQCA analysis may lead to sufficiency analyses that identify "typical cases" that fail to match actual conditions. Therefore, researchers employing fsQCA should carefully consider regional heterogeneity and explicitly define the boundaries of the generalizability of their findings.

Second, Intra-regional Case Heterogeneity. When selecting samples, two factors should be considered to enhance heterogeneity and improve result robustness. First, with respect to typical cases (see Section 3.2.3), include villages that represent diverse industrial foundations and cultural backgrounds; otherwise, fsQCA will yield overly uniform causal pathways, limiting the generalizability of findings. Second, although existing disclosure mechanisms cannot supply data for control groups (see Section 5.1.1) and their absence does not invalidate our conclusions, the inclusion of control groups is nonetheless recommended to further bolster the robustness and persuasiveness of the results.

5.2 Policy recommendations

5.2.1 Continued guidance for cultivating distinctive industries in undesignated villages

Based on the necessity analysis in Section 4.1 and the asymmetry analysis in Section 4.3, we conclude that "low-level characteristic leading industry annual income" constitutes a necessary condition for non-high-level farmers' income. Therefore, villages that lack distinctive industries should prioritize overcoming this necessary

condition in policy design and implementation. In this process, the government, acting as both policymaker and governance leader, should play a guiding role by assisting these villages in clarifying the development orientation of their distinctive industries (Saputra and Havlíček, 2024). Firstly, the government should consider establishing a specialized resource database. Using a combination of household and field surveys, expert assessments, and geographic information system (GIS) data collection, authorities can compile a comprehensive inventory of villages' distinctive resources—such as cultural assets, specialty agricultural products, and ecological resources. Based on this inventory, a quantitatively database can be constructed to enable cross-village comparison of resource endowments (Lang et al., 2025). Such a database would help villages identify comparative development advantages and avoid indiscriminate industrial choices that stem from unclear recognition of resource endowments.

Second, assist villages in identifying appropriate types of distinctive industries. Based on the four sustainable income-increasing pathways identified in Section 4.2, it is evident that villages exhibit differentiated path characteristics when relying on distinctive industries to promote farmers' sustainable income growth. Therefore, with the support of databases that reveal villages' comparative advantages, governments should consider multiple factors such as cost-benefit balance, market demand, and environmental carrying capacity. On this basis, they should establish scientifically sound criteria for screening and prioritizing distinctive industries, thereby clarifying industry types that align with the long-term development needs of villages (Peng et al., 2023). Specifically, villages with a solid agricultural foundation but relatively limited cultural and tourism resources may prioritize the Agriculture-Oriented E-Commerce Driven Type or the Agriculture-Oriented Chain-Based Collaborative Type. In such cases, the focus should be placed on expanding agricultural e-commerce to open sales channels, or on developing agricultural product processing to enhance industrial value added. By contrast, villages endowed with both agricultural and cultural-tourism resources may actively explore the Composite Value-Added Driven Type or the Innovation-Driven Agriculture-Tourism Co-Driven Type, with the aim of extending the value chain through industrial integration. Meanwhile, in practical implementation, emphasis should be placed on the organization and scaling-up of industries (Zhou et al., 2023). For instance, villagers' specialized cooperatives may be guided to establish, leading enterprises may be introduced, and a collaborative production model involving companies, cooperatives, and households may be constructed. Such efforts can progressively improve the upstream and downstream industrial chains surrounding distinctive industries.

5.2.2 Organizations should promote the experience of distinctive village development in northern Jiangsu

This study, grounded in distinctive-village development in northern Jiangsu, focuses on the sustainability of farmers' income. The findings identify alternative configurational pathways to sustainable income growth and show that distinctive-village initiatives can relax factor constraints and broaden income channels, thereby promoting sustained income growth. These results directly support SDG 1 (No Poverty) and SDG 3 (Good Health and Wellbeing). Consequently, the findings may have relevance for other countries and regions.

International organizations such as the Food and Agriculture Organization (FAO) and the Asian Infrastructure Investment Bank (AIIB) should play a key bridging and enabling role (Cappellaro et al., 2025). First, promote demonstration experiences at scale. Led by international organizations in collaboration with the Chinese government and regional bodies, a policy toolkit based on northern Jiangsu's model should be developed and, drawing on the four development pathways identified in Section 4.2, disseminated to areas with similar agroecological and market conditions, such as the Red River Delta in Vietnam and lowland areas of the Mekong region in Thailand (Arbara and Hooimeijer, 2025). Practical measures include preparing multilingual policy briefs and case manuals, organizing regional policy dialogues, and conducting short-term study visits to selected demonstration villages. Concurrently, monitoring indicators should be established to measure dissemination effectiveness; suggested indicators include policy adoption rates, the number of replicated demonstration villages, and the extent to which recipient countries integrate the measures into national rural development plans. Second, organize expert exchanges and capacity building. International organizations, together with universities, research institutes, and local agricultural-extension agencies, should establish exchange and training programs to promote distinctive-village practice. The program should include expert exchanges, short-term in-situ advisory placements in demonstration villages, reciprocal farmer exchanges, and structured training courses. Curricula and exchanges should focus on value-chain upgrading, deep processing of agricultural products, and integration with e-commerce platforms, with an emphasis on localization and practical operational tools.

5.3 Research limitations and future research prospects

Despite its contributions, this study has several limitations. First, in terms of variables, the limited set of conditional variables considered constrains our ability to identify all relevant factors and causal pathways underlying distinctive village outcomes. Moreover, although policy documents claim that distinctive village development promotes farmers' sustainable income growth, they do not provide explicit measurement criteria. Such claims may reflect experiential judgments from fieldwork. Therefore, our empirical analysis can only employ outcome variables related to household income, starting from the definition of sustainable income growth among farmers and using the dynamic fsQCA method to provide auxiliary validation of this viewpoint. Second, regarding sample and method, while dynamic fsQCA is well suited to configurational analysis of typical cases, the absence of ordinary or unsuccessful villages as a comparison group limits the robustness of our findings. Including such counterfactual cases (or expanding the sample) and triangulating with complementary methods would enhance causal inference and richer pathway exploration. Accordingly, future research should address these limitations by pursuing the following directions:

First, the theoretical framework proposed in this study should be further extended. Although the current framework is developed primarily from an economic perspective, future research should incorporate environmental dimensions as the concept of sustainable development becomes more deeply embedded. It is essential to explore how farmers' sustainable income growth can reconcile

income continuity with environmental sustainability. Second, a more diverse set of research methods should be employed. As distinctive village construction progresses, future studies will benefit from larger samples that include both successful and less successful (or average performing) cases as comparison groups. This would make it feasible to apply conventional econometric approaches such as DID and synthetic control methods to evaluate impacts. Such analyses are important because, on the one hand, they can empirically test the government's claim that distinctive village construction promotes farmers' sustainable income growth; on the other hand, by incorporating a broader set of conditional variables, they can investigate additional drivers of rural sustainable income growth (e.g., climate variability, market access, and policy heterogeneity). Third, cross-regional comparative studies should be conducted. Future research should move beyond a single-region perspective by selecting rural cases across diverse geographic settings, resource endowments, and policy contexts. Such comparative work would help identify both common configurational pathways and region-specific particularities for achieving sustainable income growth among farmers, thereby informing differentiated, regionally tailored development strategies.

6 Conclusion

This study reveals that within the framework of distinctive rural development, no single factor is a necessary condition for farmers' sustainable income growth; however, low annual income from leading distinctive industries is a necessary condition for maintaining low income-growth levels among farmers. fsQCA identifies four pathways for farmers' sustainable income growth: the Agriculture-Oriented E-commerce Driven Type, the Agriculture-Oriented Chain-Based Collaborative Type, the Composite Value-Added Driven Type, and the Innovation-Driven Agriculture-Tourism Co-Driven Type. These pathways demonstrate that farmers' sustainable income growth results from the synergistic interaction of multiple factors rather than the influence of a single factor. Distinctive rural development alleviates factor constraints in traditional income-growth pathways, expands new avenues for income growth, thereby enhancing farmers' capacity for income sustained growth. In addition, distinctive rural development enables villages to achieve comparable income growth effects through agricultural and tourism industrialization, even when the development level of distinctive industries remains relatively low.

The Chinese government should strengthen policy support for villages that have not yet completed distinctive village development, guiding them to identify resource endowments accurately and to develop multi-domain distinctive industrial systems encompassing agriculture, tourism, and cultural development. Such support would facilitate sustainable increases in farmers' incomes. International organizations can further assist by disseminating Northern Jiangsu's distinctive village development experiences to regions with comparable conditions, thereby contributing to the sustainability of farmers' income growth beyond the study area. Future research should integrate environmental dimensions into the analytical framework and adopt a broader range of analytical methods to deepen understanding of how distinctive village development fosters sustainable income growth among farmers.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

HC: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Resources, Software, Supervision, Validation. JW: Conceptualization, Data curation, Formal analysis, Investigation, Project administration, Resources, Software, Supervision, Writing – original draft. H-YC: Conceptualization, Data curation, Formal analysis, Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing. WJ: Conceptualization, Formal analysis, Methodology, Supervision, Validation, Writing – review & editing. SW: Formal analysis, Funding acquisition, Investigation, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Reference

- Adnan, R. M., Mostafa, R. R., Wang, M., Parmar, K. S., Kisi, O., and Zounemat-Kermani, M. (2025). Improved random vector functional link network with an enhanced remora optimization algorithm for predicting monthly streamflow. *J. Hydrol.* 650:132496. doi: 10.1016/j.jhydrol.2024.132496
- Agosin, M., and Retamal, Y. (2021). A model of diversification and growth in open developing economies. *Struct. Chang. Econ. Dyn.* 58, 455–470. doi: 10.1016/j.strueco.2021.07.004
- Arbara, S., and Hooimeijer, F. (2025). A conceptual framework for integrating deltaic food systems and spatial design: the case of the Mekong River Delta. *Front. Sustain. Food Syst.* 9:1466134. doi: 10.3389/fsufs.2025.1466134
- Berg-Schlosser, D., and De Meur, G. (2009). “Comparative research design: case and variable selection” in *Configurational comparative methods. Qualitative comparative analysis (QCA) and related techniques*. eds. B. Rihoux and C. C. Ragin (Thousand Oaks and London: Sage), 19–32.
- Beynon, M., Pickernell, D., Battisti, M., and Jones, P. (2024). A panel fsQCA investigation on European regional innovation. *Technol. Forecast. Soc. Change* 199:123042. doi: 10.1016/j.techfore.2023.123042
- Cappellaro, G., Mele, V., and Ansari, S. (2025). Bridging global mandates and local realities: intermediary clusters and interorganizational collaboration for international development. *Organ. Stud.* 46, 157–185. doi: 10.1177/01708406241298398
- Cei, Y., Stefani, G., Defrancesco, E., and Lombardi, G. V. (2018). Geographical indications: A first assessment of the impact on rural development in Italian NUTS3 regions. *Land Use Policy* 77, 157–185. doi: 10.1016/j.landusepol.2018.01.023
- Chen, S., Duan, P., and Yu, X. (2022). Ecological aspiration and the income of farmers aroused by grain for green project. *Front. Ecol. Evol.* 10:961490. doi: 10.3389/fevo.2022.961490
- Crilly, D., Zollo, M., and Hansen, M. T. (2012). Faking it or muddling through? Understanding decoupling in response to stakeholder pressures. *Acad. Manag. J.* 55, 1429–1448. doi: 10.5465/amj.2010.0697
- Ding, Y. (2023). The impact of agricultural industrial agglomeration on farmers' income: an influence mechanism test based on a spatial panel model. *PLoS One* 18:e0291188. doi: 10.1371/journal.pone.0291188
- Ding, Y., Yang, H., Peng, C., and Lyu, C. (2025). How do entrepreneurial traits affect green entrepreneurial performance? A fuzzy set qualitative comparative analysis (fsQCA). *Results Eng.* 27:105711. doi: 10.1016/j.rineng.2025.105711
- Dong, F., Zhang, Y., and Wang, Z. (2024). Activation and inheritance: farmers' willingness to participate in agricultural heritage tourism development—a case study on the Nanguo pear cultivation system in Anshan, China. *Sustainability* 16:10500. doi: 10.3390/su162310500
- Du, Y. Z., and Jia, L. D. (2017). Configurational perspective and qualitative comparative analysis (QCA): a new pathway for management research. *Manag. World* 6, 155–167. doi: 10.19744/j.cnki.11-1235/f.2017.06.0122017
- Fan, C., and Wang, J. (2024). Configurational impact of self-regulated writing strategy, writing anxiety, and perceived writing difficulty on EFL writing performance: an fsQCA approach. *Sci. Rep.* 14:11125. doi: 10.1038/s41598-024-61537-x
- Fang, Y., and Yang, Y. (2025). Analysis of spatial effects and influencing factors of rural industrial integration in China. *Sci. Rep.* 15:16790. doi: 10.1038/s41598-025-01875-6
- Feng, Y., Dai, J., and Zhang, L. (2025). Digital infrastructure and income disparities: a quasi-natural experiment based on the “broadband China” strategy. *Int. Rev. Econ. Finance* 102:104350. doi: 10.1016/j.iref.2025.104350
- Fu, H., Xu, M., Wu, Y., and Wang, W. (2024). What facilitates frugal innovation? – a configurational study on the antecedent conditions using fsQCA. *J. Innov. Knowl.* 9:100522. doi: 10.1016/j.jik.2024.100522
- Gao, J., and Wu, B. (2017). Revitalizing traditional villages through rural tourism: a case study of Yuanjia Village, Shaanxi Province, China. *Tour. Manag.* 63, 223–233. doi: 10.1016/j.tourman.2017.04.003
- Garcia-Castro, R., and Ariño, M. A. (2016). A general approach to panel data set-theoretic research. *J. Adv. Manag. Sci. Inf. Syst.* 2:63–76:526. doi: 10.6000/2371-1647.2016.02.06
- Geng, Y., Liu, L., and Chen, L. (2023). Rural revitalization of China: a new framework, measurement and forecast. *Socio Econ. Plan. Sci.* 89:101696. doi: 10.1016/j.seps.2023.101696
- Guo, Y., and Li, S. (2024). A policy analysis of China's sustainable rural revitalization: integrating environmental, social and economic dimensions. *Front. Environ. Sci.* 12:1436869. doi: 10.3389/fenvs.2024.1436869
- Hamilton, S., Kjørli, S., Ligon, E., and Shafran, A. (2024). Spatial procurement of farm products and the supply of processed foods: application to the tomato processing industry. *Rev. Ind. Organ.* 64, 11–33. doi: 10.1007/s11151-023-09939-5
- Han, J., and Kim, C. (2025). Public sector corruption in South Asia: focusing on institutional factors with a two-step fsQCA. *Humanit. Soc. Sci. Commun.* 12:148. doi: 10.1057/s41599-025-04477-9
- He, H., Wang, S., Tuo, S., and Du, J. (2022). Analysis of the effect of rural tourism in promoting farmers' income and its influencing factors—based on survey data from Hanzhong in southern Shaanxi. *Sustainability* 14:1289. doi: 10.3390/su14031289
- Huang, J.-k. (2023). Rural transformation, income growth, and poverty reduction by region in China in the past four decades. *J. Integr. Agric.* 22, 3582–3595. doi: 10.1016/j.jia.2023.10.037
- Huang, Z., and Tan, M. (2023). Spatial differences of specialty agriculture development in the mountainous areas of China – “one village, one product” as an example. *Heliyon* 9:e18391. doi: 10.1016/j.heliyon.2023.e18391
- Kim, M. (2013). Many roads lead to Rome: implications of geographic scope as a source of isolating mechanisms. *J. Int. Bus. Stud.* 44, 898–921. doi: 10.1057/jibs.2013.39
- Kinkpe, A. T., Luckmann, J., and Grethe, H. (2024). Welfare effects of food-processing development in agriculture-based economies: a CGE analysis for Benin. *Appl. Econ.* 56, 7825–7844. doi: 10.1080/00036846.2023.2288065
- Krogslund, C., Choi, D. D., and Poertner, M. (2015). Fuzzy sets on shaky ground: parameter sensitivity and confirmation bias in fsQCA. *Polit. Anal.* 23, 21–41. doi: 10.1093/pan/mpu016
- Lai, M., Li, W., Gao, Z., and Xing, Z. (2024). Evaluation, mechanism and policy implications of the symbiotic relationship among rural digitization, agricultural development and farmer enrichment: evidence from digital village pilots in China. *Front. Environ. Sci.* 12:1361633. doi: 10.3389/fenvs.2024.1361633
- Lang, W., Hui, E. C.-m., Chen, T., and Huang, Y. (2025). A pathway to empower rural resilience through rural computing: an exploratory study. *Appl. Geogr.* 176:103530. doi: 10.1016/j.apgeog.2025.103530
- Li, S., Chen, G., Zhu, J., Xie, Q., Jiang, J., and Liao, C. (2025). Empowering China's cross-border e-commerce: high-quality development explored through fsQCA. *Humanit. Soc. Sci. Commun.* 12:1183. doi: 10.1057/s41599-025-05551-y
- Li, L., Du, K., Zhang, W., and Mao, J.-Y. (2019). Poverty alleviation through government-led e-commerce development in rural China: an activity theory perspective. *Inf. Syst. J.* 29, 914–952. doi: 10.1111/isj.12199
- Li, L., Huang, M., and Yao, Q. (2025). How to crack the dilemma of enterprise green transformation?—analysis of linkage effect based on fsQCA and NCA. *Environ. Dev. Sustain.* doi: 10.1007/s10668-025-06438-3
- Li, Z., Yang, M., Zhou, X., Li, Z., Li, H., Zhai, F., et al. (2023). Research on the spatial correlation and formation mechanism between traditional villages and rural tourism. *Sci. Rep.* 13:8210. doi: 10.1038/s41598-023-35486-w
- Lin, L., Zhou, D., and Ma, C. (2010). Green food industry in China: development, problems and policies. *Renew. Agric. Food Syst.* 25, 69–80. doi: 10.1017/S174217050999024X
- Liu, Y.-L., Chiang, J.-T., and Ko, P.-F. (2023). The benefits of tourism for rural community development. *Human. Soc. Sci. Commun.* 10:137. doi: 10.1057/s41599-023-01610-4
- Liu, M., Min, S., Ma, W., and Liu, T. (2021). The adoption and impact of e-commerce in rural China: application of an endogenous switching regression model. *J. Rural. Stud.* 83, 106–116. doi: 10.1016/j.jrurstud.2021.02.021
- Liu, Y., Wang, Y., Dupre, K., and McIlwaine, C. (2022). The impacts of world cultural heritage site designation and heritage tourism on community livelihoods: a Chinese case study. *Tour. Manag. Perspect.* 43:100994. doi: 10.1016/j.tmp.2022.100994
- Long, H., Liu, Y., Wu, X., and Dong, G. (2009). Spatio-temporal dynamic patterns of farmland and rural settlements in Su–Xi–Chang region: implications for building a new countryside in coastal China. *Land Use Policy* 26, 322–333. doi: 10.1016/j.landusepol.2008.04.001
- Luangpaiboon, P. (2017). Strategic design for dynamic multi-zone truckload shipments: a study of OTOP agricultural products in Thailand. *Comput. Electron. Agric.* 135, 11–22. doi: 10.1016/j.compag.2017.01.023
- Ma, Z. (2025). Towards environmental deliberative democracy in China. *Humanit. Soc. Sci. Commun.* 12:500. doi: 10.1057/s41599-025-04837-5
- Ma, X., and Komatsu, S. (2024). Impact of e-commerce on income inequality: evidence from rural China based on cross-county panel data. *Inf. Technol. Dev.* 31, 635–663. doi: 10.1080/02681102.2024.2397340
- Mihailović, B., Radić Jean, I., Popović, V., Radosavljević, K., Chronos Krasavac, B., and Bradić-Martinović, A. (2020). Farm differentiation strategies and sustainable regional development. *Sustainability* 12:7223. doi: 10.3390/su12177223
- Nildam, S., Rawang, W., Kliengchuay, W., and Tantrakarnapa, K. (2024). Eco-friendly OTOP production for sustainable society: a case study of Thailand. *J. Eohuman.* 3, 2810–2821. doi: 10.62754/joe.v3i8.4930
- Niu, K., He, W., and Qiu, L. (2023). Symbiosis coordination between industrial development and ecological environment for sustainable development: theory and evidence. *Sustain. Dev.* 31, 3052–3069. doi: 10.1002/sd.2569
- Pappas, I. O., Kourouthanassis, P. E., Giannakos, M. N., and Chrissikopoulos, V. (2016). Explaining online shopping behavior with fsQCA: the role of cognitive and affective perceptions. *J. Bus. Res.* 69, 794–803. doi: 10.1016/j.jbusres.2015.07.010
- Pappas, I. O., Papavaslopoulou, S., Mikalef, P., and Giannakos, M. N. (2020). Identifying the combinations of motivations and emotions for creating satisfied

- users in SNSs: an fsQCA approach. *Int. J. Inf. Manag.* 53:102128. doi: 10.1016/j.ijinfomgt.2020.102128
- Pappas, I. O., and Woodside, A. G. (2021). Fuzzy-set qualitative comparative analysis (fsQCA): guidelines for research practice in information systems and marketing. *Int. J. Inf. Manag.* 58:102310. doi: 10.1016/j.ijinfomgt.2021.102310
- Peng, Y., Peng, X., Li, X., Lu, M., and Yin, M. (2023). Effectiveness in rural governance: influencing factors and driving pathways—based on 20 typical cases of rural governance in China. *Land* 12:1452. doi: 10.3390/land12071452
- Perdomo-Verdecia, V., Garrido-Vega, P., and Sacristán-Díaz, M. (2024). An fsqca analysis of service quality for hotel customer satisfaction. *Int. J. Hosp. Manag.* 122:103793. doi: 10.1016/j.ijhm.2024.103793
- Ragin, C. C. (2008). “174 measurement versus calibration: a set-theoretic approach” in *The Oxford handbook of political methodology*, eds J. M. Box-Steffensmeier, H. E. Brady and D. Collier (New York: Oxford University Press), 174–198.
- Ragin, C. C., and Strand, S. I. (2008). Using qualitative comparative analysis to study causal order comment on Caren and Panofsky (2005). *Sociol. Methods Res.* 36, 431–441. doi: 10.1177/0049124107313903
- Saputra, R., and Havlíček, T. (2024). Strengthening rural governance for rural development through collaborative strategy: the application of soft system methodology and textual network analysis. *Syst. Pract. Action Res.* 37, 1175–1193. doi: 10.1007/s11213-024-09696-w
- Schneider, C. Q., and Wagemann, C. (2012). Set-theoretic methods for the social sciences: a guide to qualitative comparative analysis. New York: Cambridge University Press.
- Shen, H., Aziz, N. F., and Lv, X. (2025). Using 360-degree panoramic technology to explore the mechanisms underlying the influence of landscape features on visual landscape quality in traditional villages. *Ecol. Inform.* 86:103036. doi: 10.1016/j.ecoinf.2025.103036
- Shi, Q., Tong, X., and Chen, S. (2025). How entrepreneurial learning and capability interact to influence new farmer entrepreneurial performance in China: a configuration analysis based on fsQCA. *J. Rural. Stud.* 119:103756. doi: 10.1016/j.jrurstud.2025.103756
- Shoyama, K., Nishi, M., Hashimoto, S., and Saito, O. (2022). Correction to: outcome-based assessment of the payment for mountainagriculture: a community-based approach to countering land abandonment in Japan. *Environ. Manag.* 69:1049. doi: 10.1007/s00267-022-01615-w
- Tang, Y., Qi, Y., Zhou, F., and Hua, L. (2023). A study on the differential effects of heterogeneous environmental regulations on the green transformation of Chinese manufacturing enterprises under “double carbon” target. *Heliyon* e19841. doi: 10.1016/j.heliyon.2023.e19841
- Tang, C. S., Wang, Y., and Zhao, M. (2024). The impact of input and output farm subsidies on farmer welfare, income disparity, and consumer surplus. *Manag. Sci.* 70, 3144–3161. doi: 10.1287/mnsc.2023.4850
- Wang, B., Liu, P., and Han, A. (2025). Can e-commerce development improve farmers' incomes? Evidence from prefecture-level data and the spatial difference-in-difference approach. *Aust. J. Agric. Resour. Econ.* 69, 344–368. doi: 10.1111/1467-8489.12611
- Wang, Z., Wang, C., Dou, H., Cheng, G., Zhang, J., Lei, X., et al. (2025). A strategy of building a beautiful and harmonious countryside: reuse of idle rural residential land based on symbiosis theory. *Habitat Int.* 155:103238. doi: 10.1016/j.habitatint.2024.103238
- Wang, J., Zhou, F., Xie, A., and Shi, J. (2024). Impacts of the integral development of agriculture and tourism on agricultural eco-efficiency: a case study of two river basins in China. *Environment, Development and Sustainability* 26, 1701–1730. doi: 10.1007/s10668-022-02781-x
- Wei, W., Tang, H., and Ma, H. (2024). Exploring determinants of county suburban vegetable planting via the fsQCA-NCA approach. *Front. Sustain. Food Syst.* 8:1463031. doi: 10.3389/fsufs.2024.1463031
- Wondirad, A., Kebete, Y., and Li, Y. (2021). Culinary tourism as a driver of regional economic development and socio-cultural revitalization: evidence from Amhara National Regional State, Ethiopia. *J. Destin. Mark. Manag.* 19:100482. doi: 10.1016/j.jdmm.2020.100482
- Woodside, A. G. (2019). Accurate case-outcome modeling in economics, psychology, and marketing. *Psychol. Mark.* 36, 1046–1061. doi: 10.1002/mar.21255
- Xu, D., Fei, X., Chen, Q., Hong, X., and Shen, G. (2025). Interplay of industrial transformation, diversified governance, and talent gathering on the ruralization of China. *J. Urban Plann. Dev.* 151:04024055. doi: 10.1061/JUPDDM.UPENG-5240
- Xu, C., Meng, Y., Wang, J., Zhou, X., and Peng, D. (2024). Exploring the decision model for tourism symbiosis of ancient villages and towns based on tourist reviews: a case study of Huaihua City in China. *Int. J. Tourism Res.* 26:e2679. doi: 10.1002/jtr.2679
- Yan, Y., Zhou, L., and Iossifova, D. (2025). Rural type classification based on resource characteristics and its relationship with local villagers' concerns: a case study of the beautiful villages initiative in Zhejiang, China. *J. Asian Archit. Build. Eng.* 1–21. doi: 10.1080/13467581.2025.2510612
- Yang, J. (2023). Rural industrial convergence, urbanization development, and farmers' income growth – evidence from the Chinese experience. *Front. Sustain. Food Syst.* 7:14. doi: 10.3389/fsufs.2023.1237844
- Yang, G., Gong, G., Luo, Y., Yang, Y., and Gui, Q. (2022). Spatiotemporal characteristics and influencing factors of tourism–urbanization–technology–ecological environment on the Yunnan–Guizhou–Sichuan region: an uncoordinated coupling perspective. *Int. J. Environ. Res. Public Health* 19:8885. doi: 10.3390/ijerph19148885
- Ye, W., Wang, Y., Wu, K., Yang, X., Yang, Q., and Liu, Q. (2023). Exploring the rural transformation of the loess plateau from a perspective of community resilience: a case study from the Jiaxian County, northwestern China. *Appl. Geogr.* 154:102919. doi: 10.1016/j.apgeog.2023.102919
- You, L., Liu, M., Ji, T., Wu, X., and Li, Y. (2025). Design reflections on the integrated development of rural cultural and ecological resources in China. *Humanit. Soc. Sci. Commun.* 12:1294. doi: 10.1057/s41599-025-05323-8
- Zhang, F. (2023). Determinants of local governments' information disclosure: a dynamic QCA analysis based on provincial panel data. *J. Intelligence* 42, 133–141+207. doi: 10.3969/j.issn.1002-1965.2023.01.018
- Zhang, J. (2023). The nonlinear effects of tourism on rural income inequality and urban–rural income inequality: evidence from China. *Tour. Econ.* 29, 172–193. doi: 10.1177/13548166211041802
- Zhang, Y., and Chen, H. (2025). Research on the realization path of China multi-agent value co-creation in new energy microgrids-based on fsQCA method. *Sci. Rep.* 15:23486. doi: 10.1038/s41598-025-08966-4
- Zhang, S., Liang, J., Su, X., Chen, Y., and Wei, Q. (2023). Research on global cultural heritage tourism based on bibliometric analysis. *Herit. Sci.* 11:139. doi: 10.1186/s40494-023-00981-w
- Zhou, J., Chen, H., Bai, Q., Liu, L., Li, G., and Shen, Q. (2023). Can the integration of rural industries help strengthen China's agricultural economic resilience? *Agriculture* 13:1813. doi: 10.3390/agriculture13091813
- Zhou, S., Jia, W., Diao, H., Geng, X., Wu, Y., Wang, M., et al. (2025). A cyclegan-pix2pix framework for multi-objective 3D urban morphology optimization: enhancing thermal performance in high-density areas. *Sustain. Cities Soc.* 126:106400. doi: 10.1016/j.scs.2025.106400
- Zhou, X., Ma, W., Li, G., and Qiu, H. (2020). Farm machinery use and maize yields in China: an analysis accounting for selection bias and heterogeneity. *Aust. J. Agric. Resour. Econ.* 64, 1282–1307. doi: 10.1111/1467-8489.12395

Appendix A

TABLE A1 Abbreviation of secondary indicators.

Secondary indicator	Abbreviation
Annual Income of Leading Characteristic Industry	AILCI
Level of Agricultural Production	LAP
Agricultural Processing Level	APL
Level of Agricultural E-commerce	LAE
Tourism Income Level	TIL
Per-Visitor Tourism Revenue	PTR
Cultural Resources	CR
Per Capita Disposable Income of Villagers	PCDIV