Scientific Research Publishing

Modern Economy, 2023, 14, 1257-1287
https://www.scirp.org/journal/me
ISSN Online: 2152-7261
ISSN Print: 2152-7245

Research on Innovative Development of Leading Industries in Rural Revitalization: Taking Sichuan Province as an Example

Hong Wang

School of Economy & Management, Xichang University, Xichang, China
Email: giant945@126.com

How to cite this paper: Wang, H. (2023). Research on Innovative Development of Leading Industries in Rural Revitalization: Taking Sichuan Province as an Example. *Modern Economy, 14,* 1257-1287.
https://doi.org/10.4236/me.2023.1410065

Received: July 18, 2023
Accepted: September 24, 2023
Published: September 27, 2023

Abstract

The imbalance between urban and rural development and the imbalance between the eastern and western regions in Sichuan Province is a prominent issue, and the rural revitalization strategy is a strategic opportunity to achieve high-quality development in the province. The foundation of rural revitalization strategy lies in industrial prosperity, which mainly depends on the development of rural leading industries. To study the relationship between the development of rural revitalization leading industries and economic factors, innovation factors, and regional space, the paper selected the added value of the primary industry in various cities (autonomous prefectures) in Sichuan Province from 2012 to 2021 as the dependent variable. The selected explanatory variables include consumption indicators, investment indicators, production factor indicators, and innovation factor indicators. Considering the adjacency relationship between cities (autonomous prefectures), the Queen criterion is used to set the first-order adjacency spatial weight matrix for each city (autonomous prefectures) in Sichuan Province. The spatial econometric analysis software GeoDa is used for global and local correlation analysis. By analyzing the spatial relationship between the added value of the primary industry and relevant economic factors in Sichuan Province since the 18th National Congress of the Communist Party of China, this study investigates the innovative development of rural revitalization leading industries. By applying innovation theory, it is pointed out that the innovative development of the leading industries in rural revitalization in Sichuan Province must establish a collaborative system of industrial structure innovation, industrial organization innovation, industrial technology innovation, and industrial policy innovation. Rural leading industries must be integrated through industrial space.

Keywords

Rural Revitalization, Leading Industries, Innovation, Development

1. Introduction

The phenomenon of "urban-rural dualization" is a long-term social phenomenon formed in the process of socio-economic development. This "urban-rural dualization" phenomenon is more prominent in economically developed countries and regions, and it is an important social and development problem that troubles both developed and developing countries. To improve the socialist market economy system, accelerate urbanization, develop agricultural production, increase farmers' income, and narrow the urban-rural income gap, it is necessary to embark on the reform of the urban-rural dual system (Li, 2008). China is the earliest developing country to pay attention to the coordinated development of urban and rural areas. To improve the well-being of farmers with high quality, we have designed rural revitalization strategies at the national level, and academic research in related fields is also ahead of developed countries in Europe and America. The foundation and focus of rural revitalization strategy lies in industrial prosperity. Rural industrial prosperity is not simply a problem of primary industry development, but rather a problem of deep integration and development of primary, secondary, and tertiary industries in rural areas. It is a problem of innovative development of rural leading industries.

To narrow the development gap between the eastern and western regions and promote coordinated regional development, the Chinese government proposed the Western Development Strategy in 1999, injecting vitality into the urban economy in the western region. However, the effect was not significant for the development of rural leading industries in the western region. In 2017, Rural Revitalization Strategy became a national strategy and brought new development momentum to the leading industries of rural revitalization in the western region. By analyzing the spatial distribution characteristics of the added value of the primary industry and indicators of consumption, investment, production factors, and innovation factors in Sichuan Province from 2012 to 2021, this study investigates the innovative development of rural revitalization leading industries. The relevant research conclusions and achievements can serve as a reference for the development of leading industries in rural revitalization in Sichuan Province, and can also serve as a reference for other regions in western China.

2. Industrial Theory and Related Research

Industry, as a collection of economic activities with similar attributes, is the carrier of economic value creation, transformation, and realization. Theoretical research on industries in China mainly focuses on the secondary and tertiary industries, and there are few studies related to the innovative development of rural revitalization leading industries. Industry theory is the study of the competitive

behavior of enterprises producing similar or closely related substitute products or services, as well as their impact on economic performance and related public policies. Industry research mainly focuses on the spatiotemporal correlation, technological correlation, and innovation correlation of industries.

2.1. Industrial Spatiotemporal Correlation

The spatiotemporal correlation of industries can be divided into two categories: geographical spatiotemporal correlation and policy spatiotemporal correlation. Geographical spatiotemporal correlation refers to the characteristics of a specific industry's production factors, products, services, and information that have a specific connection in physical space and during a specific period. The geographical spatial correlation of a certain industry covers the supply side, industry side, and demand side of the industry. The strength of this geographical spatial correlation depends on the degree and importance of the impact of a specific geographical space on the industry, and is not significantly related to spatial distance. The spatiotemporal correlation of policies refers to the phenomenon where policies have a significant impact on a certain industry at certain stages or throughout the process of factor input configuration, industrial operation, product and service output. The essence of industrial spatiotemporal correlation is to develop the right industry at the right time, in the right region. The spatiotemporal correlation of industries can generally be divided into four stages based on their interaction intensity and development stages: industrial attraction, industrial penetration, industrial convergence, and industrial integration. Industrial attraction is the primary stage of industrial geographical spatial correlation, mainly due to the imbalance of industrial development between regions, which leads to the trend and possibility of industrial spatial layout extending to other regions, often a one-way force. Some scholars have found that there is a trend of migration of the distribution center of the primary industry in the county economy of Guizhou Province towards the population center and economic center (Huang & Zhao, 2016). Industrial penetration refers to the radiative effect of mutual learning between different industries in terms of technology, processes, management, channels, etc., often a two-way or multi-directional interaction between industries. Industrial convergence is a purposeful optimization and restructuring of industry resources taken by enterprises within or between industries related to the industrial chain, to seek or maintain long-term competitive advantages. The interconnectivity between industries and the pursuit of maximizing efficiency are the internal driving forces for industrial convergence and development (Chen, 2006). By integrating, intersecting, and restructuring the industrial chain through industrial integration, we can deepen and expand the depth and breadth of open innovation in agricultural product enterprises (Li & Yang, 2017). Industrial integration refers to a high-quality industrial development model based on geographical spatiotemporal correlation and policy spatiotemporal correlation, with industrial innovation as the core development factor. The trend of industrial integration development for the lead-

ing industry in rural revitalization will be based on the deep integration of primary, secondary, and tertiary industries based on rural areas, farmers, and agriculture, followed by the "fourth industry", namely the ecological industry. Classical economic theory holds that an industry includes multiple industries, but an industry can only be subordinate to one industry. In the context of rural revitalization strategy, the ecological industry will break through the constraints of a single industry, and the assumption of heterogeneity among different industries will become blurred.

2.2. Industrial Technology Correlation

Industrial technological linkage refers to the direct and indirect interdependence and mutual restraint of technological and economic connections formed by various sectors of the national economy in the process of social reproduction (Shi, 2022). Technological correlation is an important concept in evolutionary economic geography, which is the manifestation of "cognitive proximity" at the level of industrial products. Its specific meaning refers to the similarities between two industries or products in production technology, management mechanisms, production factors, infrastructure, and other aspects (Hidalgo et al., 2007). If two cities have relative comparative advantages in the same industry, they have similar industrial structure foundations and have technological connections in the industry. The more industries that two cities have the same comparative advantage, the stronger the technological relevance (Pang & Jiao, 2023). The technological connections between enterprises include vertical and horizontal connections. Vertical correlation refers to the relationship between enterprises upstream and downstream of the industrial chain, mainly reflected in the differentiation of industries and the connection between specialized production technologies. Horizontal correlation is mainly due to the diversification of market demand, which determines the differentiation of products and the connections between numerous enterprises. It mainly reflects the incomplete substitutability of products and the homology of production technology between enterprises (Feng, 2010). Due to the promoting effect of technological connections on regional industrial development, when choosing the direction of industrial development, full consideration should be given to the original industrial foundation and local knowledge base of the region, and the development of related industries and technologies should be carried out, rather than blindly "seeking novelty" or "greedy for greatness" (Pang & He, 2021).

The correlation of industrial technology is first manifested in the correlation between different industries within the same industry. The traditional primary industry mainly includes agriculture, forestry, animal husbandry, fisheries, as well as specialized and auxiliary activities in agriculture, forestry, animal husbandry, and fishing. Under the rural revitalization strategy, the primary industry will be promoted to develop in a high-quality manner at the three levels of industrial chain length, breadth, and depth through the catalytic effect of innovative elements in rural industries.

2.3. Industrial Innovation Correlation

Marshall's theory of economies of scale, Weber's location theory, and the new economic geography theory represented by Krugman all believe that industrial agglomeration can improve economic growth efficiency through various channels such as saving production and logistics costs, sharing infrastructure and factors, and spillover of knowledge and technology (Wang, Xu, & Zhang, 2022). Chandler had already stated his viewpoint in "The Visible Hand" that the potential for productivity can only be realized through internal organizational processes within the enterprise, and the core of this process is a management structure that can effectively plan and coordinate administration. New technologies only provide the potential for productivity, and achieving the potential economic benefits of new technologies is an organizational issue, while the potential economic benefits brought about by technological innovation can only be realized through organizational innovation (Liu, 2018). Industrial correlation is mainly reflected in the sensitivity coefficient and influence coefficient. Sensitivity refers to the spillover effect of a certain industry on other industries, while influence refers to the spillover effect of a certain industry on other industries. Some industries have both high coefficients, indicating that they are in a strategic position in economic development and can be selected as leading industries (Tang, Wang, & Ma, 2011).

The theory of industrial structure mainly studies the interrelationships and ways of connection between industries; The industrial correlation theory mainly studies the technological and economic connections between the physical or value forms formed by the mutual movement of inputs and outputs between different industries; The theory of industrial organization mainly studies the industry composed of enterprises that produce similar or closely related products and services, analyzes the operation of the market and industry, especially the competition and cooperation behavior between enterprises; The theory of industrial space mainly studies the rationalization of regional industrial spatial layout, that is, to implement a reasonable industrial layout within a certain geographical spatial range based on the resource advantages and industrial characteristics of different regions, so as to fully and effectively utilize the resources of each region. In the above theoretical system of related industries, the key role of innovation factors in industrial development is ignored or not valued. The theory of industrial innovation integrates innovation as a core industrial element into industrial construction, and then studies the catalytic, fusion, and fission effects of innovation in the industry.

3. Current Status of Innovation Theory and Related Research

3.1. The Scientific Meaning of Innovation

Schumpeter first proposed "innovation" from a dynamic perspective in his book "Economic Development Theory", believing that innovation is a change in the

production function and a recombination of existing resources (Schumpeter, 2017). The Oslo Handbook: Innovative Data Collection, Reporting, and Use (4th edition) defines innovation as a new or improved product or process (or combination thereof) that is significantly different from the previous product or process of the unit and has been provided to potential users (products) or used by the unit (processes). According to the Oslo Handbook's definition of innovation, all innovations must contain a certain degree of novelty (European Union, 2018). This novelty includes: organizational innovation for enterprises, new products for the market, and new knowledge for the world. The definitions of these two types of innovation each have their own emphasis. The former highlights the economic attributes of innovation and emphasizes the process of introducing new factors or combinations of factors into the production system to generate value added; the latter highlights the scientific attributes of innovation and emphasizes innovative scientific activities. Innovation requires collaborative innovation among government, industry, academia, research, and business, rather than just collaborative innovation between industry, academia, and research. Collaborative innovation refers to the joint innovation of all parties involved in industry, academia, and research on the same innovation platform, rather than just the relationship of technology transfer.

3.2. Innovative Driven Scientific Characteristics

The concept of "innovation driven" was first proposed by Porter in his book "National Competitive Advantage", in which he divided the development of national competitive advantage into four stages: factor driven, investment driven, innovation driven, and wealth driven. Porter believes that when an economy forms a complete diamond system and the key elements within the diamond system interact clearly, the economy achieves innovation drive (Porter, 1990). The essence of innovation driven is that in the economic development system, the allocation rules of factors, investments, and other resources are carried out around achieving the goals of the innovation system, thereby making innovation have a significant effect on improving the speed and quality of economic development.

Innovation driven development refers to using innovation as the main endogenous driving force of the economy and society and an important means of promoting economic and social development, promoting the transformation and upgrading of the economy. Innovation driven development is not independent of factor driven, investment driven, and wealth driven factors, but rather an economic model with innovation driven factors, investment, and wealth allocation as the dominant force. An innovative economy reflects the requirements of resource conservation and environmental friendliness. It is an economy based on knowledge and talent, driven mainly by innovation, with the development of new technologies and products with independent intellectual property rights as the focus, and marked by innovative industries (Hong, 2011). Technological in-

novation is at the forefront of the industrial chain, with strong industrial independence. The core element is talent capital, and the concept of industrial development lies in creative thinking.

3.3. Research on Industrial Innovation

Organizational innovation activities induced by the emergence of potential benefits during market operation are called induced innovation; The organizational innovation activities carried out by the government through policy formulation are called mandatory innovation; Organizational innovation activities induced by the joint action of market forces and government forces are called quasi induced or quasi mandatory innovation (Li, 2006). To promote the structural reform of agricultural supply side through industrial organization innovation, we should adjust land relations, cultivate moderate scale business entities, develop regional specialization in agriculture, optimize the industrial structure of agricultural products, highlight the heterogeneity of specialized agricultural products, form comparative advantages in agriculture, and promote the transformation of the agricultural market from complete competition to monopolistic competition (Wang, 2018). The modern agricultural industrial park, with the integration of three industries as the main content, is an important carrier and lever for achieving rural revitalization and breaking down the dual barriers between urban and rural areas in the context of urban-rural industrial synergy (Tang et al., 2022). Finding new agricultural spaces, matching the planting of agricultural products that meet market demand and have high economic value, and exploring new economic types and spaces for non-agricultural industries are the second spatial path to promote long-term poverty alleviation development (Jiang, 2021).

In summary, the core of the innovative development of leading industries under the rural revitalization strategy lies in building an organic integration mechanism that integrates innovation factors, rural factors, and industrial factors. By relying on this mechanism, we can achieve root in rural areas, ensure the prosperity of farmers, and ultimately achieve a win-win situation between urban and rural areas.

4. The Current Situation and Key Influencing Factors of the Primary Industry in Sichuan Province

From the perspective of economic and geopolitical relations, Sichuan Province borders Chongqing, Yunnan, Guizhou, Tibet, Qinghai, Gansu, and Shaanxi. With the help of the "Chengdu-Chongqing Double Cities Economic Circle", it has become a gateway connecting the eastern and central provinces with the western regions. The administrative scope of Sichuan Province includes 18 prefecture level cities and 3 ethnic minority autonomous prefectures. The spatial location of Sichuan Province is shown in **Figure 1**. From the perspective of economic development, since 2015, Sichuan Province's regional GDP has ranked 6th in the country for five consecutive years. Sichuan Province ranks high in overall

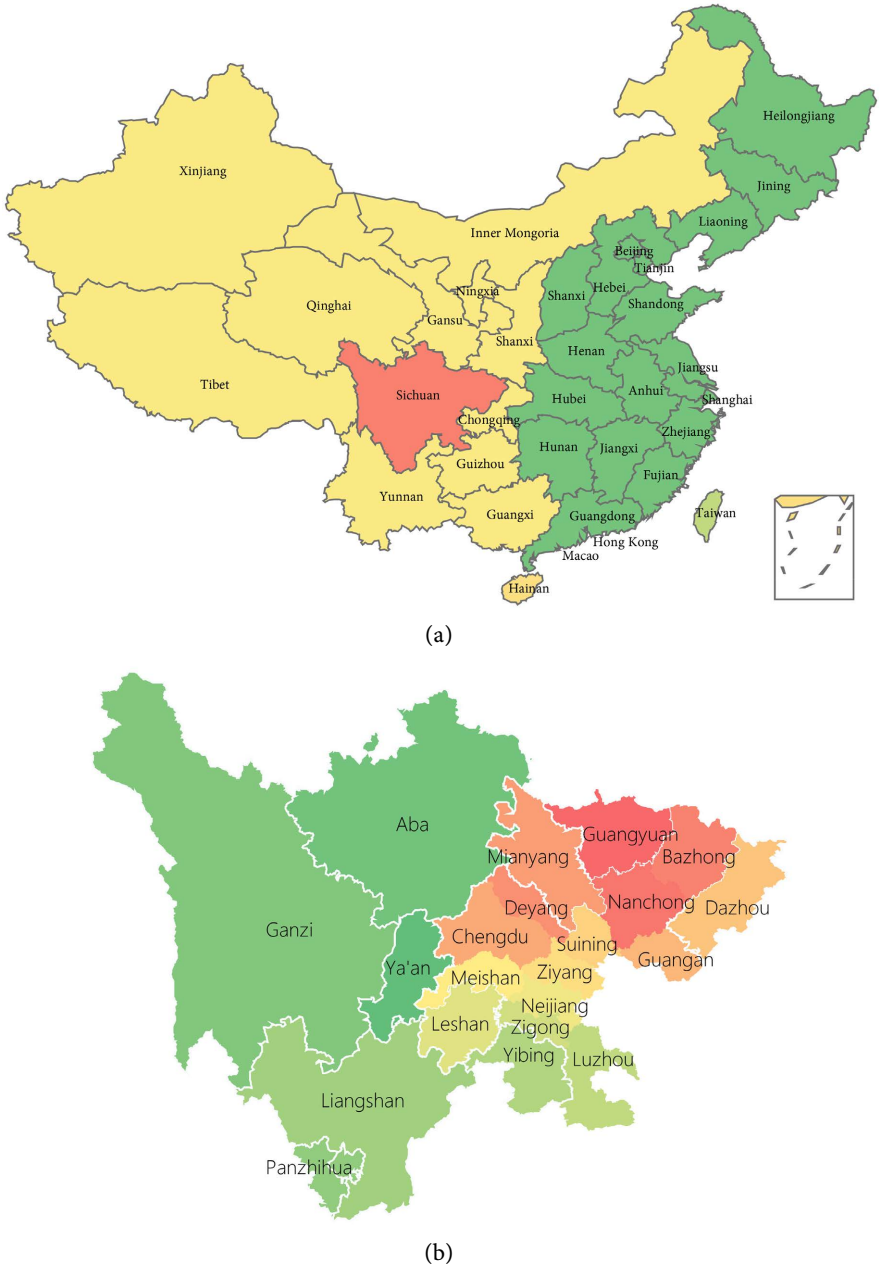


Figure 1. Schematic diagram of spatial location and administrative divisions in Sichuan province. (a) Location of Sichuan province; (b) Administrative divisions of Sichuan province.

development, but there is still a significant gap compared to Guangdong Province, which ranks first in the country; Sichuan Province is a populous province in the western region and also a multi-ethnic province, with 18 cities and three ethnic minority autonomous prefectures: Aba Tibetan and Qiang Autonomous Prefecture, Ganzi Tibetan Autonomous Prefecture, and Liangshan Yi Autonomous Prefecture. Rural revitalization is of great significance; from the current development situation, there are obvious issues of "strong in the east and weak in the west" and "urban-rural duality" in the development of Sichuan Province;

From the perspective of industrial structure, the economic growth rate of the secondary and tertiary industries in Sichuan Province far exceeds that of the primary industry. By studying the spatial relationship between the added value of the primary industry and other economic indicators in Sichuan Province, exploring the innovative development of rural industries in the context of the rural revitalization strategy in Sichuan Province has both theoretical significance and strong demonstration and promotion value.

4.1. Data Source and Spatial Weight Matrix Setting

The original data of this article comes from the Sichuan Statistical Yearbook (2013-2022), and all variables are named with no more than ten characters. The Sichuan Statistical Yearbook (2013) was officially released in 2013, but the data were all from 2012, and so on. The specific format rule is "variable name_year". The main explanatory variable chosen in this article is the value added of the primary industry (PIR_); The selected consumer explanatory variables are three sets of data: average wage of all employed employees (WoE), per capita disposable income of rural residents (PCDI_), and per capita consumption expenditure of rural residents (PCEC_); The selected investment explanatory variables include five sets of data: real estate investment completion (REI_), total road mileage (TLHi_), classified road mileage (Exw_C), highway passenger turnover (Pas_), and highway freight turnover (Fre_H_); The selected explanatory variables for the production factor category are four sets of data: the increase or decrease index of energy consumption per unit area of gross domestic product (IDE_), the amount of agricultural fertilizer application (CoCF_), rural electricity consumption (ECRA_), and crop planting area (TSA_); The selected innovative explanatory variables include five sets of data: the number of graduates from regular higher education institutions (Gradu_), the number of full-time teachers from regular higher education institutions (FtT_), the number of graduates from secondary vocational education institutions (Gra_S_), the number of full-time teachers in secondary vocational education institutions (Tea_S_), and the internal expenditure of research funds (IEoR&_).

When studying the spatial distribution characteristics of regional economy, it is necessary to consider the spatial adjacency relationship between cities (autonomous prefectures). According to the first law of geography, "all attribute values on the surface are interrelated, but values closer to each other have greater correlation than values farther away." This spatial attribute feature is usually represented by a spatial weight matrix. According to the different indicators for determining adjacency, the spatial weight matrix can be divided into adjacency matrix and distance matrix. The spatial weight matrix in this article adopts the adjacency matrix, which is a matrix used to reflect the interdependence between individual units in space. W_{ij} is the element in the matrix, representing the adjacency relationship between individual unit i and individual unit j. If adjacent, W_{ij} takes a value of 1, otherwise it is 0. The adjacency between individual units

and their adjacent units is called first-order adjacency, while the adjacency between individual units and their adjacent units is called second-order adjacency. Based on the connection relationship, the following spatial weight matrix W can be constructed to reflect the adjacency relationship between the research object regions:

$$W = \begin{pmatrix} w_{11} & \cdots & w_{1n} \\ \vdots & \ddots & \vdots \\ w_{n1} & \cdots & w_{nn} \end{pmatrix} \tag{1}$$

$$w_{ij} = \begin{cases} 1 \\ 0 \end{cases} \tag{2}$$

wherein, If City (Autonomous Prefecture) i is adjacent to City (Autonomous Prefecture), $w_{ij} = 1$; or $w_{ij} = 0$.

The adjacency rules for creating spatial weight matrices can be divided into three methods: Rook criterion, Bishop criterion, and Queen criterion. The Rook criterion refers to the existence of a common edge relationship between adjacent units, which is considered adjacency. The Bishop criterion refers to the existence of a common point or common edge relationship between adjacent units, which is considered adjacency. The Queen criterion includes the Rook criterion or Bishop criterion. This article uses the Queen criterion to set the first-order adjacency spatial weight matrix for each city (Autonomous Prefecture) in Sichuan Province. Typically, the spatial weight matrix generated by GeoDa software is a sparse matrix stored in text format, with region names represented by pinyin. The spatial weight matrix is detailed in Table 1.

Compare the contribution rate of the primary industry economic growth (i.e. the ratio of the added value of the primary industry to the added value of the current year's GDP) and the global Moran index analysis of the added value of the primary industry in each city (Autonomous Prefecture) of Sichuan Province in 2011-2021, and the relevant situation of the economic growth of the primary industry in each city (Autonomous Prefecture) is shown in Figure 2. In Figure 2, the Moran Index of the contribution rate of the primary industry to economic growth in 2015 and 2018 shows a more significant negative correlation, mainly due to the downward pressure on the economy in Sichuan Province and the faster growth rate of the secondary and tertiary industries compared to the primary industry.

4.2. Global Distribution Characteristics of the Primary Industry in Various Cities (Aotonomous Prefectures) of Sichuan Province

The commonly used method for studying the characteristics of economic distribution is spatial autocorrelation analysis. Spatial autocorrelation also comes from the concept of correlation in univariate statistical analysis, which refers to the similarity or correlation of a thing in a certain space and its surrounding adjacent spaces (Rob & Nicholas, 2006). Spatial autocorrelation analysis is a correlation

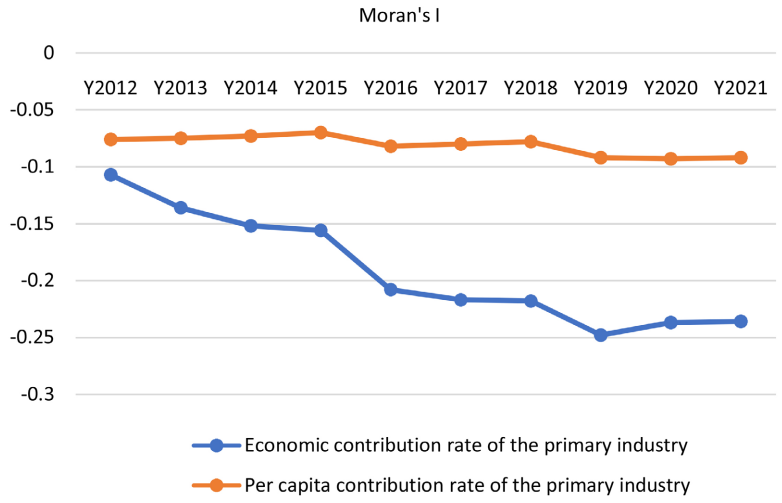


Figure 2. Global Moran index of economic contribution rate and per capita value added of the primary industry in Sichuan province.

Table 1. Spatial weight matrix of each city (prefecture) in Sichuan province.

Region	Number of Adjacent Areas	Name of the Adjacent Areas
Chengdu	5	Deyang, Meishan, Yaan, Ziyang, Aba
Zigong	5	Luzhou, Neijiang, Leshan, Meishan, Yibin
Panzhihua	1	Liangshan
Luzhou	3	Zigong, Neijiang, Yibin
Deyang	5	Chengdu, Mianyang, Suining, Ziyang, Aba
Mianyang	5	Deyang, Guangyuan, Suining, Nanchong, Aba
Guangyuan	3	Mianyang, Nanchong, Bazhong
Suining	5	Deyang, Mianyang, Nanchong, Guangan, Ziyang
Neijiang	4	Zigong, Luzhou, Meishan, Ziyang
Leshan	5	Zigong, Meishan, Yibin, Ya'an, Liangshan
Nanchong	6	Mianyang, Guangyuan, Suining, Guangan, Dazhou, Bazhong
Meishan	6	Chengdu, Zigong, Neijiang, Leshan, Ya'an, Ziyang
Yibin	4	Zigong Luzhou Leshan Liangshan
Guangan	3	Suining, Nanchong, Dazhou
Dazhou	3	Nanchong, Guangan, Bazhong
Ya'an	6	Chengdu, Leshan, Meishan, Aba, Ganzi, Liangshan
Bazhong	3	Nanchong, Guangyuan, Dazhou
Ziyang	5	Deyang, Meishan, Chengdu, Neijiang, Suining
Aba	5	Chengdu, Deyang, Mianyang, Ya'an, Ganzi
Ganzi	3	Aba, Liangshan, Ya'an
Liangshan	5	Panzhihua, Leshan, Yibin, Ya'an, Ganzi

analysis between variables with the same attribute, which tests whether the attribute value of a certain element is related to the attribute value of its adjacent spatial elements. Calculating the Moran's I index cannot directly determine its spatial correlation based on its positive or negative values, and hypothesis testing is also necessary. The relationship between *P*-value, Z-value, confidence level, and significance level in the hypothesis test meets the requirements of Table 2.

Selecting the value added of the primary industry in 2012 (PIR_2012) as the first variable and the average wage of all employed individuals in 2012 (WoE_2012) as the second variable, the global Moran's I index of the bivariate obtained is −0.119, with a negative spatial correlation between the two variables. The spatial correlation of the bivariate is shown in Figure 3. The corresponding Monte Carlo test is shown in Figure 4, with a *P*-value of 0.191 and a Z-value of −0.8527, assuming that the test is not significant.

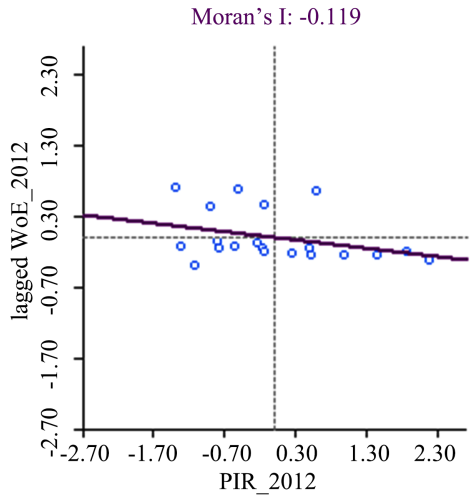


Figure 3. Correlation between per capita gross domestic product and average wage of all employed persons in 2012.

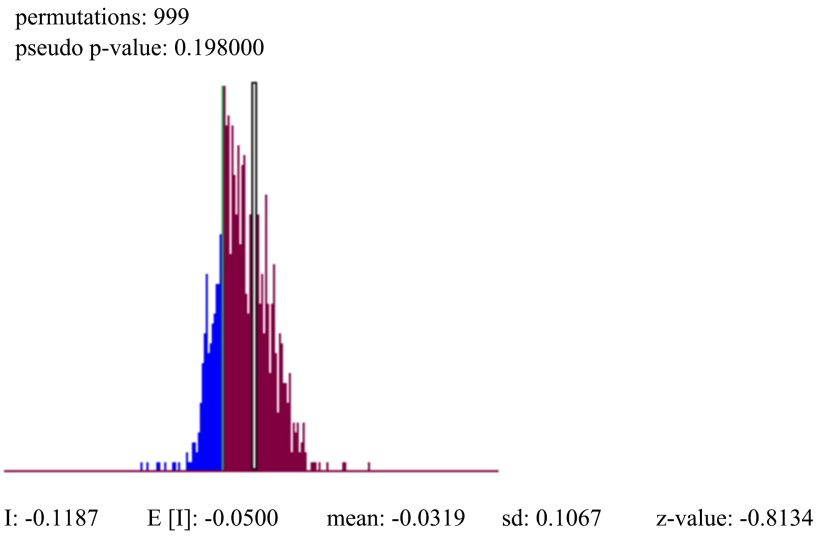


Figure 4. Hypothesis test for the Moran's I index in 2012.

Table 2. *P*-value, Z-value and confidence relationship.

P-value	Z-value	Confidence level	Significance level
$P < 0.10$	$Z > 1.65$ or $Z < -1.65$	90%	Significant
$P < 0.05$	$Z > 1.96$ or $Z < -1.96$	95%	Very significant
$P < 0.01$	$Z > 2.58$ or $Z < -2.58$	99%	Extremely significant

Select the value added of the primary industry (PIR_) from 2013 to 2021 as the first variable, and the average wage of all employees in the corresponding year as the second variable. Using the same method, obtain the global relevant data of the bivariate for each year, as shown in Table 3. There is a negative correlation between the average salary of all employees in employment units and the added value of the primary industry from 2012 to 2021. In 2020 and 2021, there is a significant negative correlation between the two, meaning that an increase in the latter will significantly lead to a decrease in the former.

The economic law reflected by this phenomenon is that as the average wage level increases, the increase in the average wage of urban employed population is actually greater, which will attract more rural employed population to transfer to cities. Rural revitalization and industrial prosperity cannot be separated from high-quality employees related to industries, innovative development of rural leading industries, and significant pressure on balanced allocation of industrial talents. Compare the proportion of urban and rural employed population in Sichuan Province from 2012 to 2021, as shown in Figure 5. The migration of rural employment to urban areas is evident, and as migrant workers move to urban areas for work, many rural populations migrate to urban areas for living. These factors to some extent hinder the healthy development of rural industries.

Similarly, there is a negative correlation between the added value of the primary industry in various cities (prefectures) in Sichuan Province and the completion of real estate investment in the same year, but it was not significant during the research period, as shown in Table 4. The growth of real estate development is accompanied by the pace of urbanization, and the real estate industry is a resource dependent industry. The real estate industry occupies a large amount of funds, land resources, and human resources. The transformation of young and middle-aged labor force in rural employment into urban migrant workers has to some extent suppressed the development of the primary industry in Sichuan Province, although this inhibitory effect is not significant. The two elements of capital and human resources are also indispensable for rural leading industries.

According to comparable prices, the energy consumption per unit of GDP in Sichuan Province has shown a decreasing trend from 2012 to 2021, as shown in Table 5. In 2013, there was a very significant negative correlation between the two sets of indicators, that is, with the decrease in energy consumption per unit of GDP, the added value of the primary industry decreased significantly. In 2018, there was a significant negative correlation between the two sets of indicators,

that is, with the decrease in energy consumption per unit of GDP, the added value of the primary industry significantly decreased. In addition, there was a negative correlation between the two groups of indicators in other years, but it was not significant. Therefore, it can be seen that the added value of the primary industry in Sichuan Province decreased with the decrease of energy consumption level during the research period, indicating that the primary industry in Sichuan Province did not pay enough attention to energy consumption level in the process. The development of the primary industry should strengthen the structural proportion of clean energy and new energy, which is not only conducive to improving the growth rate of the added value of the primary industry, but also conducive to protecting the rural environment.

Table 3. Analysis of the correlation between the added value of the primary industry and the average wage of all employees in the Unit.

Primary Industry by Region (PIR_)	Average Wage of Employed Persons in all Units by Region (WoE_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Moran' I	−0.119	−0.116	−0.116	−0.119	−0.125	−0.131	−0.133	−0.135	−0.169	−0.172
P-value	0.1910	0.2020	0.2040	0.1980	0.1800	0.1520	0.1510	0.1380	0.0340	0.0350
Z-value	−0.8527	−0.8100	−0.8148	−0.8374	−0.9191	−1.0008	−1.0169	−1.0417	−1.8076	−1.8141
Spatial Correlation	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Significant	Significant

Table 4. Analysis of the correlation between the added value of the primary industry and the completion of real estate investment.

Primary Industry by Region (PIR_)	Completion of Real Estate Investment (REI_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Moran' I	−0.091	−0.094	−0.093	−0.091	−0.092	−0.102	−0.121	−0.118	−0.126	−0.133
P-value	0.2780	0.2650	0.2710	0.2710	0.2640	0.2310	0.1790	0.1970	0.1730	0.1620
Z-value	−0.6132	−0.6406	−0.6245	−0.6153	−0.6356	−0.7508	−0.9057	−0.8460	−0.9061	−0.9497
Spatial Correlation	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant

Table 5. Analysis on the Spatial correlation between the added value of the primary industry and the energy consumption index per unit of regional GDP.

Primary Industry by Region (PIR_)	Increase or Decrease of Energy Consumption of Gross Domestic Product per Unit Area by Region (IDE_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Moran' I	0.039	−0.374	−0.006	−0.139	−0.135	−0.101	−0.180	−0.160	0.071	0.037
P-value	0.4360	0.0040	0.4730	0.0850	0.0720	0.2440	0.0450	0.0630	0.2560	0.3600
Z-value	0.1604	−3.4599	−0.0562	−1.3657	−1.4166	−0.6920	−1.7357	−1.4918	0.5935	0.3084
Spatial Correlation	Non-significant	Extremely significant	Non-significant	Non-significant	Non-significant	Non-significant	Significant	Non-significant	Non-significant	Non-significant

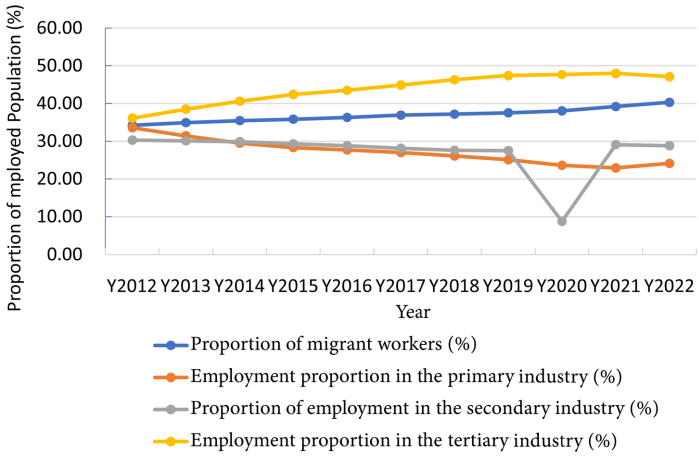


Figure 5. The proportion of urban and rural employment in Sichuan province from 2012 to 2021.

Sichuan Province is located across several major geomorphic units, such as the Qinghai Tibet Plateau, Hengduan Mountains, the Yunnan-Guizhou Plateau, Qinling-Bashan Mountains, and Sichuan Basin. The terrain is high in the west and low in the east, tilting from northwest to southeast. Except for the hills in the Chengdu Plain, most areas within the province are high mountains and valleys, making transportation extremely inconvenient. The overall level of transportation facilities in Sichuan Province is not high, especially in the western Sichuan Plateau region. There are still a few areas in Sichuan Province that have not opened railways, and transportation mainly relies on road transportation. Therefore, it is significant to study the spatial relationship between road passenger and freight turnover and the primary industry. By analyzing the spatial correlation between the added value of the primary industry and the total mileage of highways from 2012 to 2021, the results are shown in **Table 6**. Overall, there is a negative correlation between the two, with a significant negative correlation between 2012 and 2020 and a very significant negative correlation between 2013 and 2019. However, the negative correlation between the two was not significant in 2021.

Through the spatial correlation analysis between the added value of the primary industry and the mileage of graded highways, it was found that there is an overall negative correlation between the two. There was a significant negative correlation between 2015, 2016, and 2020, an extremely significant negative correlation between 2017 and 2019, and a negative correlation between the other four years, but not significant. The analysis results in **Table 6** and **Table 7** indicate that highways, especially graded highways, not only solve the accessibility and convenience of urban transportation, but also comprehensively consider the accessibility and convenience of rural areas. Only in this way can the fairness of road access be achieved. Although the convenience and accessibility of rural transportation cannot directly promote the increase in value-added of the primary industry, they are important basic conditions for achieving the prosperity of rural industries.

Table 6. Analysis on the spatial correlation between the added value of the primary industry and the total mileage of highways.

Primary Industry by Region (PIR_)	Total Mileage of Highway (THLi_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Moran' I	−0.223	−0.226	−0.242	−0.246	−0.238	−0.254	−0.265	−0.259	−0.228	−0.203
P-value	0.0310	0.0240	0.0130	0.0090	0.0090	0.0050	0.0040	0.0070	0.0280	0.0490
Z-value	−1.7997	−1.8652	−2.0054	−2.0902	−2.0640	−2.2335	−2.2882	−2.1931	−1.7887	−1.5728
Spatial Correlation	Significant	Extremely significant	Extremely significant	Extremely significant	Extremely significant	Extremely significant	Extremely significant	Extremely significant	Significant	Non-significant

Table 7. Analysis on the spatial correlation between the added value of the primary industry and the expressway and class I to IV.

Primary Industry by Region (PIR_)	Expressway and Class I to IV (Exw_C)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Moran' I	−0.177	−0.184	−0.198	−0.209	−0.203	−0.229	−0.247	−0.245	−0.222	−0.197
P-value	0.0680	0.0550	0.0390	0.0300	0.0290	0.0110	0.0080	0.0110	0.0280	0.0580
Z-value	−1.4099	−1.495	−1.6226	−1.7653	−1.7665	−2.0246	−2.1419	−2.0767	−1.7210	−1.5092
Spatial Correlation	Non-significant	Non-significant	Non-significant	Singnificant	Significant	Extremely significant	Extremely significant	Extremely significant	Significant	Non-significant

The spatial correlation between the added value of the primary industry in Sichuan Province and the turnover of highway passenger transportation is generally negative, but the correlation between 2012 and 2017 is not significant. After 2018, the correlation is significant, as shown in Table 8.

The accessibility and convenience of transportation are conducive to passenger and logistics flow between regions and between urban and rural areas, but there is a significant lag effect in the contribution of road mileage, road passenger and freight turnover growth to the primary industry. Similarly, the added value of the primary industry is chosen as the first variable, and the turnover of highway freight, the number of graduates from ordinary higher education institutions, the number of full-time teachers from ordinary higher education institutions, the number of graduates from secondary vocational education, the number of full-time teachers in secondary vocational education, internal expenditure of scientific research funds, the amount of agricultural fertilizers used, rural electricity consumption, per capita disposable income of rural residents, per capita consumption expenditure of rural residents, and crop planting area are chosen as the second variable, There is a negative correlation between indicators, but this negative correlation is not significant.

The increase in the number of graduates, full-time teachers, and internal expenditures for scientific research in vocational and higher education institutions will lead to a decrease in the added value of the primary industry. The main reason is that the preferred employment direction for vocational and higher education

Table 8. Analysis on the spatial correlation between the added value of the primary industry and passenger-kilometers of highway.

Primary Industry by Region (PIR_)	Passenger-kilometers of Highway (Pas_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Moran' I	−0.109	−0.112	−0.119	−0.129	−0.168	−0.203	−0.235	−0.243	−0.269	−0.249
P-value	0.2310	0.2140	0.2330	0.1970	0.0980	0.0570	0.0160	0.0140	0.0110	0.0280
Z-value	−0.7560	−0.7854	−0.7518	−0.8504	−1.2181	−1.4921	−1.8070	−1.9251	−2.1552	−1.6995
Spatial Correlation	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Non-significant	Significant	Significant	Extremely significant	Significant

graduates is mostly urban, with only a few choosing to start businesses in rural areas. The increase in the number of full-time teachers in universities and vocational colleges is not significantly negatively correlated with the added value of the primary industry, mainly because the proportion of full-time teachers in areas related to the primary industry is decreasing year by year. The increase in internal expenditure of scientific research funds reflects the importance that the country and society attach to scientific research innovation. However, the proportion of scientific research investment directly serving the primary industry is very small. Although there has been an increase in scientific research funds related to the primary industry after the introduction of the rural revitalization strategy, it is difficult to play a role in the short term. Therefore, increasing scientific research investment and talent cultivation in the primary industry is also an important measure related to the prosperity of rural industries. The increase in the use of agricultural fertilizers will increase the production of the primary industry, but it also increases the cost of agricultural production, resulting in the strange phenomenon of "increasing production without increasing income". With the development of the economy, green and ecological agricultural products are more popular in the market and have more economic value. Therefore, under the premise of ensuring food supply security, the use of agricultural fertilizers should be reduced, and the production of top-notch and ecological agriculture should be adhered to. This will help improve the quality of the development of the primary industry and be conducive to rural environmental protection. The increase in per capita disposable income and per capita consumption expenditure in rural areas will lead to a decrease in the added value of the primary industry, mainly due to the small proportion of household disposable income invested in expanding reproduction or technological innovation in rural consumption expenditure.

4.3. Local Autocorrelation Analysis

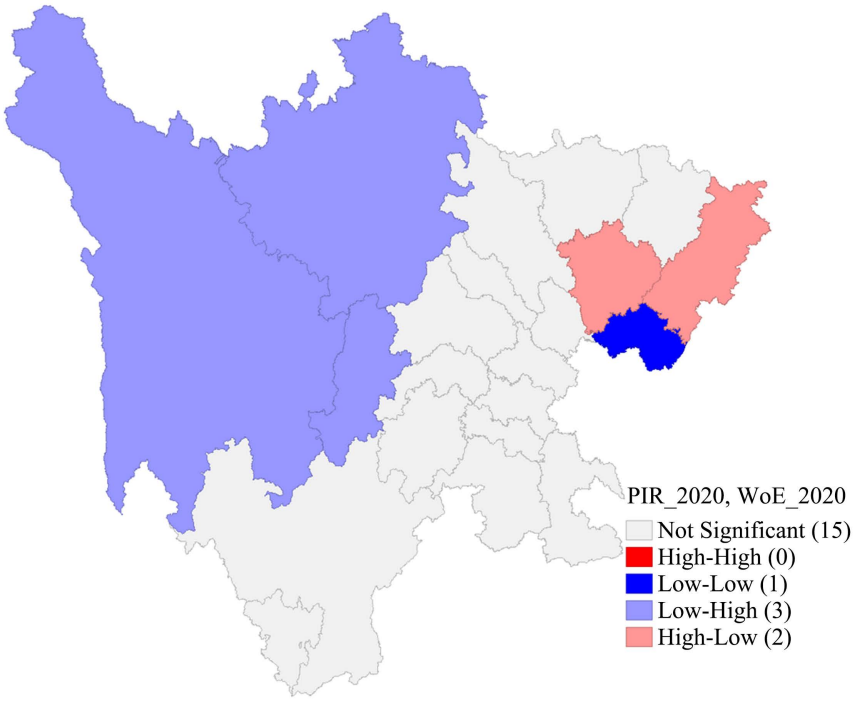
Will there be spatial correlation in local areas when the global spatial correlation is not significant? Using the previous approach, analyze the local autocorrelation of various cities (autonomous prefectures) in Sichuan Province from 2012 to 2021, using the added value of the primary industry in each year as the first va-

riable and other variables in the same year as the second variable. Local spatial autocorrelation can reflect the similarity of the same attribute value between each region and surrounding areas, used to verify the spatial heterogeneity of local regions, and can compensate for the shortcomings of global spatial autocorrelation (Li, Ye, & Wang, 2013). The local correlation results between the added value of the primary industry from 2012 to 2021 and the average wage of all employees in the unit are shown in Table 9, which is the same as the spatial weight matrix used in the global analysis. From Table 9, it can be seen that there was a negative correlation between the two in various cities (autonomous prefectures) from 2012 to 2019, but the significance of Lisa in 20 cities (autonomous prefectures) was not significant, only in Ganzi Prefecture. The Lisa significance map showed a "low-low" distribution; In 2020, there was still a negative correlation, with Lisa significance not significant in 15 cities (autonomous prefectures).

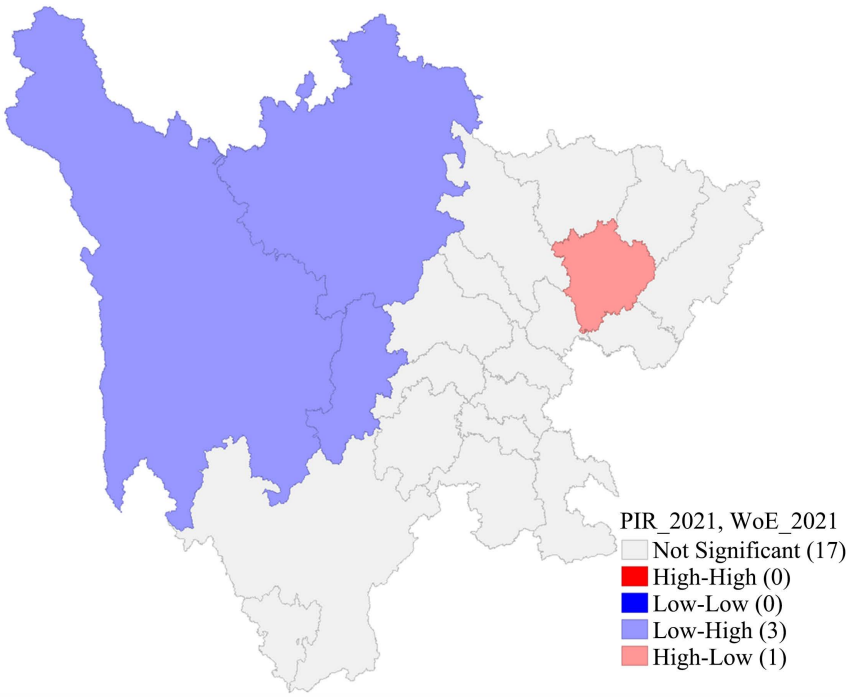
The partial correlation between the added value of the primary industry in 2020 and 2021 and the average wage of all employees in the unit is shown in Figure 6. In 2020, there was a significant local correlation between Guang'an and Dazhou, with Guang'an showing a "low-low" local significance and Dazhou showing a "high-low" local significance. Nanchong showed a "high low" local significance; Ganzi, Aba, and Ya'an all exhibit a "low high" local significance. In 2021, Ganzi showed a "low-high" local significance, Aba showed a "low-high" local significance, Nanchong showed a "high-low" local significance, and Ya'an showed an extremely significant "low-high" local correlation.

Table 9. Partial correlation analysis between the added value of the primary industry and the average wage of employed persons in all units.

Primary Industry by Region (PIR_)	Average Wage of Employed Persons in all Units by Region (WoE_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Local Moran's I	−0.119	−0.116	−0.116	−0.119	−0.125	−0.131	−0.133	−0.135	−0.169	−0.172
Non-significant	20	20	20	20	20	20	20	20	15	17
P-0.05	Ganzi (Low-Low)	Ganzi (Low-Low)	0	0	0	0	0	Ganzi (Low-Low)	Guang'an (Low-Low), Dazhou (High-Low)	Ganzi (Low-High), Aba (Low-High), Nanchong (High-Low)
P-0.01	0	0	Ganzi (Low-Low)	Ganzi (Low-Low)	Ganzi (Low-Low)	Ganzi (Low-Low)	Ganzi (Low-Low)	0	Ganzi (Low-High), Aba (Low-High)	0
P-0.001	0	0	0	0	0	0	0	0	Ya'an (Low-High), Nanchong (High-Low)	Ya'an (Low-High)



(a)



(b)

Figure 6. Lisa significance of the value added of the primary industry and the average wage of all employed workers in 2020 & 2021. (a) Y2020; (b) Y2021.

Similarly, by analyzing the local correlation between the added value of the primary industry and the completion of real estate investment between 2012 and 2021, the two are generally negatively correlated, but the local correlation be-

tween cities (autonomous prefectures) is basically not significant. The increase in real estate investment will significantly affect the growth of the primary industry in the region. Mainly because the growth of the real estate industry drives the urbanization process, to some extent squeezing the development space of rural areas, agriculture, and farmers. Similarly, by analyzing the local correlation between the added value of the primary industry and the increase or decrease index of energy consumption per unit of GDP between 2012 and 2021, the relevant data is detailed in Table 10. Overall, economically developed areas such as Chengdu, Liangshan, Ya'an, Deyang, Mianyang, Leshan, and economically disadvantaged areas such as Ganzi, Dazhou, and Bazhong in Sichuan Province are significantly affected by energy consumption policies, making them more sensitive to the requirements of clean development.

Similarly, compared to the second variable, which is the total mileage of highways, the mileage of graded highways, the turnover of highway passenger transportation, the turnover of highway freight transportation, the number of graduates from ordinary higher education institutions, the number of full-time teachers from ordinary higher education students, the number of graduates from secondary vocational education, the number of full-time teachers from secondary vocational education, and rural electricity consumption, the local correlation of the two variables is only significantly negative in 2 - 3 regions, and the local correlation between most regions is not significant. For regions with relatively poor economic conditions such as Ganzi, Aba, Deyang, and Dazhou, where the

Table 10. Partial correlation analysis of the increase or decrease of energy consumption of GDP per unit area.

Primary Industry by Region (PIR_)	Increase or Decrease of Energy Consumption of Gross Domestic Product per Unit Area by Region (IDE_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Local Moran's I	0.039	−0.374	−0.006	−0.139	−0.135	−0.101	−0.180	−0.160	0.071	0.037
Non-significant	19	19	16	17	19	19	15	16	21	19
P-0.05	Ziyang (Low-Low), Meishan (Low-Low)	Ganzi (Low-High)	Ganzi (Low-High), Ya'an (Low-High), Chengdu (High-High), Deyang (High-High)	Luzhou (Low-Low), Zigong (Low-Low), Neijiang (High-High), Ya'an (Low-High)	Ya'an (Low-High)	Bazhong (Low-High)	Guang'an (Low-Low), Mianyang (High-Low), Deyang (High-Low), Leshan (High-High), Ganzi (Low-High)	Ganzi (Low-High), Bazhong (Low-Low)	0	Mianyang (High-High)
P-0.01	0	0	0	0	Ganzi (Low-High)	Liangshan (High-Low)	0	Aba (Low-High), Ya'an (Low-High)	0	Dazhou (High-Low)
P-0.001	0	Panzhihua (Low-High)	Aba (Low-High)	0	0	0	Panzhihua (Low-High)	Panzhihua (Low-High)	0	

second variable is internal expenditure on scientific research funds, the growth of internal expenditure on scientific research funds will lead to negative growth in the primary industry. Therefore, it is necessary to strengthen scientific research cooperation and collaborative innovation with surrounding regions to avoid repetitive scientific research investment. At the same time, it is necessary to increase investment in related scientific research funds in the primary industry to play a significant driving role in the primary industry.

By studying the local correlation between the added value of the primary industry and the application of agricultural fertilizers in various cities (prefectures) in Sichuan Province, the relevant data is shown in Table 11. From 2012 to 2021, there was a local weak negative correlation between the two, with Guangyuan, Bazhong, Nanchong, Suining, Guang'an, and Ganzi Prefecture showing significant local negative correlation. Ganzi Prefecture has not shown significant local negative correlation since 2018. Liangshan Prefecture has consistently shown a very significant local negative correlation over the past decade, while Nanchong City also showed a very significant local negative correlation in 2013 and 2015. The agriculture of these seven cities (prefectures), including Liangshan Prefecture, accounts for a large proportion in their regional economic structure. The application of agricultural fertilizers is highly positively correlated with the crop yield of the primary industry, that is, an increase in the application of agricultural fertilizers will lead to an increase in crop yield. However, the increase in yield does not bring about an increase in the added value of the primary industry, but

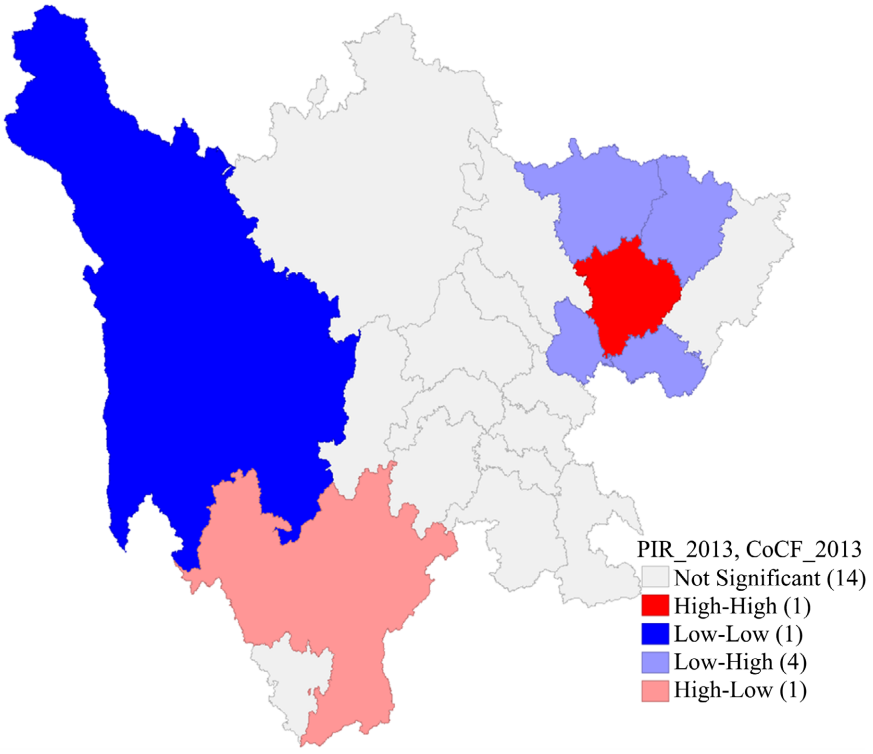
Table 11. Local correlation analysis between the added value of the primary industry and the consumption of chemical fertilizers.

Primary Industry by Region (PIR_)	Consumption of Chemical Fertilizers (CoCF_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Local Moran's I	−0.061	−0.045	−0.067	−0.069	−0.118	−0.128	−0.136	−0.137	−0.117	−0.106
Non-significant	14	14	14	14	14	14	15	15	15	15
P-0.05	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High), Ganzi (Low-Low)	Guanyuan (Low-High), Bazhong (Low-High), Suining (Low-High), Guang'an (Low-High), Ganzi (Low-Low)	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High), Ganzi (Low-Low)	Guanyuan (Low-High), Bazhong (Low-High), Suining (Low-High), Guang'an (Low-High), Ganzi (Low-Low)	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High), Ganzi (Low-Low)	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High), Ganzi (Low-Low)	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High)	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High)	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High)	Guanyuan (Low-High), Bazhong (Low-High), Nanchong (High-High), Suining (Low-High), Guang'an (Low-High)
P-0.01	Liangshan (High-Low)	Liangshan (High-Low), Nanchong (High-High)	Liangshan (High-Low)	Liangshan (High-Low), Nanchong (High-High)	Liangshan (High-Low)	Liangshan (High-Low)	Liangshan (High-Low)	Liangshan (High-Low)	Liangshan (High-Low)	Liangshan (High-Low)
P-0.001	0	0	0	0	0	0	0	0	0	0

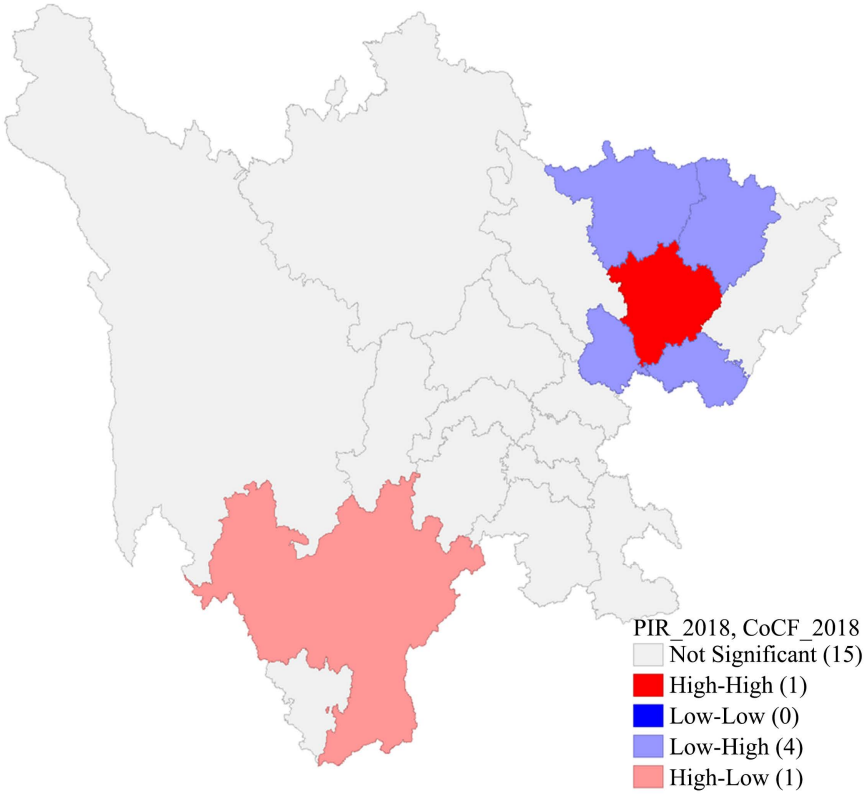
rather has a negative effect. These are Guangyuan, Bazhong, Nanchong, Suining, Guang'an the seven regions of Ganzi and Liangshan should attach great importance to these issues. The extensive use of agricultural fertilizers can have a significant short-term increase in production, but increasing production does not increase income, and can also lead to a decrease in soil quality and rural environmental pollution. In areas dominated by agriculture and tourism, the issue of green production in the primary industry remains an important issue for growth and protection. Only by scientifically addressing this issue can we effectively support rural revitalization strategies.

Selecting Lisa's significance maps for the two key years of 2013 and 2018 can intuitively reflect the local correlation between the added value of the primary industry and the amount of agricultural fertilizer applied in the second year of the 18th and 19th National Congress of the Communist Party of China, as shown in **Figure 7**. In **Figure 7**, it can be seen that Liangshan Prefecture and Ganzi Prefecture are both ethnic autonomous regions. The economic development of Liangshan Prefecture belongs to the first tier with the strongest economic strength in Sichuan Province, while Ganzi Prefecture is at the bottom of the third tier with the weakest economic strength. The development of Liangshan Prefecture does not have a significant driving effect on the development of Ganzi Prefecture, and it can also easily cause a "siphon phenomenon", attracting the resources and elements of Ganzi Prefecture to Liangshan Prefecture. Nanchong City and its surrounding cities of Guangyuan, Bazhong, Guang'an, and Suining have an economic foundation for the coordinated development of the primary industry.

Analyzing the added value of the primary industry as the first variable and the per capita disposable income of rural residents as the second variable, the spatial local correlation between the variables is generally not significant. Except for 2012, 2013, and 2021, which showed a weak negative correlation, all other research periods showed a weak positive correlation that was not significant. Taking the per capita consumption expenditure of rural residents as the second variable, the overall spatial local correlation between variables is not significant. Except for the weak negative correlation in 2012, all other research periods have shown weak positive correlation. Taking the planting area of crops as the second variable, the overall local correlation between it and the added value of the primary industry shows a negative correlation, although it is not significant in most regions. This characteristic is extremely similar to using the amount of agricultural fertilizer application as the second variable. From this, it can be seen that the increase in crop planting area significantly leads to a decrease in the added value of the primary industry, which is significantly reflected in areas dominated by agriculture, such as Guangyuan, Bazhong, Suining, Guang'an, and Liangshan. Therefore, in the overall planning of rural revitalization, Sichuan Province should emphasize the guidance of comprehensive output value, combined with the availability of land in hilly and mountainous areas, and under the premise of



(a)



(b)

Figure 7. Lisa significance of the value added of the primary industry and the application of agricultural fertilizers in 2013 and 2018. (a) Y2013; (b) Y2018.

ensuring food security, focusing on the cultivation of high value-added economic crops, green production methods, and differentiated production to address the fragmentation of arable land in the western mountainous areas of Sichuan Province (Table 12).

Through the global and local spatial correlation analysis of the added value of the primary industry from 2012 to 2022, it can be seen that the allocation of basic economic factors in Sichuan Province has a negative correlation with the overall development of the primary industry. There is a lag and disconnection problem between factor driven and investment driven effects in rural industries. From the spatial characteristics of the primary industry in Sichuan Province, it is difficult for general industrial development factors to drive the development of the primary industry, and the correlation between regions is weak. If we want to achieve the revitalization of rural industries in Sichuan Province, we need to strengthen the targeted industry driving factors and innovative development of the primary industry.

5. The Current Situation and Key Influencing Factors of the Primary Industry in Sichuan Province

The fundamental goal of rural revitalization strategy is to accelerate the high-quality development of rural industries and solve the problems of regional development imbalance, urban-rural development imbalance, and inadequacy. Under the background of rural revitalization strategy, the prosperity of rural industries depends on the innovation of leading industrial structure and organizational innovation. The leading industrial elements of rural revitalization can be divided into three levels from the inside out, as shown in Figure 8. The core of rural

Table 12. Local correlation analysis between the added value of the primary industry and the total sown areas of farm crops.

Primary Industry by Region (PIR_)	Total Sown Areas of Farm Crops (TSA_)									
	Y2012	Y2013	Y2014	Y2015	Y2016	Y2017	Y2018	Y2019	Y2020	Y2021
Local Moran's I	−0.142	−0.139	−0.100	−0.107	−0.166	−0.186	−0.187	−0.190	−0.174	−0.154
Non-significant	17	16	17	17	17	17	17	17	17	17
P-0.05	Guangyuan (Low-High), Bazhong (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Guangyuan (Low-High), Bazhong (Low-High), Suining (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Bazhong (Low-High), Suining (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Bazhong (Low-High), Suining (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Bazhong (Low-High), Suining (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Guangyuan (Low-High), Bazhong (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Guangyuan (Low-High), Bazhong (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Guangyuan (Low-High), Bazhong (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Guangyuan (Low-High), Bazhong (Low-High), Guang'an (Low-High), Liangshan (High-Low)	Guangyuan (Low-High), Bazhong (Low-High), Guang'an (Low-High), Liangshan (High-Low)
P-0.01	0	0	0	0	0	0	0	0	0	0
P-0.001	0	0	0	0	0	0	0	0	0	0

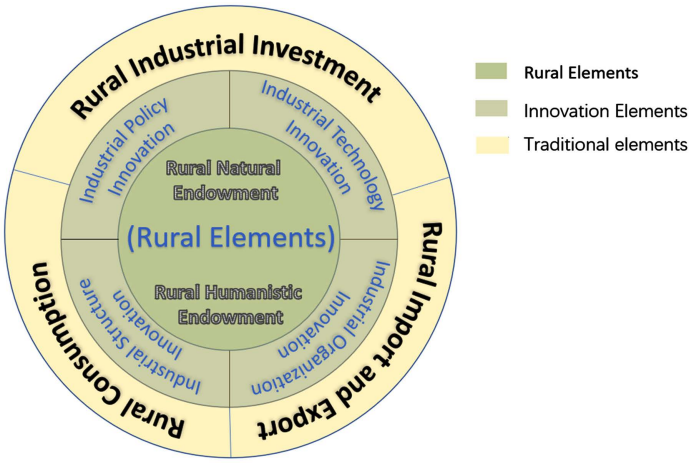


Figure 8. Model of rural leading industry elements.

leading industries is rural elements, including natural endowment and humanistic endowment in rural areas; The middle is the innovation element, which is a catalyst for the deep integration of rural and traditional elements. It mainly includes four categories: industrial policy innovation, industrial structure innovation, industrial organization innovation, and industrial technology innovation, and is the fundamental guarantee for the deep integration of the three industries. The outer circle serves as an industrial carrying element, including rural industrial investment, rural import and export, and rural consumption.

The selection criteria for rural leading industries under the rural revitalization strategy are based on the unique potential of rural areas, which includes the deep integration of three industries, scarcity of rural resources, regional differentiation, rural history and culture, and accessibility (Wang & Lu, 2023). The leading industry for rural revitalization is an emerging industry format based on the potential of rural characteristics. This emerging industry does not follow the traditional division of three types of industries in terms of industrial policy, industrial structure, industrial organization, and industrial technology, but is catalyzed by innovative factors. These emerging industries may vary depending on regional characteristics. Through the spatial correlation analysis of the main influencing factors of the development of the primary industry in Sichuan Province, the innovative development of the leading industry in rural revitalization in Sichuan Province depends on a series of measures as follows:

5.1. Innovation in the Leading Industrial Structure of Rural Revitalization

Building a rural revitalization leading industrial structure based on the deep integration of primary, secondary, and tertiary industries in rural areas is the direction and goal of industrial structure innovation. The leading industry in rural revitalization differs fundamentally from the traditional primary industry in terms of industrial factors and organizational forms. Compared with the primary industry, the main body of emerging industries is technological new farmers,

the object is rural industries, and the carrier is rural. In addition to possessing higher-level primary industry functions, emerging industries will also be a new growth pole for high-quality economic growth in China, until achieving balanced and coordinated development of the urban-rural economy. The success of "Village Super" and "Village BA" in Guizhou in 2023 is a model and successful case for the innovation of the leading industrial structure in rural revitalization.

There are many innovative ideas for the leading industrial structure of rural revitalization, which are specifically reflected in: 1) Building rural manor based industries around the rural technology industry chain. Rural estate transformation is not about transforming rural areas into towns, but rather integrating rural elements, innovative elements, and economic development elements into organic entities of life and industry, such as wineries, farms, and mountain farms. 2) Cultivate and strengthen rural culture and creative industries. For example, by making scientific research, production processes, processing processes, and achievements of rural industries artistic, such as wheat field art, rice field art, folk art, cultural and agricultural products, and ethnic culture; 3) Rural modern service industry and expansion, such as rural tourism, rural health, rural sports, etc. Rural three-dimensional industries based on high-tech will cultivate three-dimensional industries such as scientific research, planting and breeding, deep processing, supply and sales, and services.

Taking the orchid industry as an example, the research end will focus on developing new varieties, new orchid products, orchid planting technology, processing technology, etc; The scientific research achievements will serve as technical support for orchid cultivation and planting, guiding orchid cultivation, planting, deep processing, etc; Orchid deep processing will use orchids as the main material for high-value product development and processing; By leveraging the construction of a national market, we aim to connect the supply chain of orchids and related products in urban and rural areas; Relying on the orchid base, carry out cultural and tourism activities such as flower field sightseeing and wedding photography. Taking the traditional Chinese medicine industry as an example, the cultivation and breeding of traditional Chinese medicine raw materials have obvious geographical distribution and concentration characteristics. According to China's terrain, landforms, natural climate characteristics, and ethnic medicine system, a total of fifteen authentic medicinal material production areas have been formed, including Guanyao Medicine, Mongolian Medicine, Uyghur Medicine, Tibetan Medicine, Yunyao Medicine, Guiyao Medicine, Chuanyao Medicine, Qinyao Medicine, Zheyao Medicine, Huaiqing Medicine, Haiyao Medicine, Huaiyao Medicine, Northern Medicine, Southern Medicine and Cantonese Medicine. The main production areas of these authentic medicinal materials are distributed in the vast rural areas of these areas. Centering on the main production areas of authentic medicinal materials, it is possible to integrate traditional Chinese medicine, traditional Chinese medicine culture, traditional Chinese medicine education, traditional Chinese medicine diagnosis and treatment, tra-

ditional Chinese patent medicines and simple preparations processing, research and development and production enterprises, so that these traditional Chinese medicine enterprises can be directly integrated into rural development. The integrated development of the secondary and primary industries can cultivate more new economies with market potential and competitiveness driven by innovative factors. If the brewing and biotechnology industries sink to rural areas, obtaining high-quality raw materials (origin), producing and manufacturing high-quality products, and processing waste materials from the production process into organic fertilizers or organic drugs. If food processing enterprises take root in rural areas and collaborate with planting, animal husbandry, and fishing to build a three-dimensional ecological industrial system in rural areas. Through deep processing in the production area, it brings broad prospects for enhancing the value of agricultural products.

The innovative development of rural leading industries will drive the transfer of rural cultural tourism, new agriculture, medical and health care, fine chemicals, biotechnology and other industries from urban areas to rural areas. Under the strategy of rural revitalization, the integration of the primary and tertiary industries has led to the development of new forms of rural culture, sports, and tourism, such as rural agricultural culture, rural sports culture, ethnic culture, folk culture, and agricultural field art, enriching the connotation of rural tourism. Rural ecological tourism and experiential vacation have become the leisure pursuits of urban populations. More new rural formats can be generated, such as rural ecological construction, rural civilization creation, rural intelligent manufacturing, and rural scientific research. Rural digitization and internet construction improve the level of rural informatization, promote the integration of rural industries and rural e-commerce, and lay a solid foundation for the prosperity of rural industries.

5.2. Industrial Organization Innovation

Under the background of rural revitalization strategy, there are qualitative differences in the organizational form and governance of rural leading industries compared to traditional and modern agricultural stages. In the era of planned economy, the organizational form of the primary industry is to meet the fair distribution in times of extreme material scarcity; the reform and opening up, as well as the distribution of farmland to households, have revitalized China's primary industry, significantly improving resource allocation efficiency and agricultural production efficiency. The industrial organization form of China's primary industry has gone through three stages: public ownership domination, regional market domination, and market-oriented competition guidance. The industrial environment of different stages affects the corresponding organizational governance. In the stage of public ownership domination, the organizational form of the primary industry is collective governance under a planned system, with administrative planning as the link between industries, and the market is in a closed state; The symbol of the stage of regional market dominance is the

reform and opening up and the distribution of farmland to households. At this stage, the collective economic form of the primary industry is gradually replaced by household responsibility. At this stage, the organizational governance of the primary industry is mainly managed by dispersed farmers, and production and operation are mainly determined by each household based on general experience. Although production efficiency is significantly improved, the quality of products varies because the operating entities are individual farmers. It is difficult to gain a competitive voice.

Regional economic integration and collaborative innovation is a new form of industrial organization for rural leading industries. Rural revitalization of leading industries relies on and is rooted in new economic entities in rural areas. Industrial organization and resource allocation are catalyzed by innovative factors, integrating traditional industrial and rural factors, and thus constructing and cultivating distinctive rural leading industries. The existing administrative governance models in China are difficult to meet the requirements of rural development under the rural revitalization strategy, mainly manifested in the limitations and low efficiency of rural development caused by administrative division to a large extent. Through the spatial correlation analysis of the primary industry among various cities (prefectures) in Sichuan Province, it can be seen that under the existing development model of the primary industry, the correlation between the primary industry in rural areas of Sichuan Province is relatively weak. Regional economic integration and collaborative innovation will be one of the important means to crack the economic relationship built around the market and industry.

5.3. Industrial Technology Innovation

The leading industry technological innovation in rural revitalization refers to scientific research, technological application, and scientific management related to emerging industries in rural revitalization. From the perspective of the development history of the primary industry, it has gone through three important stages: primitive agriculture, traditional agriculture, and modern agriculture. The proposal of the rural revitalization strategy will mark the entry of the leading industry in rural revitalization into the era of wisdom. The technology of rural leading industries in the smart era is a combination of scientific research, intelligent industrial technology, scientific management technology, rural social governance and service smart technology, and uses scientific and technological innovation to catalyze the multiplier effect of traditional rural industrial elements.

Under the strategy of rural revitalization, the specific direction of scientific research on rural leading industries is reflected in three important fields: basic scientific discovery, innovation in industrial technology application, and development of management science. The ultimate goal of basic scientific discovery is to achieve the world's leading scientific position in the field of rural revitalization leading industries, especially in the source areas of the industrial chain of

rural leading industries such as excellent variety breeding; The goal of industrial technology application innovation is to transform scientific research into specific products, patents, or services, and improve the quality and quantity of unit output; Management science is not only an objective need to meet the development of rural revitalization leading industries, but also an organizational technical guarantee for high-quality development of industrial organizations.

5.4. Industrial Policy Innovation

The integration of rural leading industries not only refers to the geographical space of industries, but also includes the policy space of industries. Industrial policy innovation is first manifested in the formulation and application of industrial policies divided by the distribution areas of leading industries. The policy makers and scope of application in China are usually divided according to administrative levels. National industrial policies are formulated by the State Council or its affiliated ministries, and the scope of application is often national or designated regions; The industrial policies formulated by provinces and autonomous regions are local in nature, and their scope of application is usually within the jurisdiction of the policy maker or a designated area within the jurisdiction; By analogy, the industrial policies formulated by each level of government only apply to the administrative regions under their jurisdiction. However, the spatial distribution of rural leading industries is often related to specific regions, and the location of a certain leading industry is often cross administrative regions. The administrative regional characteristics of industrial policies can hinder the healthy development of industries. In recent years, innovative measures to formulate policies across departments and administrative regions based on industry have been common, but there is still great room for improvement at the district and county levels. Secondly, in terms of industrial policy driving methods, the main driving force is guided by industrial strategy to avoid mandatory and one-size fits all suppression. The role of industrial policy innovation lies in the organic integration of rural factors, industrial factors, and innovation factors. Through policy guidance, innovative thinking always occupies an active position in industrial development.

6. Conclusion

Sichuan Province must rely on the new development opportunities brought by the rural revitalization strategy to solve the problem of "urban-rural dual structure" and reduce regional development balance and insufficiency. The development of leading industries in rural revitalization must be based on rural elements, and through innovative elements, industrial and rural elements must be organically integrated. The innovative development of leading industries in rural revitalization must be coordinated to achieve industrial structure innovation, industrial organization innovation, industrial technology innovation, and industrial policy innovation.

Acknowledgements

The research in this article was supported by the National Social Science Foundation of China (Project No. 21XMZ003) and the Doctoral Research Initiation Fund of Xichang University (Project No. YBS202103). Sincerely thank our colleagues in the research group for reviewing and improving the translated manuscript. Thank you to the editor for your patience, friendliness, and guidance.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Chen, L. Q. (2006). Interpenetration of Industrial Development: Industrial Convergence. *Journal of Guizhou University of Finance and Economics, 3,* 31-35.

European Union (2018). *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation* (4th ed.). https://www.oecd.org/innovation/oslo-manual-2018-9789264304604-en.htm

Feng, L. (2010). Study on the Relationship between Industrial Cluster and Technology Relatedness. *Science Technology and Industry, 10,* 4-6.

Hidalgo, C. A, Klinger, R. B., Barabási, A. L. et al. (2007). The Product Space Conditions the Development of Nations. *Science, 317,* 482-487. https://doi.org/10.1126/science.1144581

Hong, Y. X. (2011). Several Important Concepts about Innovation Driven and Innovative Economy. *Journal of the Masses, 8,* 31-33.

Huang, D. K., & Zhao, Y. L. (2016). Spatial-Temporal Evolution of County Population and Economic Disparities in Guizhou Province. *Journal of Guizhou Normal University (Natural Sciences), 34,* 16-25.

Jiang, M. (2021). Exploring the Optimization of County Territory Space Based on the Long Term Mechanism of Poverty Alleviation—Taking Xide County, Liangshan Yi Autonomous Prefecture as an Example. *Development of Small Cities & Towns, 39,* 23-31.

Li, D., Yai, X. M., Wang, S. L. et al. (2013). Analysis of Deepening and Driving Forces of County Economic Spatial Differences Based on ESDA-GIS—Taking Lanzhou Xining Urban Dense Area as an Example. *Economic Geography, 33,* 31-36.

Li, Y. N. (2008). The Reform of the Rural-Urban Dualism. *Journal of Peking University (Philosophy and Social Sciences), 45,* 5-11.

Li, Y. S. (2006). Innovation in Agricultural Industrial Organizations: Government Function Positioning and Behavior Boundary. *Contemporary Economic Research, 2,* 55-57.

Li, Y., & Yang, J. (2017). Industry Chain Integration Model about Agriculture Case Studies from the Perspective of Industry Convergence. *Soft Science, 3,* 27-36.

Liu, J. (2018). Innovation in Industrial Organization Models: A Review and Analysis Based on Chandler's Theory. *China Economics & Trade Herald, 9,* 41-43.

Pang, Y. P., & He, L. (2021). Research on the Growth Effect of Technological Relatedness: Evidences from the Panel Data of Prefecture-Level Cities in the Yellow River Basin. *Urban Development Studies, 28,* 84-91.

Pang, Y. P., & Jiao, S. H. (2023). Economic Connection and Network Structure Evolution

of Zhengzhou and Luoyang Metropolitan Area: From the Perspective of Technological Relatedness. *Areal Research and Development, 42,* 43-47.

Porter, M. E. (1990). *The Competitive Advantage of Nations*. Free Press. https://doi.org/10.1007/978-1-349-11336-1

Rob, K., & Nicholas, J. T. (2006). *Conducting Research in Human Geography: Theory, Methodology & Practice*. Pearson Prentice Hall.

Schumpeter, J. A. (2017). *The Theory of Economic Development: With a New Introduction by Richard Swedberg*. Taylor & Francis Group.

Shi, Q. (2022). *Industry Economics* (5th ed.). China Renmin University Press.

Tang, L. X., Huang, F., Liao, B. T. et al. (2022). Research on the Development Path of Modern Agricultural Industrial Park under the Background of Urban Rural Industrial Collaboration—Taking Tianxi Agricultural Industrial Park in Tianmen City as an Example. *Xiandai Horticulture, 17,* 62-65.

Tang, Y. C., Wang, Z. Y., & Ma, Y. H. (2011). A Study on the Selection of Leading Industries Based on DEA and Input-Output Tables—Taking Tianjin City as an Example. *Journal of China Market, 11,* 30-32. https://doi.org/10.13939/j.cnki.zgsc.2021.11.030

Wang, H., & Lu, M. N. (2023). The Choice of Leading Industries for Rural Revitalization—Taking Liangshan Yi Autonomous Prefecture as an Example. *Rural Economy and Science-Technology, 34,* 1-4.

Wang, Y. F. (2018). Industrial Organization Innovation in Agricultural Supply Side Structural Reform. *Academic Search for Truth and Reality, 4,* 86-91.

Wang, Y. F., Xu, M., & Zhang, J. Q. (2022). The Impact of Collaborative Agglomeration of Agricultural Tourism on the Growth of Agricultural Green Total Factor Productivity: Mechanism of Action and Empirical Evidence. *Journal of Anhui Normal University (Humanities and Social Sciences), 50,* 143-157.