



## Research on the Coupling Mechanism of Urban-Rural Integration and Industrial Development: A Case Study of the Yangtze River Delta Region

Xinlei Yang<sup>1\*</sup>, Xiyin Tan<sup>2</sup>

<sup>1,2</sup> School of Business, Shanghai Dianji University, Shanghai, China

\* Corresponding Author: Xinlei Yang

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### Article Info

**ISSN (Online):** 2582-7138

**Impact Factor (RSIF):** 7.98

**Volume:** 06

**Issue:** 05

**September - October 2025**

**Received:** 07-07-2025

**Accepted:** 08-08-2025

**Published:** 31-08-2025

**Page No:** 211-215

### Abstract

With the continuous development of society, studying the relationship between urban-rural integration and industrial development has become an important part of promoting social progress. In order to better study the mutual influence between urban-rural integration and industrial development, this study constructs a coordinated coupling mechanism model of urban-rural integration and industrial development and conducts an overall analysis of the coupling status of urban-rural integration and industrial development in the Yangtze River Delta region. The study found that through methods and policies such as spatial carrier integration and digital chain integration in the Yangtze River Delta region at present, the coordination and coupling between the two are relatively good. However, the negative impact of the two still cannot be ignored.

**Keywords:** Urban-Rural Integration, Industrial Development, Yangtze River Delta Coupling Mechanism

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### 1. Introduction

Urban-rural integration has a complex correlation with industrial development, and the growth of both plays an irreplaceable role in social development. The relationship between them has been shown in previous studies. For example, urban-rural integration can provide factors such as talent, capital, and land for industrial development, and also promote the extension of agriculture to various industrial chains. Industrial development, in turn, creates new jobs, attracts talent, and encourages the flow of factors. Integrated urban-rural development refers to the coordinated development between industry and agriculture, city and rural areas, through the rational allocation of production factors and public resources<sup>[1, 2]</sup>. Industrial development refers to the process of the emergence, growth, and evolution of industries, including the evolution of individual sectors and industries as a whole. In general, the core of industrial development is industrial change, and the direction of industrial development is industrial optimization<sup>[3]</sup>.

### 2. Literature Review

#### 2.1 The impact of urban-rural integration on industrial development

It is not difficult to find from previous studies that the impact of urban-rural integration on industrial development has both positive and negative aspects. On the positive side, urban-rural integration can actively promote the optimization and upgrading of the industrial structure. One study found that urban-rural integration has driven industrial transformation, enabling old industrial cities to achieve remarkable results in resource allocation, industrial structure optimization, and upgrading, etc<sup>[4]</sup>. Another study found that urban-rural integration could enable some emerging industries, such as "live-streaming sales" and "service-oriented agriculture", to extend from cities to rural areas, driving the development of rural industries and gradually forming a multi-level and more complete industrial structure. It is worth noting that with the expansion and upgrading of industries, more jobs have been created, promoting employment for the rural population<sup>[5]</sup>. Not only that, but the positive promotion of industrial development by urban-rural integration is also reflected in the fact that urban-rural integration promotes regional synergy and balanced urban-rural development. Villages with a high level of integration can drive the development of surrounding areas and form industrial clusters.

In addition, with the advancement of urban-rural integration, the upgrading of the industrial structure in rural areas has gradually narrowed the development gap between rural and urban areas, promoting regional balance<sup>[5]</sup>.

There is also a negative impact of urban-rural integration on industrial development. In the context of urban-rural integration, industrial development sometimes faces greater risks and challenges. First of all, for some industries where the upgrading level of industrial structure is below the threshold, the flow of factors between "urban" and "rural" has exacerbated the misallocation of factors; Secondly, in a situation where the development of rural economy, industries, etc. is far inferior to that of urban areas, urban-rural integration may instead lead to the flow of rural high-skilled talents, capital, etc. to urban areas, creating a "siphoning effect" and promoting industrial development in the opposite direction<sup>[6]</sup>; In addition, urban-rural integration can promote industrial clusters in rural areas, but there may be situations such as the aggregation of low-value-added industries within the clusters, which is not conducive to the positive development of industries<sup>[5]</sup>.

## 2.2 The impact of industrial development on urban-rural integration

Industrial development has a positive impact on urban-rural integration. Industrial development can act as a "fusion agent" for urban-rural integration. First, with the rapid development of industries such as rural tourism and agriculture, more and more people are being attracted, breaking the status quo that high-tech talents only exist in cities and promoting the coordinated balance between "cities" and "rural areas"<sup>[7]</sup>; Secondly, the digital transformation in rural areas and the rapid development of emerging industries such as "smart agriculture" and "live-streaming sales" can significantly reduce the information dissemination gap between urban and rural areas<sup>[8]</sup>. Not only that, industrial development also promotes the two-way flow of elements between urban and rural areas, breaking down the barriers to the one-way flow of elements from "rural" to "urban". As the level of industrialization and modernization in rural areas deepens, urban factors such as capital and technology do not remain locally but are constantly being transferred to industries in rural areas, truly achieving the two-way flow of production factors<sup>[9]</sup>.

Industrial development also hurts urban-rural integration. First, the types and circumstances of industrial development vary from place to place, which may lead to a widening gap in levels between urban and rural areas. Specifically, for rural areas in the central and eastern regions where the economic development level is relatively high, there are more high value-added industries, and the clusters of these industries will reduce the urban-rural gap and have a positive promoting effect on urban-rural integration, but for rural areas in the western region where the economic development level is relatively backward, there are more low value-added industries, These industrial clusters will instead exacerbate the urban-rural gap and hurt urban-rural integration; Secondly, the introduction and development of new sectors may cause conflicts and be detrimental to urban-rural integration. Specifically, the introduction of some emerging industries in rural areas may cause the region's original advantageous technologies and industries to be impacted, and even lead to "marginalization". The region's industrial structure is forced to transform, and the unsmooth

replacement of old and new industries hurts the local area, and even repels the inflow of talents, funds, etc.<sup>[10]</sup>.

## 2.3 The interaction between urban-rural integration and industrial development

From previous studies, we have found that there are complex interactions between urban-rural integration and industrial development. Therefore, we should delve deeper into how the two interact with each other, what factors may have an impact on the interaction, and what current measures can promote the positive impact between the two. Coupling mechanism studies can effectively reflect the interaction between the two, and the effectiveness of this approach has been demonstrated in previous literature. Therefore, this paper uses this mechanism to explore the coordinated relationship between urban-rural integration and industrial development to better address the above problems<sup>[11]</sup>.

## 3. Research Methods

### 3.1 Mechanism Construction

This paper first establishes the coupled theoretical mechanism of urban-rural integration and industrial development. Previous studies have shown that there is a significant interaction between urban-rural integration and industrial development. Therefore, this study constructs a coordinated coupling mechanism for urban-rural integration and industrial development, aiming to explore how the two subsystems can achieve a benign interaction. Figure 1 shows the complex coordination relationship between urban-rural integration and industrial development.

Urban-rural integration subsystems: (1) Economic integration. Economic integration has both positive and negative effects on industrial development. On the one hand, economic integration makes the market larger, with a continuous influx of elements such as technology, resources, and people, and at the same time expands market demand, directly driving industrial development. On the other hand, the larger market size means more intense competition, which may hit some small and medium-sized industries. (2) Social integration. Social integration also promotes and restricts industrial development. Specifically, social integration means the gathering and collision of people and groups. Labor is one of the important factors influencing industrial development. Social integration has led to the reallocation of labor in various regions. For example, the surplus labor in regions such as Guizhou has flooded into large cities like Shanghai and Beijing, and the labor in various regions has become more balanced. However, the collision between different ethnic groups may have an impact on traditional industries, so traditional industries should also consider how to "offset" and "smooth out" such an impact. (3) Spatial integration. Spatial integration means downplaying geographical boundaries. On the one hand, the location of industries is no longer restricted by geographical boundaries, and elements such as resources and people can flow more quickly. On the other hand, social integration leads to more intense competition among industries within a space, which may be detrimental to the positive development of these industries. (4) Ecological integration. Ecological integration has a dual effect on industrial development. Ecological integration can give rise to industries that produce circularly and reuse waste, which is beneficial not only for industrial development but also for environmental protection. However, for some heavily polluting industries, the cost of

treating waste gas and waste residue has increased, and the path of "discharging first and treating later" has been completely blocked. These industries may face major transformation or even exit the market. (5) Cultural integration. Cultural integration both promotes and restricts industrial development. Specifically, the boost of cultural integration amplifies industrial value and enhances economic benefits<sup>[12]</sup>. But at the same time, the inclusion of culture increases the cost of the industry, and the excessive commercialization of culture may also hinder the industry. Industrial development subsystems: (1) industrial scale. The size of industries has a considerable impact on urban-rural integration. On the one hand, if rural areas have large industries and industrial clusters, it can drive technology, resources, etc. to flow into rural areas, and at the same time drive the development of surrounding rural areas and narrow the urban-rural gap. On the other hand, if large-scale industries and industrial clusters are located in county towns, cities, and other areas, a large number of rural laborers will flow into these areas, which may further "hollow" rural areas.

Expanding gap between urban and rural areas<sup>[13]</sup>. (2) Industrial structure. Industrial structure has both positive and negative effects on urban-rural integration. Specifically, if the industrial structure is rich in hierarchy, such as complementary industrial structure, where urban areas are responsible for scientific research and development and rural areas for supporting facilities, it can better promote urban-rural integration and achieve common development; If the industrial hierarchy is single and all the processes are carried out by cities, it will further "divide" urban and rural areas. (3) Industrial efficiency. The level of industrial efficiency determines the effect of urban-rural integration. Efficient industries increase industrial profits, and if profits are placed in rural areas, it can accelerate the flow of factors and improve the construction of public facilities and services in rural areas; If profits are placed only in urban areas, it will further widen the gap between urban and rural areas, which is not conducive to urban-rural integration. If the industrial efficiency is low, it will be detrimental to both urban industrial development and rural development.

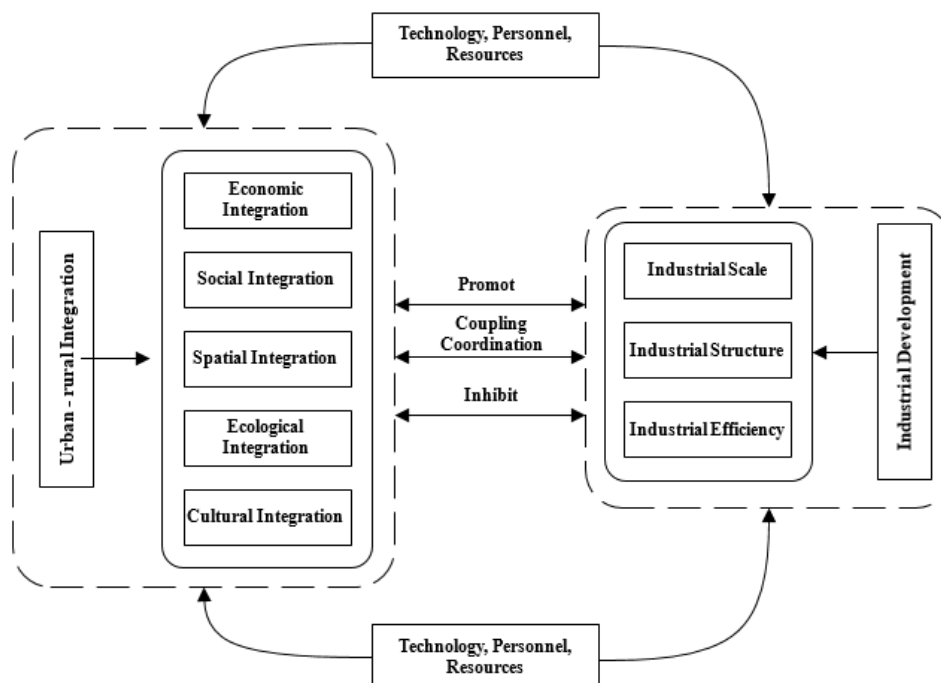


Fig 1

### 3.2 Research Subjects

This paper selects the Yangtze River Delta region as the subject for the study, which has several advantages: (1) significant gradient differences. The counties in the Yangtze River Delta region cover three types of development levels: developed, moderately developed, and underdeveloped, making the research results representative and complete. (2) Abundant policy interventions. The Yangtze River Delta region is rich in national strategies and government policies, providing abundant cases and practical support for our research on which measures can promote the positive interaction between urban-rural integration and industrial development.

This study used Youdao Dictionary and Youdao dict for translation during the research writing process. Additionally, this study did not use AI generative tools to generate new

languages and content. Finally, the authors reread the translation results of this study to ensure that no new content is produced.

### 4. Results

At present, the Yangtze River Delta region uses urban-rural integration as a "key" to achieve industrial upgrading and promote industrial development, which can mainly be attributed to the following aspects: (1) the rational distribution of each link in the industrial chain. Many industries in the Yangtze River Delta divide the industrial chain into four stages and place the manufacturing links in the countryside, making the countryside a part of the urban industry. For example, at the Yangtze River Delta Vegetable Industry Conference held in Shanghai in 2017, the three provinces and one municipality of Jiangsu, Zhejiang, Anhui,

and Shanghai signed relevant agreements and announced the establishment of the "Yangtze River Delta Vegetable Association Industry Alliance". Shanghai announced that it would actively promote industrial integration in conjunction with urban and rural revitalization. (2) Integration of spatial carriers. For example, the Jiaxing region attaches great importance to the flow of factors and the allocation of resources between urban and rural areas, and has formed four types of industrial clusters based on this, namely "characteristic towns - small towns - modern agricultural zones - typical demonstration zones", to build the leading industries of characteristic towns and promote industrial development<sup>[14]</sup>. (3) Achieve the circulation of elements. The Yangtze River Delta region has broken down the barriers of administrative divisions and household registration, enabling the smooth flow of land, capital, talent, etc. between urban and rural areas, thereby promoting industrial development. For instance, the Smart Oasis Institute of Zhejiang University once signed a "dual employment agreement" with the government of Jiashan County, achieving a "mutual pursuit" of talents. Professors from Zhejiang University retained their positions at the university while working at the Jiashan laboratory, and the research team eventually achieved a high degree of integration of research and industry<sup>[15]</sup>.

The Yangtze River Delta region has also promoted the integration of urban and rural areas by leveraging industrial development. Specifically, (1) Digital chain integration. Digital chain integration focuses on coordinated development between urban and rural areas, enabling synchronized information between urban and rural areas to "work together". For example, the Yangtze River Delta region has been committed to the high-quality development of the digital economy. The e-commerce industry in rural areas has been promoted. Forms such as live streaming and online sales have made it more convenient to sell agricultural products and greatly increased sales volume. The rural economy has developed rapidly and promoted urban-rural integration. The gap between urban and rural areas has been narrowed<sup>[16]</sup>. (2) The tourism industry drives development. At present, the Yangtze River Delta region continues to focus on agricultural industrialization to promote the integration of urban and rural industrial development. Kunshan, for example, has broken down traditional agricultural barriers through the chain development of "leading enterprises + cooperatives + family farms". Kunshan's Bacheng Town has introduced big data and Internet of Things monitoring to assist crab farming, significantly increasing the contribution rate of agricultural science and technology. In addition, the area has created new business forms such as leisure agriculture. By integrating resources, it has formed "one village, one product" characteristic agricultural tourism projects, greatly promoting the integration and mutual assistance between the "city" and the "rural area"<sup>[17]</sup>.

Despite this, there are still some problems in the coordination and coupling between urban-rural integration and industrial development in the Yangtze River Delta region, and these problems cannot be ignored. For example, (1) peripheral counties are marginalized. In recent years, counties located on the outskirts of big cities have often received a lot of industrial transfers from big cities through their superior geographical locations. Located on the outskirts of town, however, because the distance is too far, the reason is ignored, such as traffic unchanged, even resources, and so on<sup>[18]</sup>. (2) The digital divide has widened

in the opposite direction. Although urban and rural areas in the Yangtze River Delta region have been actively achieving coordinated development, the industrial layout is still mainly distributed in urban areas, and rural areas are often only allocated some low-value-added jobs. Urban income is much higher than that in rural areas, and the gap has widened in the opposite direction<sup>[19]</sup>.

## 5. Case Analysis

### 5.1 Case One: Deqing County, Zhejiang Province

After the Hangzhou-Nanjing and Huzhou-Hangzhou high-speed railways were officially put into operation, the travel time between Deqing County and the central cities in the Yangtze River Delta region, such as Nanjing, Hangzhou, and Shanghai, was shortened to within two hours. With the high-speed railway opening, Deqing County put forward a series of "Shanghai combines navigation" development strategies, population, capital, and other elements associated with high-speed flow<sup>[20]</sup>. In 2017, the people's hospital of Deqing County officially became the Deqing campus of Zhejiang University Sir Run Run Shaw Hospital, and in 2023, it established a full trusteeship relationship with Zhejiang University Sir Run Run Shaw Hospital, bringing about a qualitative improvement in the local medical level of Deqing county; In 2019, the public university jointly built by Zhejiang University of Technology and the government of Deqing County was officially put into use. The "urban" and "rural" areas have been continuously integrated and interconnected, public services have been integrated into the city, and the gap between urban and rural areas has been further narrowed<sup>[21]</sup>. In recent years, Deqing County has seen the agglomeration of three advantageous industries - biomedicine, high-end equipment, and green home - and the vigorous development of various emerging industries. The industrial structure has been optimized and upgraded, and the industrial development level has improved.<sup>[20]</sup> In summary, Deqing County in Zhejiang Province has relied on the development of high-speed rail to drive the rapid advancement of urban-rural integration and industrial development, and the interaction has ultimately led to a more coordinated coupling in the county.

### 5.2 Case 2: Guannan County, Jiangsu Province

Guannan County is located in the northern part of Jiangsu Province. Its main industrial development shows the characteristics of "emphasizing the primary industry and neglecting the tertiary industry". The industrial structure of the county is mainly low-value-added and traditional agriculture, resulting in relatively serious industrial pollution in the area<sup>[22]</sup>. In addition, it is clearly stated in the "Overall Territorial Spatial Planning of Guannan County" that currently Guannan County lacks pre-control for the implementation of future major projects along the coast, and factors flow slowly, resulting in the county always being a "poorly coordinated and coupled" coastal county. Finally, due to the weak industrial structure and the relatively weak industrial carrying capacity of the two provincial platforms, the county's fiscal revenue level is relatively low, unable to invest in sufficient infrastructure construction, and the gap with urban development is gradually widening. In summary, Jiangsu Guannan County, due to its traditional industrial structure and lagging development, has indirectly affected the fiscal revenue level of the region, resulting in backward industrial development in the county and an increasing gap



with the city. Therefore, the degree of coordinated coupling in the county is low and may continue to decline.

## 6. Conclusion

Overall, the coordinated coupling of urban-rural integration and industrial development in the counties of the Yangtze River Delta region is generally good, but there are still some counties with poor coordinated coupling. Therefore, this paper suggests that for regions with good coordination and coupling at present, they should continue to maintain this advantage, further accelerate the flow of factors between urban and rural areas, and rationally arrange the industrial layout and optimize the industrial structure in light of the actual situation to strive to improve the level of coordination and coupling; For regions with poor coordination and coupling at present, it is necessary to deeply analyze the deficiencies in factor distribution and key industrial layout within the county, and actively seek policy, strategic and financial support from the state, to improve the current coupling situation of urban-rural integration and industrial development as soon as possible.

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