Research Article


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The integrated development of urban and rural areas is the best way to promote agricultural and rural construction and achieve rural revitalization in the new era [1], and promote the equal exchange and two-way flow of factors between urban and rural areas. The coupling coordinated development of urban-rural logistics has opened the channel for “selling agricultural products to the cities, while selling industrial products to the countryside,” thereby laying a solid foundation for the two-way flow of factors between urban and rural areas. Therefore, it is essential to measure the grey correlation between the coupling coordination degree of urban-rural logistics and the integrated development level of urban and rural areas, analyze the key factors affecting the urban-rural integrated development, and put forward measures to promote it. First, this paper constructs an index system of coupling coordination degree; then it measures the coupling coordinated development level of urban-rural logistics using the coupling coordination degree model. Second, it constructs an index system and measures the urban-rural integrated development level using the entropy method and comprehensive weighted method. Finally, it quantitatively measures the grey correlation degree between the coupling coordination degree of urban-rural logistics and the integrated development level of urban and rural areas using the grey correlation analysis method. The results reveal that the coupling coordinated development level of urban-rural logistics has improved and the urban-rural integrated development level has had a significant upward trend. The factors in the subsystems of urban-rural logistics, such as economic environment, logistics infrastructure, logistics informatization level, logistics demand level, and logistics human resources, have an excellent effect on promoting the urban-rural integrated development.

1. Introduction

The integrated development of urban and rural areas is the best way to promote agricultural and rural construction, achieve rural revitalization in the new era [1], and promote the equal exchange and two-way flow of factors between urban and rural areas. The coupling coordination development of urban-rural logistics has opened the channel for “selling agricultural products to the cities, while selling industrial products to the countryside,” thereby laying a solid foundation for the two-way free flow of factors between urban and rural areas [2]. Therefore, measuring the grey correlation relationship between the coupling coordination degree of urban-rural logistics and the integrated development level of urban and rural areas will effectively promote urban-rural integrated development and rural revitalization in the new era.

Existing studies on urban and rural logistics mainly involve the construction, evaluation, and strategic path discussion of urban and rural logistics integration systems. For instance, using factor analysis methods, Duan et al. [3] evaluated the integration level of urban and rural logistics in Shanxi Province by constructing an urban and rural logistics integration framework. Zhou et al. [4] analyzed the unbalanced “duality” pattern of urban and rural logistics in Jiangsu, designed an integrated system architecture for the two-way circulation, and put forward the construction priorities and measures. Chen [5] thoroughly analyzed the
development status and significant problems of integrating urban and rural logistics in China and put forward measures to construct an urban and rural logistics integration system. Gong [6] conducted an empirical study using urban and rural logistics data from 2000 to 2015 and analyzed the coordinated development level. Wang et al. [7] established a system synergy model and studied the data of urban and rural logistics of Anhui Province from 2001 to 2017, finding a time-series evolution trend from weak synergy to low and medium synergy, but the overall level is low. Bai [8] concluded that the level of economic development, transportation infrastructure, and utilization rate of transportation facilities are the key factors that affect the integration of urban-rural logistics.

Studies on urban-rural integration mainly involve theoretical and empirical research on the connotation, formation mechanism, evolution process, evaluation method, and influencing factors of rural-urban integration. Zhou et al. [9] analyzed the definition and evolution of China’s urban-rural relations from the perspective of Marxist’s urban-rural relations theory. Li [10] concluded that implementing an urban and rural coordinated development strategy would meet and balance the needs and interests of urban and rural residents and lead to the sustainable development of urbanization. Zhang et al. [11] measured the coordination degree and urban-rural integration level in the Yellow River Basin from the perspectives of urban development, rural development, and urban-rural integration perspectives. Li [12] suggested that the coordinated development of urban and rural can be achieved by breaking down institutional barriers and formulating a reasonable urban-rural interaction model. Zhang et al. [13] summarized the evolution process, practical experience, and challenges of urban-rural relations based on an empirical study of Jiangsu Province. Yao et al. [14] thoroughly analyzed the opportunities, significant problems, and factors affecting the urban-rural integration development of Nanjing. They put forward policy recommendations for accelerating the urban-rural integration development of Nanjing, such as establishing an urban-rural interaction system and promoting the equalization of urban and rural public services. Nishida [15] discussed the role of interdependence between agriculture and nonagriculture in economic development and structural change from the perspective of a two-way interaction between urban and rural areas. Li et al. [16] found that the government’s investment in rural areas and the development of township enterprises can strengthen the connection between rural areas and cities, which would significantly promote the development of rural regions. Chen et al. [17] analyzed the urban-rural integration development models in Chengdu, Chongqing, Shanghai, and Suzhou. They summarized and described the top-down Coordination model by the city government, the authorization model of entrepreneurial township government, the negotiation model, and the labour force transfer model and discussed the enlightenment of different ways to other cities. Cao [18] evaluated the development level of China’s urban-rural integration driven by “two-wheel coordination” using the coupling coordination degree model and analyzed the evolution of its spatial pattern and the influencing factors of its development. Lu et al. [19] discussed the recognition and realization mechanism of the “element-structure-function” coupling coordination of urban-rural logistics and the integrated development of urban and rural areas quantitatively and analyzing the key factors affecting the urban-rural integrated development will dramatically promote the urban-rural integrated development and rural revitalization in the new era. This paper first measures the urban-rural logistics coupling coordinated development level in Hubei Province using the coupling coordination degree model. Second, it measures the urban-rural integration development level using the entropy method and comprehensive weighted method. Finally, the grey correlation analysis method is used to evaluate the grey correlation between the urban-rural logistics coupling coordinated development level and the urban and rural integrated development level. It further analyzes the key factors affecting the urban-rural integrated development. Based on the results, it puts forward measures and recommendations to promote urban-rural integrated development.

2. Coupling Coordinated Development Level Evaluation

2.1. Index System Construction. Based on previous research [6–8], this paper constructs an index system from five perspectives—urban and rural economic environment, logistics infrastructure, logistics informatization level, logistics demand level, and logistics human resources—to evaluate the coupling coordination degree of urban-rural logistics quantitatively. The urban and rural economic environment was assessed using the per capita disposable income and per capita consumption expenditure of urban or rural households. The construction of urban and rural logistics infrastructure was evaluated using the length of urban or rural delivery routes and the number of urban or rural broadband access users. The level of logistics informatization was assessed using the number of mobile phones and household computers per 100 households in urban or rural areas. The logistics demand level is evaluated using the total output value of industrial activities; the gross output value of farming, forestry, animal husbandry, and fishery; and the total retail sales of urban or rural consumer goods. The logistics human resources are evaluated using the total and employed population in urban or rural areas. An index system is established, as presented in Table 1.
2.2. Data Processing and Weight Determination

2.2.1. Data Standardization. The index system contains 20 evaluation indicators. All data are from the statistical Yearbook of Hubei Province from 2012 to 2021, reflecting the development level of urban and rural logistics subsystems since 2011. In the normalization methods commonly used in existing literature [18, 20–22], this paper employs the min-max normalization method to standardize the indicator data to eliminate the dimensional influence. Moreover, using the treatment method of zero value proposed by Yi [23], 0.01 is added to the standardized results to avoid meaningless assignments. The formula is as follows, where \( x_{ij} \) is the original data and \( x'_{ij} \) is the normalized value of \( x_{ij} \).

\[
x'_{ij} = \begin{cases} 
\frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} + 0.01, & \text{positive indicator} \\
\frac{\max(x_{ij}) - x_{ij}}{\max(x_{ij}) - \min(x_{ij})} + 0.01, & \text{negative indicator}
\end{cases}, \quad i = 1, \ldots, m; \quad j = 1, \ldots, n. \tag{1}
\]

2.2.2. Indicators Weight Determination. This paper employs the entropy method [24, 25] to determine the index weight, and the formula is as follows:

\[
P_{ij} = \frac{x'_{ij}}{\sum_{i=1}^{m} x'_{ij}}, \quad i = 1, \ldots, m; \quad j = 1, \ldots, n, \tag{2}
\]

\[
E_j = -k \sum_{i=1}^{m} p_{ij} \ln p_{ij}, \quad k = \frac{1}{\ln m} > 0, \quad E_j \geq 0, \quad j = 1, \ldots, n, \tag{3}
\]

\[
D_j = 1 - E_j, \quad j = 1, \ldots, n, \tag{4}
\]

\[
W_j = \frac{D_j}{\sum_{j=1}^{n} D_j}, \quad j = 1, \ldots, n. \tag{5}
\]

2.3. Measurement of Coupling Coordination Degree. In the development of urban and rural logistics, the rural and urban logistics subsystems are not independent but evolve continuously in mutual influence. Therefore, it is necessary to regard these two subsystems as composite systems. Then, construct the coupling coordination degree model [26–28] to analyze the coupling degree and coordinated development level of the composite systems. The coupling degree model is as expressed in
$C = 2 \sqrt{\frac{U_u \times U_r}{U_u + U_r}}, 0 \leq C \leq 1. \quad (6)$

$U_u$ and $U_r$ represent the systematic order degree of the urban and rural logistics subsystems, reflecting the orderly development level of the urban and rural logistics systems, respectively; the larger the value, the higher the orderliness level. $U_u$ and $U_r$ are usually obtained by the comprehensive weighted method [23]. The formula is as follows:

$$U_u = \sum_{j=1}^{n} x_{ij} W_j, i = 1, \ldots, m; j = 1, \ldots, n,$$

$$U_r = \sum_{j=1}^{n} x_{ij} W_j, i = 1, \ldots, m; j = 1, \ldots, n. \quad (7)$$

Then, the coupling coordination degree model is used to calculate the coupling coordination degree of urban-rural logistics composite systems. The formula is as follows:

$$D = \sqrt{C \times T}. \quad (8)$$

where $T = \alpha U_u + \beta U_r$ is the comprehensive coordination indicator, and the coefficients $\alpha$ and $\beta$ are determined by the importance of the urban and rural subsystems in the composite system [29]. This paper assumes that $\alpha = \beta = 0.5$. The coupling degree and coupling coordination degree types of the urban-rural logistics composite systems are determined in Table 4, referring to the classification shown in Tables 5 and 6.

2.4. Calculation Results and Analysis. As presented in Figure 1, the order degree of the urban logistics subsystem has increased significantly. Each indicator grew steadily from 2011 to 2020, whereas the order degree of the rural logistics subsystem remains at a medium level with some fluctuations. The main reason is that the accelerating pace of urbanization pushes the rural population to move to urban areas. The rural population decreased from 27.77 million in 2011 to 21.43 million in 2020. Conversely, the total and employed populations in urban areas continued to increase from 2011 to 2020. For example, the urban population increased from 2982.53 million in 2011 to 3632.04 million in 2020.

Figure 2 reveals that the coupling coordination degree of the urban-rural logistics composite system increased from 0.410 to 0.865 from 2011 to 2020. The coupling coordination type also changed from close to incongruity to extreme coupling coordination. The overall development level of urban-rural logistics has been improving. Specifically, from 2011 to 2014, the coupling coordination type changed from close to incongruity to primary coupling coordination. The mutual promotion between urban and rural areas is not apparent. From 2015 to 2016, due to the increased interaction between urban and rural areas, the logistics industry in Hubei Province gradually formed a particular scale, and the coupling coordination type was in the intermediate stage. From 2017 to 2018, the coupling coordination degree reached 0.797, which is a good coupling coordination stage. By 2020, the coupling coordination degree reached 0.865, which is a good coupling coordination stage.
coordination degree increased to 0.865 and reached extreme coupling coordination.

Overall, more and more counties (cities and districts) joined the pilot project of urban-rural integration since Ezhou was carried out in 2008, and it has been continuously promoted. In 2020, Hubei Province sped up the construction of urban-rural integration infrastructure and further improved transportation and logistics facilities, rural information facilities and urban-rural integrated public service facilities. Based on this, the coupling coordinated development of urban and rural logistics has accelerated.

### 3. Evaluation of Urban-Rural Integration Development

#### 3.1. Index System Construction

Drawing on the previous researches [11, 18, 23], this paper constructs an index system of urban-rural integration development in Hubei Province from four perspectives: economic, social, spatial, and ecological integration, comprehensively considering the scientificity, accuracy, authenticity, and availability of indicators as shown in Table 7.

<table>
<thead>
<tr>
<th>Coupling coordination degree</th>
<th>Coupling coordination type</th>
<th>Coupling coordination degree</th>
<th>Coupling coordination type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 ≤ D ≤ 0.1</td>
<td>Extremely incongruous</td>
<td>0.5 ≤ D ≤ 0.6</td>
<td>Primary coupling coordination</td>
</tr>
<tr>
<td>0.1 ≤ D ≤ 0.2</td>
<td>Serious incongruity</td>
<td>0.6 ≤ D ≤ 0.7</td>
<td>Intermediate coupling coordination</td>
</tr>
<tr>
<td>0.2 ≤ D ≤ 0.3</td>
<td>Mild incongruity</td>
<td>0.7 ≤ D ≤ 0.8</td>
<td>Good coupling coordination</td>
</tr>
<tr>
<td>0.3 ≤ D ≤ 0.4</td>
<td>Primary incongruity</td>
<td>0.8 ≤ D ≤ 0.9</td>
<td>High-quality coupling coordination</td>
</tr>
<tr>
<td>0.4 ≤ D ≤ 0.5</td>
<td>Close to incongruity</td>
<td>0.9 ≤ D ≤ 1.0</td>
<td>Extreme coupling coordination</td>
</tr>
</tbody>
</table>

#### 3.2. Urban and Rural Integrated Development Level Evaluation

In this paper, the entropy method and comprehensive weighted method were used to evaluate the level of urban and rural integrated development in the following steps:

**Data standardization:** The original data of each indicator was standardized by the min-max normalization method to eliminate the influence of indicator dimensions. The formula is shown in formula (1).
3.3. Calculation Results and Analysis. According to the above calculation results, the level of urban-rural integrated development in Hubei Province is closely related to economic, social, spatial, and ecological integration. As shown in Figure 3, the level of urban-rural integration in Hubei Province showed an apparent increasing trend from 2011 to 2020, where it was increased from 0.143 in 2011 to 0.901 in 2020, increasing by 5.30 times. The score of integrated development levels in 2013 and 2014 increased by 72.4% and 49.8%, respectively, compared with the previous year. Thus, the level of urban-rural integrated development in Hubei Province has been significantly improved from 2011 to 2020.

Specifically, as shown in Figure 4, the level of urban-rural economic integration development in Hubei Province increased significantly from 2011 to 2020, from 0.003 in 2011 to 0.305 in 2020. Although the social integration level fluctuated in 2012 and 2015, the evaluation score increased from 0.055 to 0.193, or 2.51 times, from 2011 to 2020, showing an increasing trend as a whole. The level of urban-rural spatial integration development has been rising steadily from 2011 to 2020, from the initial 0.002 to 0.167, with a remarkable improvement effect. From 2011 to 2020, the level of urban-rural integrated ecological development increased from 0.083 to 0.236, but on the whole, it fluctuated wildly. Compared with the previous year, it declined significantly in 2012, 2014, and 2017–2019, and the recovery effect was remarkable in 2020, reaching 0.236.

4. Grey Correlation Analysis

This paper quantitatively measures the grey correlation between the coupling coordination development level of urban-rural logistics and the integrated development level of urban and rural areas using the grey correlation analysis method [34, 35]. Then, it further analyzes the key factors affecting urban-rural integrated development. Based on the results, it puts forward measures and recommendations to promote urban-rural integrated development.

4.1. Model Construction and Variable Description. This paper constructs a grey correlation analysis model by taking the urban-rural integration degree as a reference sequence and taking the economic environment, logistics infrastructure, logistics informatization level, logistics demand level, and logistics human resources as the comparison sequence. Then, calculate the correlation value of each factor in the urban-rural logistics subsystem and the urban-rural integration degree in each year from 2011 to 2020.

4.2. Grey Correlation Degree Calculation

4.2.1. Grey Correlation Coefficient Calculation. First, the comprehensive score of each factor of economic environment, logistics infrastructure, logistics informatization level, logistics demand level, and logistics human resources was calculated using the weighted comprehensive method (formula (7)) according to the weight calculated above. Based on the results, the grey correlation coefficient \( \xi_i(k) \) was calculated by formula (9), that is, each factor in the urban-rural logistics subsystem and the urban-rural integration from 2011 to 2020:

\[
\xi_i(k) = \frac{\Delta (\min) + \rho \Delta (\max)}{\Delta x_i(k) + \rho \Delta (\max)},
\]

\[
\Delta (\min) = \min_{i=1}^{n}\min_{k=1}^{n}|x_i(0) - x_i(k)|,
\]

\[
\Delta (\max) = \max_{i=1}^{m}\max_{k=1}^{n}|x_i(0) - x_i(k)|,
\]

\[
\Delta x_i(k) = |x_i(0) - x_i(k)|,
\]

where \( x_i(0) \) represents the reference sequence, \( x_i(k) \) represents the comparison sequence, and \( \Delta x_i(k) \) is the absolute difference between the reference sequence and the comparison sequence; \( \rho \) is the identification coefficient, ranging from 0 to 1, and a smaller value means a larger resolution, and vice versa. In this paper \( \rho = 0.5 \). The results of the grey correlation coefficient are shown in Tables 10 and 11.

4.2.2. Grey Correlation Degree Calculation. According to the grey correlation coefficient obtained above, each factor’s grey correlation degree \( ri \) was calculated using the following formula’s mean value method (10). And then, it was sorted to determine the correlation order. On this basis, the main factors affecting the improvement of urban-rural integration were analyzed. The results are shown in Tables 12 and 13.
4.3. Calculation Results and Analysis. According to the calculation results, the correlation degree between each factor and the urban-rural integration degree ranged from 0.596 to 0.645. As shown in Figure 5, the logistics human resources and logistics infrastructure are in the first and second place in the correlation order, and their correlation degree was higher than 0.630, indicating that these two factors had played an effective role in promoting the development of urban-rural integration. Secondly, the third to fourth in the correlation order were the economic environment and logistics informatization level. Their correlation degree ranged from 0.598 to 0.627, indicating that these two factors had played a good role in promoting urban and rural integration development. Finally, the logistics demand level, which ranked fifth in the correlation order, was lower than 0.618, indicating that the logistics demand level played a certain but not the key role in promoting urban-rural integration development.
Figure 4: The trends of economic, social, spatial, and ecological integration.

Table 10: The grey correlation coefficient between the urban logistics factors and urban-rural integration degree.

<table>
<thead>
<tr>
<th>Year</th>
<th>Economic environment</th>
<th>Logistics infrastructure</th>
<th>Logistics informatization</th>
<th>Logistics demand</th>
<th>Logistics human resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>0.888</td>
<td>0.995</td>
<td>0.949</td>
<td>0.888</td>
<td>0.889</td>
</tr>
<tr>
<td>2012</td>
<td>0.876</td>
<td>0.862</td>
<td>1.000</td>
<td>0.880</td>
<td>0.867</td>
</tr>
<tr>
<td>2013</td>
<td>0.733</td>
<td>0.725</td>
<td>0.736</td>
<td>0.742</td>
<td>0.720</td>
</tr>
<tr>
<td>2014</td>
<td>0.610</td>
<td>0.610</td>
<td>0.589</td>
<td>0.619</td>
<td>0.597</td>
</tr>
<tr>
<td>2015</td>
<td>0.604</td>
<td>0.583</td>
<td>0.597</td>
<td>0.614</td>
<td>0.669</td>
</tr>
<tr>
<td>2016</td>
<td>0.564</td>
<td>0.542</td>
<td>0.554</td>
<td>0.571</td>
<td>0.636</td>
</tr>
<tr>
<td>2017</td>
<td>0.514</td>
<td>0.497</td>
<td>0.495</td>
<td>0.509</td>
<td>0.570</td>
</tr>
<tr>
<td>2018</td>
<td>0.497</td>
<td>0.476</td>
<td>0.478</td>
<td>0.482</td>
<td>0.538</td>
</tr>
<tr>
<td>2019</td>
<td>0.496</td>
<td>0.537</td>
<td>0.462</td>
<td>0.476</td>
<td>0.525</td>
</tr>
<tr>
<td>2020</td>
<td>0.415</td>
<td>0.479</td>
<td>0.406</td>
<td>0.402</td>
<td>0.435</td>
</tr>
</tbody>
</table>

Table 11: The grey correlation coefficient between the rural logistics factors and urban-rural integration degree.

<table>
<thead>
<tr>
<th>Year</th>
<th>Economic environment</th>
<th>Logistics infrastructure</th>
<th>Logistics informatization</th>
<th>Logistics demand</th>
<th>Logistics human resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>0.839</td>
<td>0.851</td>
<td>0.839</td>
<td>0.839</td>
<td>0.868</td>
</tr>
<tr>
<td>2012</td>
<td>0.821</td>
<td>0.931</td>
<td>0.839</td>
<td>0.822</td>
<td>0.928</td>
</tr>
<tr>
<td>2013</td>
<td>0.695</td>
<td>0.749</td>
<td>0.697</td>
<td>0.700</td>
<td>1.000</td>
</tr>
<tr>
<td>2014</td>
<td>0.604</td>
<td>0.616</td>
<td>0.597</td>
<td>0.593</td>
<td>0.764</td>
</tr>
<tr>
<td>2015</td>
<td>0.597</td>
<td>0.594</td>
<td>0.588</td>
<td>0.587</td>
<td>0.607</td>
</tr>
<tr>
<td>2016</td>
<td>0.557</td>
<td>0.535</td>
<td>0.543</td>
<td>0.551</td>
<td>0.526</td>
</tr>
<tr>
<td>2017</td>
<td>0.508</td>
<td>0.498</td>
<td>0.492</td>
<td>0.505</td>
<td>0.468</td>
</tr>
<tr>
<td>2018</td>
<td>0.492</td>
<td>0.483</td>
<td>0.488</td>
<td>0.479</td>
<td>0.437</td>
</tr>
<tr>
<td>2019</td>
<td>0.489</td>
<td>0.483</td>
<td>0.478</td>
<td>0.476</td>
<td>0.422</td>
</tr>
<tr>
<td>2020</td>
<td>0.419</td>
<td>0.418</td>
<td>0.417</td>
<td>0.409</td>
<td>0.368</td>
</tr>
</tbody>
</table>

Table 12: Correlation degree and correlation order of urban logistics factors and urban-rural integration.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Economic environment</th>
<th>Logistics infrastructure</th>
<th>Logistics informatization</th>
<th>Logistics demand</th>
<th>Logistics human resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation degree</td>
<td>0.620</td>
<td>0.631</td>
<td>0.627</td>
<td>0.618</td>
<td>0.645</td>
</tr>
<tr>
<td>Correlation order</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 13: Correlation degree and correlation order of rural logistics factors and urban-rural integration.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Economic environment</th>
<th>Logistics infrastructure</th>
<th>Logistics informatization</th>
<th>Logistics demand</th>
<th>Logistics human resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation degree</td>
<td>0.602</td>
<td>0.616</td>
<td>0.598</td>
<td>0.596</td>
<td>0.639</td>
</tr>
<tr>
<td>Correlation order</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>
5. Conclusions and Countermeasures

5.1. Conclusions. Through systematic analysis on the level of coordinated development of urban-rural logistics coupling, the level of urban-rural integrated development, and the influence of various factors in the urban-rural logistics subsystem on the urban-rural integrated development in Hubei Province, the following conclusions are drawn:

(1) From 2011 to 2020, the overall coupling coordination degree of the urban-rural logistics composite system in Hubei Province showed an obvious increasing trend, from 0.410 in 2011 to 0.865 in 2020, an increase of 111%. The coupling coordination type changed from close to incongruity in 2011 to extreme coupling coordination. The sudden COVID-19 outbreak in 2020 seriously impacted the national logistics industry, which reduced the comprehensive coordination degree of urban and rural logistics subsystems in Hubei and the order degree of each subsystem. However, from 2011 to 2019, the comprehensive coordination degree of urban and rural logistics subsystems in Hubei showed a continuous growth trend. The development level of the urban logistics subsystem continued to rise steadily, while that of the rural logistics subsystem dropped during 2015–2017, but with a good overall development trend.

(2) From 2011 to 2020, the level of urban-rural integrated development in Hubei Province showed a significant increasing trend, from 0.157 in 2011 to 0.987 in 2020, an increase of 5.29 times. Compared with 2011, the level of economic, social, spatial, and ecological integrated development in 2020 had been significantly improved, showing a good development trend.

(3) From 2011 to 2020, the correlation degree between each factor and the urban-rural integration degree ranged from 0.612 to 0.660. All of these were higher than 0.6, indicating that all the above factors impacted the improvement of urban-rural integration. Specifically, from the average correlation degree, logistics human resources have the most significant influence on urban-rural integration development, with an average correlation degree of 0.642. The influence of logistics infrastructure on urban-rural integration development is the second, with an average correlation degree of 0.624. The third is the level of logistics informatization, with an average correlation degree of 0.613. And the fourth and fifth are economic environment and logistics demand levels, respectively, with an average correlation degree of 0.611 and 0.607.

5.2. Countermeasures. Based on the conclusions, this paper put forward the following countermeasures on how to further promote the urban-rural integration development: first, it is essential to introduce and cultivate many high-quality logistics personnel and strengthen the training of urban and rural logistics employees to improve their professional levels. As far as the logistics industry is concerned, the significant demand and insufficient supply of logistics professionals are common problems the entire industry faces, especially rural logistics. Therefore, it is essential to strengthen the external introduction and internal training of talents, attract and retain high-quality professionals by providing subsidies, settling down, and generous work benefits. At the same time, it is necessary to promote cooperation between logistics enterprises and significant universities to build and share learning and production bases jointly, encouraging employees in logistics enterprises to participate in vocational skills training to improve their overall professional skills. Second, it is necessary to strengthen the urban and rural logistics infrastructure and unblock the logistics corridors between urban and rural areas. Then,
comprehensively building urban and rural logistics network systems, creating and sharing the logistics network nodes improve their functions and efficiency. Third, it is important to accelerate the construction of an integrated information platform for urban and rural logistics, covering all counties, townships, and administrative villages in the province. It should be constructed to integrate logistics, capital flow, and information flow to achieve the accurate matching of people, vehicles, goods, stations, lines, and other essential resources and give full play to the role of logistics information technology in promoting urban-rural integrated development. Fourth, it further encourages the rapid economic growth of urban and rural areas, raises the income and consumption levels of urban and rural residents, and reduces the gap between urban and rural areas. At the same time, it increases the investment in urban and rural logistics enterprises, encourages urban logistics enterprises to sink into the rural market, and helps rural logistics enterprises develop rapidly, which lays a solid foundation for urban-rural integrated development. Finally, it further enhances the level of urban and rural logistics demand. On the one hand, the development of rural e-commerce can improve the demand for rural logistics. At the same time, the construction of a two-way circulation channel of “selling agricultural products to the cities, while selling industrial products to the countryside” can promote the improvement of the two-way demand for urban and rural logistics and provide strong support for the integrated development of urban-rural areas.

This paper was intended to explore the grey correlation between the coupling coordinated development level of urban-rural logistics and the urban-rural integrated development level and analyze the key factors affecting urban-rural integration development in Hubei. Although it provides a reference for subsequent research on urban-rural integrated development, some deficiencies in selecting indicators and data acquisition still need to be continuously improved. Future research should improve the existing index system and expand the research scope to analyze the coordination relationship between urban-rural logistics and urban-rural integrated development in other provinces or the whole country.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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