An Empirical Analysis of Inclusive Finance Support to the Development of Rural Revitalization in Linyi

Zhao Juan [1,2]

[1]School of Business, Linyi University, Linyi, China;

2 Center for International Education, Philippine Christian University, Manila, Philippines

Email: cloud0436@163.com

Abstract: This research adopts the coefficient of variation method to construct Linyi inclusive financial development index and rural revitalization index. According to the standard of international inclusive financial development level, when the inclusive financial development index is between 0 and 1, it indicates that inclusive financial development in the region is from a low level to a high level. The research finds that the degree of inclusive financial development in Linyi is different.   Apart from Lanshan District, the level of inclusive financial development in other districts and counties is low, with the unstable inclusive financial development index between 0.01 and 0.15 in most years. After measuring the rural revitalization index, it is found that the Linyi's rural development is better and the regional development is more balanced. Through empirical analysis, the research comes to a conclusion that inclusive finance can effectively promote the rural revitalization in Linyi. Based on the above analysis, the paper puts forward the following suggestions: Linyi should optimize the layout of financial resources, improve the rural financial ecological environment, perfect the credit system of farmers, improve the quality of financial services, and increase the investment in agriculture, forestry and water to guide the upgrading of agricultural industry structure.

Keywords: inclusive finance, rural revitalization, Linyi City

I. Introduction

Based on the 2018 Central Document No. 1, the National Development and Reform Commission made and released the Strategic Plan for Rural Revitalization (2018-2022), which focuses on promoting rural industrial, talent, cultural, ecological and organizational revitalization in accordance with the general requirements of prosperous industry, ecological livability, civilized countryside, effective governance and affluent living. As an old revolutionary area and a large agricultural city, Linyi is an inevitable choice for the nation to implement a good rural revitalization strategy. As a key link to rural revitalization, financial support is the main obstacle to the revitalization of rural areas in Linyi. In practice, inclusive finance service gradually expands from public welfare micro-credit to comprehensive business in payment and credit, and provides convenient financial services to different social classes, especially to less developed areas and low-income groups, in a low-cost mode by improving financial infrastructure. The development of inclusive finance can break the financial constraints of the traditional financial system on the disadvantaged groups and provide them with continuous financial services[1], which has a significant contribution to economic growth[2] [3]. Therefore, an empirical study on inclusive finance support for rural revitalization in Linyi can explore the feasible path of inclusive finance support for rural revitalization in Linyi. To achieve the strategic goal of rural revitalization, it is necessary to study inclusive finance to support rural revitalization, analyze the inherent logic, and put forward reasonable suggestions to solve problems and promote rural revitalization. At the same time, with the reference to the inclusive financial index of Linyi City, the degree of development and regional balance of inclusive finance in Linyi is revealed, which will help policy makers and practitioners have a better understanding of the current situation and spatial characteristics of inclusive finance, enhance the level of inclusive finance, promote the healthy and sustainable development of inclusive finance, stimulate the vitality of rural revitalization, and promote the implementation of the rural revitalization.

II. Literature Review

After reviewing the existing literature, the author finds that domestic and foreign scholars mainly focus on the following aspects: firstly, the measurement of inclusive financial development; secondly, the study of rural revitalization; thirdly, inclusive financial support for rural revitalization. The above three aspects will be discussed respectively.

1.The measurement of inclusive financial development.

Domestic and foreign scholars evaluate the development of digital inclusive finance in China in three dimensions: breadth, depth and sustainability[4],[5], 1[6], [7], [8], [9]. Kangni proposed that the evaluation of the level of inclusive financial development should be combined with the policy guidelines, geographical factors, industrial structure and environmental factors and other factors[10]. Cuestas proposed that the coverage of inclusive finance can be measured by the proportion of people who enjoy financial products and services[11]. Dhrifi calculates the proportion of inclusive financial inclusion index in the index in detail[12]. In the method of inclusive finance index compilation, the index of different dimensions of inclusive finance are index dimensionless and borrowed from hierarchical analysis, and finally the comprehensive index of inclusive finance is obtained[13],[14],[15],[16],[17].

2. Rural revitalization research.

Rural revitalization research is studied in two ways. First, the study on the index of rural revitalization. At present, the design of rural revitalization index system is mostly based on the five aspects of "prosperous industry, ecological livability, civilized countryside, effective governance, and affluent living" [18]; the second is the study of rural revitalization paths. The development of rural finance is the key to rural revitalization[19], the main role of the government is irreplaceable[20], and the role of rural rehabilitation and reform organizations is very important[21]. Through infrastructure construction, the financial environment is improved[22],[23],[24],[25]; a digital inclusive finance ecosystem with multi-party cooperation and mutual support is created[26]. It is necessary to popularize financial knowledge among farmers[27], to improve rural residents' financial literacy[28], and to improve the digital inclusive finance regulatory system[29].

3. Inclusive financial support for rural revitalization.

Inclusive finance breaks the financing constraints of disadvantaged groups in the traditional financial system[30], provides continuous financial services for disadvantaged groups[1], lowers the customer access threshold, meets the financial needs of small, medium and micro enterprises and low-income people[15]. It can help the poor gain access to savings and loans, accumulate assets and build personal credit, thereby enhancing the security of their future lives[31]. Inclusive finance reduces enterprise financing costs and improves financing efficiency by expanding enterprise financing channels and promoting enterprise production expansion[32]. Inclusive finance encourages resident entrepreneurship and enterprise innovation, improves the entrepreneurial enthusiasm and probability of entrepreneurship among rural residents[33],[34], [35], and accelerate industrial structure upgrading[36],[37].

In summary, scholars at home and abroad measured the financial inclusion index in terms of the dimensions of financial inclusion penetration, accessibility and actual use of finance. Many scholars point out that inclusive finance can support rural revitalization. However, because the rural revitalization strategy has been proposed for a relatively short period of time, relevant studies on municipalities are insufficient. Based on this, this paper selects the index of inclusive finance and rural revitalization in Linyi City, Shandong Province, and conducts an empirical analysis of inclusive finance supporting rural revitalization in Linyi City to explore the realistic role of inclusive finance supporting rural revitalization.

III. Measurement of the Level of Inclusive Finance and Rural Revitalization in Linyi City
1. Construction and analysis of the development index of inclusive finance in Linyi

1.1. Construction of Linyi Inclusive Financial Development Index

Based on the method of Sarma to construct the inclusive financial development index [4], the inclusive financial development index was calculated for each region in Linyi. The specific calculation formula of the inclusive financial development index is as follows.

First, the coefficient of variation method[13], [15] was applied to dimensionless the indicators; the coefficient of variation is the ratio of the standard value to the mean value of a specific index. Before the index is composited, the index with different nature and units of measurement must be dimensionlessized. The selection of dimensionless function generally requires strict monotonicity, clear value intervals, intuitive results and clear meaning. At present, the main methods of dimensionlessization of inclusive financial index include the efficacy function method, etc[38], [13], [14]. The basic idea of the coefficient of variation method is to assign weights to each index based on the degree of variation of its observed values on the evaluation objects. If the coefficient of variation of an indicator is big, it means that the index has more explanatory in measuring the differences of the object, and the index should be assigned a greater weight. The coefficient of variation method is used to determine the weights of each indicator.

Specifically, the mean and standard deviation of the ith index are calculated first, and its coefficient of variation is

$$V_i = \frac{\sigma_i}{\bar{x}_i} \qquad (1)$$

where V_i is the coefficient of variation, σ_i is the standard deviation, and $\bar{x}_i$ is the mean value.

and then V_i is summed to obtain the weights of each index:

$$m_i = \frac{V_i}{\sum_1^n V_i} \qquad (2)$$

Assuming that Linyi has n subdivision dimensions of financial inclusion, $n \geq 1$, d_i indicating the i index, the author can get:

$$d_i = m_i \times \frac{x_i - x_{imin}}{x_{imax} - x_{imin}} \qquad (3)$$

where, m_i is the weight of index i, $m_i \in (0,1)$, x_i means the actual value of the index, x_{imin} denotes the minimum value of the i dimension, x_{imax} denotes the maximum value of the i dimension, at this time, there are $x_i \in (x_{imin}, x_{imax})$、 $d_i \in (0, m_i)$. In calculating the Inclusive Finance Index (IFI), the degree of inclusive financial development can be represented by the N-dimensional point $X_i(d_1, d_2, d_3, \cdots, d_n)$, where if the IFI is at point O(0, 0, 0, $\cdots$, 0), it means that the degree of inclusive financial development in the region is 0 and there is serious financial exclusion, if the IFI is at point $m(m_1, m_2, m_3, \cdots, m_n)$, it means that the region has the highest level of inclusive financial development and the region is financially Fully compatible. When point X is farther from point O and closer to point m, the higher the degree of inclusive financial development is in this region. Let X_1 be the standardized Euclidean distance between point O and point X, and X_2 be the standardized Euclidean distance between point m and point X, the inclusive financial development index IFI is:

$$IFI = \frac{X_1 + X_2}{2} \qquad (4)$$

where

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + \cdots + d_n^2}}{\sqrt{m_1^2 + m_2^2 + \cdots + m_n^2}} \qquad (5)$$

$$X_2 = 1 - \frac{\sqrt{(m_1 - d_1)^2 + (m_2 - d_2)^2 + \cdots + (m_n - d_n)^2}}{\sqrt{m_1^2 + m_2^2 + \cdots + m_n^2}} \qquad (6)$$

1.2. Selection of inclusive financial development index

Inclusive financial development index is an important index to measure the development status of inclusive finance, so the selection of inclusive financial development index in Linyi follows the principles of scientificity, comprehensiveness, data availability, and authenticity. According to the measurement system of inclusive financial development constructed by Sarma [4], and other scholars[39], [40], [41],[42] to construct regional inclusive financial development index, together with the economic development of Linyi, the index system was constructed from three dimensions of geographical penetration, accessibility and actual usage of inclusive financial development in Linyi (see Table 1). According to the index system, the data related to Linyi's inclusive finance were compiled through the WIND database, Linyi's historical statistical yearbook and Management Committee of China Banking Regulatory Commission. The weights of each index of Linyi's inclusive finance from 2010-2019 were calculated by applying formulas (1) and (2) (see Table 1).

Table 1: Construction of index and average weights of index of Linyi inclusive financial development

Index System Dimensions	Dimension Description	Breakdown of Index	Average weight $\overline{m_i}$
Geographical Penetration of Inclusive Financial Development	Number of financial outlets	Number of financial network per 100 square kilometers	0.18
		Number of financial network per 10,000 people	0.18
Accessibility of financial inclusion development services	Number of Practitioners	Number of financial employees per 100 square kilometers	0.29
		Number of financial employees per 10,000 people	0.18

| Actual usage of inclusive financial services | Deposit Services | Percentage of deposits in GDP | 0.06 |
| | Loan Services | Loan balance as a percentage of GDP | 0.10 |

1.3. Analysis of the results of Linyi inclusive financial development index

According to the international standards of inclusive financial development, if IFI ∈ (0.5,1), it indicates that the region has a strong financial inclusion; if IFI ∈ (0.3,0.5), it indicates that the region has a medium degree of financial inclusion; if IFI ∈ (0,0.3), it indicates that the region has a strong financial exclusion and the region is poor inclusive financial development.

Based on the average weights of Linyi's inclusive financial development in Table 1, each index of Linyi's inclusive finance is dimensionless treatment, and the inclusive financial development index of each district and county in Linyi for the decade 2010-2019 is calculated by formulas (4), (5) and (6) (see Table 2).

The analysis of the inclusive financial development index of Linyi's three districts and nine counties for the decade 2010-2019 (see Table 2) found that:

1.3.1 The degree of inclusive financial development varies among districts and counties in Linyi. Apart from Lanshan District, the level of inclusive financial development in other districts and counties is low, and the inclusive financial development index is between 0.01 and 0.15. According to the international standard of inclusive financial development level, Linyi has a low level of inclusive financial development in most regions and most years, and Lanshan District has a very high measurement index, which indicates that Linyi is extremely inclusive of financial inclusion relative to other regions in Linyi.This is because of the location advantage of Lanshan District in Linyi. As the central city of Linyi, the concentration of talents, education, logistics, political and financial resources are centralized. The financial resources here are allocated efficiently, financial institutions bear a strong sense of service, the financial services are available to residents, and various resources are attracted; therefore, the indexes enjoy an absolute advantage compared to other regions.

1.3.2 In general, most of the regional inclusive financial development indexes show a fluctuating trend, reaching a peak in 2015-2017. Due to the consolidation of the financial order, the number of financial institutions and financial institution employees in each county and region suffer a declining loss, it cause the inclusive financial development index declines.

Table 2: Inclusive financial development index of each county and district in Linyi from 2010-2019

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Lanshan	1	1	1	1	1	1	1	1	1	1
Luozhuang	0.15	0.14	0.13	0.14	0.13	0.17	0.34	0.14	0.08	0.13
Hedong	0.19	0.16	0.11	0.13	0.14	0.18	0.27	0.14	0.18	0.11
Yinan	0.04	0.03	0.04	0.06	0.05	0.05	0.08	0.07	0.09	0.07
Tancheng	0.11	0.2	0.16	0.18	0.16	0.25	0.41	0.41	0.11	0.08
Yishui	0.05	0.1	0.05	0.07	0.04	0.07	0.11	0.09	0.03	0.02
Lanling	0.02	0.1	0.01	0.03	0.02	0.03	0.07	0.01	0.08	0.07
Feixian	0.02	0.1	0.04	0.06	0.04	0.04	0.07	0.06	0.1	0.06
Pingyi	0.05	0.09	0.05	0.05	0.04	0.04	0.08	0.07	0.07	0.05
Junan	0.05	0.13	0.05	0.05	0.06	0.04	0.1	0.08	0.09	0.07
Mengyin	0.07	0.11	0.06	0.08	0.08	0.11	0.13	0.08	0.12	0.08
Linshu	0.16	0.21	0.11	0.12	0.11	0.11	0.07	0.14	0.18	0.1

2. Construction and analysis of rural revitalization index of Linyi

2.1. Construction of the index system of rural revitalization in Linyi

The calculation of Linyi rural revitalization index is based on the method of financial inclusion index. The specific calculation formula is as follows.

First, the variation coefficient method is used to dimensionlessly calculate each index, and the variation coefficient is the ratio of the standard value of a specific index to its mean value. Specifically, the mean and standard deviation of the i index are calculated first, and its coefficient of variation is.

$$\alpha_i = \frac{\sigma_i}{\bar{x}_i} \qquad (7)$$

where α_i is the coefficient of variation, σ_i is the standard deviation, and $\bar{x}_i$ is the mean value.

Then the summation is performed to obtain the weights of each index:

$$u_i = \frac{\alpha_i}{\sum_1^n \alpha_i} \qquad (8)$$

Suppose Linyi rural revitalization has n subdivision dimensions, n≥1, k_i indicating the i index, with

$$k_i = u_i \times \frac{y_i - y_{imin}}{y_{imax} - y_{imin}} \quad (9)$$

where, u_i is the weight of index i, $u_i \in (0,1)$, y_i denotes the actual value of the i index, y_{imin} denotes the minimum value of the i dimension, y_{imax} denotes the maximum value of the ith dimension, at this time, there are $y_i \in (y_{imin}, y_{imax})$, $k_i \in (0, u_i)$. In calculating the rural revitalization index (RRI), the rural revitalization index can be represented by the N-dimensional point $y_i(k_1, k_2, k_3, \cdots, k_n)$, where if the RRI is at point O(0, 0, 0, $\cdots$, 0), it means the degree of rural revitalization of the region is 0. If the RRI is at point $u(u_1, u_2, u_3, \cdots, u_n)$, it means the highest level of rural revitalization in the region, when the point Y is farther from point O and closer to point u, the higher the degree of rural revitalization. Let Y_1 be the standardized Euclidean distance between point O and point Y, and Y_2 be the standardized Euclidean distance between point u and point Y. Then the rural revitalization index is:

$$RRI = \frac{Y_1 + Y_2}{2} \quad (10)$$

where, $Y_1 = \frac{\sqrt{k_1^2 + k_2^2 + \cdots + k_n^2}}{\sqrt{u_1^2 + u_2^2 + \cdots + u_n^2}} \quad (11)$

$$Y_2 = 1 - \frac{\sqrt{(u_1 - k_1)^2 + (u_2 - k_2)^2 + \cdots + (u_n - k_n)^2}}{\sqrt{u_1^2 + u_2^2 + \cdots + u_n^2}} \quad (12)$$

2.2. Selection of rural revitalization development index

Due to the poor availability of data, this paper selects the index of rural revitalization such as industrial prosperity, living environment, spiritual civilization and living affluence to measure rural revitalization based on the research of relevant scholars[43],[44], [45] and with the actual development of rural revitalization in Linyi (see Table 3). According to the mentioned index system, the data related to Linyi's rural revitalization were compiled through the WIND database, Linyi's statistical yearbook of the past years, and the management committee of the China Banking Regulatory Commission, etc., and the weights of each index of Linyi's rural revitalization from 2010-2019 were calculated by applying formulas (7) and (8) (see Table 3).

Table 3: Construction of index and average weights of index of rural revitalization index in Linyi

Dimension of index System	Dimension Description	Breakdown of Index	Average Weight $\overline{u_i}$
Industrial prosperity	Gross agricultural product	Gross agricultural product	0.28
Living Environment	Residential consumption expenditure	Expenditure on residential consumption	0.16
Spiritual civilization	Expenditure on spiritual civilization	Consumption expenditure on culture, education and entertainment	0.17
Standard of living	Clothing expenditure	Per capita clothing purchase by farmers	0.17
	Health care	Rural per capita consumption expenditure on health care	0.22

2.3. Analysis of the measurement results of Linyi rural revitalization index

Based on the average weights in Table 3, each index of Linyi's rural revitalization is dimensionless, and the rural revitalization index of each district and county in Linyi City for the ten years from 2010 to 2019 is calculated through formulas (10), (11) and (12) (see Table 4).

Due to the lack of statistical data and the differences in the selection of rural revitalization index, the calculation results of the rural revitalization index of Linyi may have large deviations. From the analysis of the rural revitalization index of Linyi districts and counties from 2010-2019 (see Table 4) the author finds that: in terms of the overall perspective of the measured index, the average value of the rural revitalization index of Linyi in the decade is 0.40, and the development of rural revitalization in Linyi is better, especially in Yinan County, which is generally ahead of other districts and counties in rural

revitalization. The overall ranking of rural revitalization index of Lanling, Yinan, and Junan counties is higher, because the three of them belong to the traditional agricultural regions, which attach importance to rural agricultural economy, and the rural economic development has developed its unique characteristics. Especially Lanling County, which is nationally famous for its vegetable industry, has a reasonable distribution of industrial chain with vegetable industry. Based on its rich ecological resources, profound cultural background and red cultural resources, it develops high-quality agriculture tourism, so as to adjust the industrial structure, increase production and income, promoting the integrated development of three industries, and developing a new model of rural development driven by rural tourism for rural revitalization. The main reason for the relatively poor revitalization index of rural villages in Luozhuang is that Luozhuang District is an industrial zone and the regional economy focuses on industrial economy.

Table 4: Rural revitalization index of each county and district in Linyi from 2010 to 2019

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Lanshan	0.42	0.60	0.34	0.35	0.35	0.41	0.56	0.18	0.31	0.40
Luozhuang	0.39	0.40	0.33	0.47	0.31	0.33	0.46	0.46	0.16	0.21
Hedong	0.40	0.34	0.39	0.36	0.54	0.33	0.48	0.16	0.20	0.49
Yinan	0.50	0.41	0.47	0.40	0.55	0.34	0.31	0.46	0.47	0.49
Tancheng	0.44	0.40	0.32	0.48	0.46	0.58	0.29	0.31	0.39	0.36
Yishui	0.33	0.37	0.49	0.41	0.31	0.35	0.42	0.54	0.39	0.61
Lanling	0.57	0.40	0.54	0.36	0.35	0.38	0.36	0.38	0.52	0.28
Feixian	0.35	0.36	0.45	0.61	0.36	0.39	0.62	0.39	0.36	0.39
Pingyi	0.46	0.45	0.22	0.37	0.37	0.32	0.40	0.54	0.19	0.32
Junan	0.44	0.44	0.52	0.31	0.43	0.63	0.41	0.35	0.38	0.53
Mengyin	0.40	0.37	0.38	0.60	0.31	0.45	0.33	0.39	0.56	0.46
Linshu	0.39	0.46	0.31	0.45	0.55	0.18	0.28	0.19	0.48	0.18

IV. Empirical Analysis of Linyi's Inclusive Finance on the Development of Rural Revitalization

1. Model setting

The influencing factors of rural revitalization are multiple, and drawing on the studies of domestic scholars [41], [44], a multiple regression model is established to test the influence role of the development of inclusive finance on rural revitalization. That is.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + + \beta_k X_{ki} + + \mu_i \quad i=1,2,3, \cdots,n$$

where Y is the dependent variable, X is the independent variable, β_0 is the intercept term (constant term), β_i is the regression coefficient, and μ_i is the disturbance term. Accordingly, the following regression model is established.

$$RRI_i = \beta_0 + \beta_1 IFI_{it} + \beta_2 sccr_{it} + \beta_3 zzr_{it} + \mu_i$$

where, RRI denotes rural revitalization index, IFI denotes inclusive financial development index, $sccr$ denotes the logarithm of the output value of the 2nd and 3rd industry in each district and county, zzr denotes the proportion of agriculture, forestry and water expenditure in total expenditure, i denotes the ith influencing factor of rural revitalization, and t denotes the observation period.

Among the above index, except for the RRI and IFI values calculated (see Table 2 and Table 4), the data used for the rest of the variables are obtained from the 2011-2020 Linyi Statistical Yearbook.

2. Empirical results and analysis

2.1. Descriptive statistics of the overall sample

In the sample data, the descriptive statistics of the variables are shown in Table 5. From the constructed rural revitalization index, the average value of Linyi is 0.40, the highest is 0.63 and the lowest is 0.16, with a large gap. The inclusive financial development index, fluctuates between a minimum of 0.012 and 1, and the county gap of financial inclusion development is obvious. The gap between the counties of the second and third industries is even more obvious, with the highest being over 110 billion and the lowest being less than 10 billion. The gap narrows after taking the logarithm. Since the economic development of Linyi is extremely uneven, the proportion of total agriculture, forestry and water expenditure in total expenditure is used to measure the impact of agriculture, forestry and water expenditure on rural revitalization. Overall, the proportion of Linyi counties in agriculture, forestry and water expenditure is small, with the lowest being 5.4%, the highest being 21.9%, and the average being 13%, and the overall proportion is not high.

Table 5: Descriptive statistics of each variable

Variable	Mean	Std. Dev.	Min	Max	Observations
Rural Revitalization Index	0.399766	0.105006	0.163227	0.632441	N =120
Inclusive Finance Index	0.174803	0.258908	0.012424	1	N =120
Logarithm of GDP of 2nd, 3rd industries	5.531965	0.493889	4.52173	7.032183	N =120
Share of total expenditure on agriculture, forestry and water in total expenditure	0.130245	0.033708	0.053552	0.218864	N =120

2.2. An empirical analysis of inclusive finance for rural revitalization

Since the scope of the sample is from 2010-2019 panel data of 12 regions in Linyi, which is a short panel and balanced panel, the fixed effects model is used in estimation methods and the robustness of estimation. The results are shown in Table 6.

Table 6: Full sample fixed effects model estimation

Mode / Independent variable	Fixed effects model		
	(1)	(2)	(3)
Inclusive Finance Index	0.172^{***} (0.0344)	0.168^{***} (0.0429)	0.154^{***} (0.0441)
Logarithm of GDP of 2nd, 3rd industries	- -	0.00431 (0.0129)	-0.0306^{*} (0.0153)
Share of agriculture, forestry and water expenditure in total expenditure	- -	- -	-0.629^{**} (0.212)
Constant term	0.370^{***} (0.00601)	0.346^{***} (0.0656)	0.624^{***} (0.0995)
N	120	120	120
R^2	0.015	0.016	0.061

$^{*} p < 0.1, ^{**} p < 0.05, ^{***} p < 0.01$; Standard deviations are in parentheses. Same as below.

As shown in column (1) of Table 6, the Inclusive Finance Index is 0.172, which is significantly positive, indicating that the development of inclusive finance can promote rural revitalization. In terms of independent variables, the total value of 2nd and 3rd industries play a low role in rural revitalization. A possible explanation is that Linyi is well-developed in trade and logistics, especially in the three districts of Linyi, which are dominated by the development of 2nd and 3rd industries.

The 2nd and 3rd industries attract a large number of laborers, so that their main income is no longer dominated by agricultural production. At the same time, the rising proportion of expenditure on agriculture, forestry and water in the total expenditure plays a negative influence on rural revitalization. It is because of the incomplete collection of relevant data or difficulties in collecting data, and the available variables data are selected in this topic when using the index related to rural revitalization, which leads to the deviation between the measured results of rural revitalization index and the actual one. Another reason is that a large number of rural laborers chose the 2nd and 3rd industries, with Linyi's rural economy dominated by small farmers' economy, agricultural bears high cost but slow economic return, which leads to the fact that agricultural, forestry and water inputs are not well reflected in the rural revitalization index.

The regional imbalance of economic development in Linyi is obvious. The three districts of Linyi, especially Lanshan District, the political, economic and cultural center of Linyi, enjoys a leading position in Linyi city, whether in terms of the number of financial institutions, the total amount of deposits and loans, the number of financial employees or the amount of GDP. In order to verify whether the results of financial inclusion for rural revitalization are reliable, the samples from Lanshan, Hedong and Luozhuang were excluded from the regression, and the regression results in Table 7 show that the coefficient of Inclusive Finance Index is still positive, indicating that the development of inclusive finance plays a corresponding role in rural revitalization in Linyi.

Table 7: Fixed-effects model estimation excluding Lanshan, Hedong and Luozhuang

Mode	Fixed effects model		
Independent variable	(1)	(2)	(3)
Inclusive Finance Index	0.146** (0.0389)	0.169** (0.0353)	0.148** (0.0363)
Logarithm of GDP of 2nd, 3rd industries	- -	-0.0299 (0.0434)	-0.0260 (0.0411)
Share of agriculture, forestry and water expenditure in total expenditure	- -	- -	0.349 (0.285)
Constant term	0.412*** (0.00338)	0.571* (0.231)	0.501 (0.220)
N	90	90	90
R^2	0.014	0.029	0.040

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ ；Standard deviations are in parentheses. Same as below.

V. Conclusions and Policy Recommendations

1. **Conclusions**

1.1. From the ranking of Linyi's GDP in Shandong Province, the relative amount of Linyi's deposit and loan balances, Linyi has a fast economic development and a good financial development situation, but from the perspective of the inclusive financial development index, Linyi's financial inclusion development is in a regional uneven state, with the three districts of Linyi, especially Lanshan District, having a better degree of financial inclusion development, while other regions are relatively backward in terms of financial inclusion development. The overall level of inclusive finance is not high, and the degree of inclusive financial development needs to be improved.

1.2. Linyi's rural revitalization is generally satisfactory, and the average value of the measured rural revitalization index reaches 0.40. The development of rural revitalization in Lanling, Yinan and Junan is better, probably because the three districts are traditional agricultural counties, which attach importance to agriculture, and agriculture-related industrial resources is reasonable is good. Lanshan District, Luozhuang District and Hedong District are rich in financial resources; they have absorbed a large amount of financial resources, forming a "financial highland effect", but the rural revitalization index shows that the overall ranking of rural revitalization is low.

1.3. The development of inclusive finance has an obvious role in promoting rural revitalization. The development of 2nd and 3rd industries attracts a large amount of rural labor resources and financial resources. The development of rural inclusive financial institutions will bring capital to the city and reduce rural financial supply. In addition to the three districts of Linyi, nine towns of Linyi are basically large agricultural ones, and the expenditure on agriculture, forestry and water can promote the improvement of rural revitalization index.

With the reference to the actual development of China's countryside at present, this research can provide some practical and effective suggestions for building a multi-level and all-round inclusive financial system in China, so as to promote the economic development of the countryside. In order to promote the development of inclusive finance in rural areas and help the implementation of rural revitalization strategy, this research puts forward corresponding suggestions and specific paths in a targeted manner.

2.**Policy Recommendations**

2.1. To optimize the layout of financial resources and balance the development of inclusive finance in counties.

Based on the above research, the three districts of Linyi are economically developed, and Lanshan District is one of the top 100 counties in China. The three districts of Linyi are rich in financial resources and have sufficient financial supply, but the financial supply of the nine towns is relatively poor, so the support for the development of inclusive finance in the nine towns should be increased. It is necessary to improve the coverage of financial outlets in rural areas, encourage the development of digital inclusive finance, carry out financial product innovation and service model in rural areas innovation, expand the scope of financial loan collateral, and increase financial supply and risk control of loans. At the same time, it is needed to increase the popularization of financial knowledge, the publicity of financial institutions, the financial literacy of farmers, the rural financial ecological environment, and promote the rapid growth of inclusive finance in the county.

2.2. To build a rural credit system and improve financial services.

Take into account the local reality, inclusive financial institutions can develop a credit system for farmers, so that financial institutions are able to collect credit in accordance with laws and rules when serving rural revitalization. It is suggested to evaluate the credit rating of farmers with loan needs, to establish credit information files of farmers including family income, moral evaluation, consumption flow, property information, etc., to provide loans and determine loan interest rates for farmers based on credit rating, and to reduce the financing cost of farmers. At the same time, it is needed to improve the relevance and flexibility of financial products, simplify and improve the loan procedures for farmers. Besides, loans should be given to farmers actively and differential management rating systems should be developed to improve the quality of financial services.

2.3. To increase agricultural, forestry and water inputs and expand the gross agricultural product.

From an overall perspective, the proportion of Linyi's agricultural, forestry and water input expenditure in total expenditure is low. Linyi's agriculture is dominated by traditional agricultural production and the industrial structure is relatively poor. Agricultural inputs are costly, time-consuming and slow in return. Therefore, a long-term mechanism should be developed for agricultural inputs to guide the transformation and upgrading of agricultural industries and increase the output of agricultural industries through agricultural, forestry and water inputs. There is an urgent need to promote the adjustment of rural industrial structure, turn the growth of the quantity of agricultural products to quality growth, improve the efficiency of agricultural products. The ultimate goal is to strengthen the first industry, further develop the second industry and build a refined third industry, with value-added agricultural achieved.

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