



Empirical Research on the Digital Economy and Farmers' Income in the Yellow River Basin

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Abstract. Based on the data of 96 cities circled in the Yellow River Basin from 2011 to 2019, the authors have measured the comprehensive indicators of urban digital economy in the Yellow River Basin in this paper. By applying fixed effect models, moderating effect models to evaluate the operating mechanism of digital economy on rural residents' income in the Yellow River Basin the authors have figured out that the development of digital economy in the Yellow River Basin has significantly increased the income of the rural residents. Furthermore the adjustment effect shows that the increase of the output value of the Primary sector of the economy together with the increase of the urban-rural income gap will reduce the impact of the digital economy on the increase of rural residents' income. Relying on these research results the authors propose that it is critical for the cities in the Yellow River Basin to improve digital infrastructure, to rearrange industrial structure, and to narrow down the urban-rural income gap.

Keywords: Digital economy · The Yellow River Basin · Farmers' income · Moderating effect

1 Introduction

The Twentieth National Congress of the Communist Party of China clearly pointed out that the realization of common prosperity for all people was included in the essential requirements of Chinese path to modernization, and made an important strategic deployment to promote common prosperity. The State Council also clearly pointed out in its report that the key and difficult point in improving the income of middle-income groups lies in how to increase the income of rural residents. Only by increasing farmers' income and narrowing the income gap between urban and rural areas can we substantially promote the Common prosperity of all urban and rural people.

With the development of the times, the digital economy has injected new vitality into the increase of rural income in the Yellow River Basin [1]. At the macro level, the development of the digital economy has broken the "digital divide" between cities and rural areas, promoted the dissemination of modern agricultural knowledge and technology, and improved agricultural production efficiency and product quality [2]. At the

micro level, the digital economy has provided new sales channels for agricultural products, reduced transportation costs for agricultural products, and increased the source of income of rural households [3, 4].

Based on this, this paper analyzes the relationship between the digital economy and rural residents' income in the Yellow River basin on the basis of Panel data of 96 cities in the Yellow River basin from 2011 to 2019, and conducts mechanism research using the methods of moderating effect to provide empirical reference for the development of the digital economy in the Yellow River basin and the improvement of rural residents' income and put forward policy recommendations.

2 Research Model and Data Explanation

2.1 Research Model

In order to verify the impact of digital economy on the income increase of farmers in the Yellow River Basin, based on the above theoretical assumptions, this article constructs the following econometric model:

$$lnincome_{it} = \beta_0 + \beta_1 lndig_{it} + \beta_c CV_{it} + u_i + v_t + \varepsilon_{it} \quad (1)$$

In Eq. (1), the dependent variable *lnincome* represents the per capita income of urban and rural areas in the Yellow River Basin, the core explanatory variable *lndig* represents the level of urban digital economy development, and CV represents a series of control variables, including educational level, agricultural machinery power, rural consumption level, rural electricity consumption, economic development, and fiscal expenditure, *i* represents the city, *t* represents the year, and u_i is the fixed effect of the city, v_t is a fixed time effect ε_{it} indicates random error term.

This paper constructs the following moderating effect model:

$$EP_{it} = \beta_0 + \beta_1 lndig_{it} + \beta_2 M_{it} + \beta_3 lndig_{it} \times M_{it} + \beta_c X_{it} + u_i + v_t + \varepsilon_{it} \quad (2)$$

where *M* represents the moderating variable β_3 is the interaction coefficient, representing the impact of the moderating variable on the relationship between digital economy development and farmers' Income.

2.2 Variable Selection

The Dependent Variable

Disposable income of rural residents (*lnincome*). This paper uses the logarithm of rural per capita disposable income of Prefecture-level city in the Yellow River basin to measure the level of farmers' income.

Core Explanatory Variable

The level of digital economy development (*lndige*). This paper selects five indicators from two aspects of digital infrastructure construction and digital financial inclusion,

and uses principal component analysis to build a digital economy index. [5]. The Digital Inclusive Finance Index draws inspiration from Guo Feng et al. (2020) [6].

Moderator Variables

This paper selects the logarithms of logarithm of Primary sector of the economy added value and logarithm of the difference between the average income of urban residents and the average income of rural residents to represent Primary sector of the economy development (*insh*) and Urban-rural income gap (*Intheil*).

Control Variable

This article selects urban education level, rural residents' consumption level, rural electricity consumption, total power of agricultural machinery, fiscal expenditure, and economic development as control variables.

3 Empirical Results

3.1 Basic Regression Results and Robustness Tests

According to Eq. (1), Table 1 reports the impact of digital economy development on the income of rural residents in the Yellow River Basin. The digital economy development coefficient in model (1) is significantly positive at the 1% level, indicating that the development of urban digital economy in the Yellow River Basin can improve the income of rural residents.

To ensure the effectiveness and robustness of the empirical results obtained in the previous section, this article adopts the methods of deleting partial samples and tail regression for robustness testing. The results are shown in Table 1, Model (2) and Model (3). In order to solve the endogenous problem, this paper uses the lag period of the digital economy as the Instrumental variable. According to the results of model (4) in Table 1, the impact of the digital economy on rural residents' income is still significantly positive, and it has passed the test of insufficient identification of Instrumental variables estimation and the test of weak Instrumental variables estimation, which further explains the robustness of the regression model.

Table 1. Basic regression results and robustness testing

	model (1)	model (2)	model (3)	model (4)
	<i>lnIncome</i>	<i>lnIncome</i>	<i>lnIncome</i>	<i>lnIncome</i>
<i>Indige</i>	0.0639*** (0.0233)	0.0424** (0.0191)	0.0605** (0.0236)	0.1810*** (0.0476)
Control variables	YES	YES	YES	YES
<i>N</i>	864	774	864	768
<i>R</i> ²	0.971	0.976	0.970	0.982

Note: The parentheses indicate standard error, while *, **, and *** respectively indicate significance at the 10%, 5%, and 1% significance levels, the same below

Data source: Stata16.0 calculation results

3.2 Moderating Effect

In order to further verify the relationship between digital economy and farmers' income, this paper selects development of Primary sector of the economy and Urban-rural income gap as moderator variables, and inspects the moderating effect between digital economy and farmers' income according to the Eq. (2).

According to the results of model (5) in Table 2. The interaction coefficient between the output value of the Primary sector of the economy and the digital economy is significantly negative, indicating that the increase of the output value of the Primary sector of the economy will inhibit the promotion of the digital economy on rural residents' income. The improvement of the primary industry will squeeze the development of other industries, making it difficult for digital technology to enter rural areas. In addition, the digital economy of cities with less added value of the Primary sector of the economy has developed more rapidly, which is more conducive to improving farmers' income [7].

The results of Model (6) in Table 2 show that the coefficient of interaction between urban-rural income gap and digital economy is significantly negative, indicating that the income gap has reduced the promoting effect of digital economy on rural residents' income. The income gap between urban and rural areas has led to a "digital divide" between urban and rural areas, with rural residents receiving less information and reducing their opportunities to obtain income. In areas with small income disparities between urban and rural areas, farmers can rely on digital technology to improve production efficiency and obtain higher incomes [8, 9].

Table 2. Moderating effect

	model (5)	model (6)
	<i>lnIncome</i>	<i>lnIncome</i>
<i>Indige</i>	0.9105*** (0.1904)	1.3700*** (0.3686)
<i>insh</i>	0.0748** (0.0325)	
<i>Indige * insh</i>	-0.0610*** (0.0135)	
<i>lntheil</i>		0.3660*** (0.0579)
<i>Indige * lntheil</i>		-0.1366*** (0.0377)
Control variables	YES	YES
<i>N</i>	864	864
<i>R</i> ²	0.973	0.976

Data source: Stata16.0 calculation results

4 Conclusion

This paper takes the Panel data of 96 cities in the Yellow River basin from 2011 to 2019 as the research object, verifies the relationship between the digital economy and farmers' income through the methods of basic regression and moderating effect, and draws the following conclusions.

Firstly, the development of digital economy in the Yellow River Basin has significantly increased the income of rural residents and passed the robustness test. Secondly, the role of the digital economy in increasing the income of rural residents in the Yellow River Basin is influenced by the industrial structure and urban-rural income gap. The development of the Primary sector of the economy will squeeze the development speed of the Tertiary sector of the economy, thus reducing the development speed of the digital economy and inhibiting the promotion of the digital economy. The income gap between urban and rural areas will widen the "digital divide" between urban and rural areas, slow down the process of rural digitization, and reduce the channels for rural residents to start businesses and find employment.

Based on the above conclusions, this article proposes the following suggestions:

Firstly, Yellow River Basin cities should promote the digital construction of rural areas, expand the impact of the digital economy on rural development. Secondly, adjust the industrial structure, encourage the development of the service industry and rural Digital transformation, further promote the development of smart agriculture and rural e-commerce, and further increase the income of rural residents [10]. Thirdly, cities in the Yellow River Basin need to break the urban-rural dual structure, promote balanced allocation of urban-rural resources and bidirectional flow of factors, and promote digital development in rural areas.

References

1. Chen, W., Wu, Y. (2021) Development of digital economy, digital divide, and income gap between urban and rural residents [J]. *South China Journal of Economics*, 11: 1–17. <https://doi.org/10.19592/j.cnki.scje.390621>.
2. Li Y., Ruan, L.J. (2023) The Expanding Paths and Policy Orientation of Chinese Agricultural and Rural Modernization under the Background of Digital Economy. *Journal of Xi'an University of Finance and Economics*, 02: 21–29. <https://doi.org/10.19331/j.cnki.jxufe.20230214.005>.
3. Yang, R.Y., Kong, F.T. (2023) Digital Development and Technological Progress of Agricultural Products Wholesale Market On the Intermediary Effect of E-Commerce Channel of Agricultural Products. *China Business and Market*, 03: 3–16. <https://doi.org/10.14089/j.cnki.cn11-3664/f.2023.03.001>.
4. Liu, L., Wang, Y. How Can Digital Operation Promote the Increase of Farmers' Income? Based on the Survey Data of Returned Entrepreneurial Enterprises in China. *China Business and Market*, 01: 9–19. <https://doi.org/10.14089/j.cnki.cn11-3664/f.2022.01.002>.
5. Zhao, T., Zhang, Z., Liang, S.K. (2020) Digital Economy, Entrepreneurship, and High-Quality Economic Development: Empirical Evidence from Urban China. *Journal of Management World*, (10): 65–76. <https://doi.org/10.19744/j.cnki.11-1235/f.2020.0154>.
6. Guo, F., Wang, J.Y., Wang, F., Kong, T., Zhang, X., Cheng, Z.Y. (2020) Measuring China's Digital Financial Inclusion: Index Compilation and Spatial Characteristics. *China Economic Quarterly*, (04): 1401–1418. <https://doi.org/10.13821/j.cnki.ceq.2020.03.12>.

7. Wang, H.P., Zhou, J.M., Lin, G.H., Chen, Z.F. (2019) Industrial Upgrading, Agricultural Structure Adjustment and County Farmers' Income - A Case Study Based on the Panel Data of 58 Counties in Fujian Province. *East China Economic Management*, 08: 23–28. <https://doi.org/10.19629/j.cnki.34-1014/f.190316001>.
8. Tu, S.W., Yang, X.X. (2022) Factor market allocation, urban-rural income gap and farmers' Common prosperity. *Guizhou Social Sciences*, 09: 148–159. <https://doi.org/10.13713/j.cnki.cssci.2022.09.010>.
9. Zhang, Z., Zhang, Y.X., Ning, Y., Xue, Z.H., How does digital Financial inclusion affect farmers' income and urban-rural income gap: evidence from 11 Prefecture-level city in Hebei Province. *Hebei Finance*, 11: 38–42, <https://doi.org/10.14049/j.cnki.hbjr.2022.11.005>.
10. Li, H.B., Wang, S., Zhao, C.M. (2021) A Study on Income Distribution Effect of Rural E-commerce Development: An Empirical Evidence from “Taobao Village”. *Economic Survey*, 01: 37–47. <https://doi.org/10.15931/j.cnki.1006-1096.2021.01.002>.

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