

The Impact of Digital Economy on Urban-Rural Income Gap: A Case Study of Anhui Province

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Abstract

Based on the panel data of 16 prefecture-level cities in Anhui Province from 2011 to 2020, the entropy method was used to measure the digital economy development index of Anhui Province, and the dual-fixed effect model was used to explore the impact of digital economy on urban-rural income gap in Anhui province. The results show that: (1) Hefei, Wuhu and Fuyang have a higher level of digital economy development, while Chizhou, Tongling and Huangshan have a lower level of digital economy development; (2) At present, the development of digital economy in Anhui Province will significantly reduce the income inequality between urban and rural areas, and the development of digital economy in Anhui Province will cause a nonlinear U-shaped influence on the income inequality between urban and rural areas; (3) The level of urbanization and the intensity of government intervention will significantly reduce urban and rural income inequality.

Keywords

Digital Economy; Urban-rural Income Gap; Entropy Method; Double Fixed Effect Model.

1. Introduction

With the rapid development of digital technology, digital economy has become the key force of national economic development, and the current stage of integration and penetration of Chinese industries, constantly promote our economy and social high quality development, has a significant impact on our urban and rural economic development. Especially in the post-COVID-19 era, digital economy has a huge positive impact on economic recovery, people's employment, consumption iteration and industrial upgrading. In 2022, the Cyberspace Administration of the CPC Central Committee and others jointly issued the Action Plan for the Development of Digital Countryside (2022-2025), which specified the key work in several fields of digital countryside construction, emphasized accelerating the construction of digital countryside, and gave full play to the driving and leading role of informatization in rural revitalization. Anhui Province actively embraces the digital age, clearly puts forward the idea of "building a high ground for the development of digital economy", and promotes the construction of a network strong province and Digital Jianghuai. It ranks among the top in the development of digital economy in China. Then, the differences of digital economy development among cities in Anhui Province, the impact of digital economy development on income gap between urban and rural areas, and whether there is room for improvement must be analyzed from the perspective of basic theory and empirical research, which is of great significance to grasp the current situation of digital economy and social development in Anhui province, further shorten the income gap between urban and rural areas, and promote the development of urban and rural economy.

The first is the literature of digital economy connotation. American scholar Don Tapscott first proposed the term "digital economy" in 1996, and defined it as "a new economy based on

human intelligence network driven by interactive multimedia, information superhighway and the Internet". Zhao Xing (2016) refers to the economic activities carried out by applying digital technology, digital product trading and other related technologies to virtual and strictly controlled digital space as "digital economy". According to Si Lijuan (2023), the connotation of digital economy mainly includes two aspects. One is that digital economy is an economic activity of production by means of digital technology; the other is that all economic output is obtained by expanding the scope of traditional economic activities through various digital inputs. Ouyang Rihui (2023) defines digital economy as an economic form that takes data elements as the key elements, digital platforms and their ecology as the main carrier, realizes efficient connection through digitalization and intelligence, and can create value in both the physical world and the digital space.

Secondly, the connotation of urban and rural income inequality literature. Wan Guanghua et al. (2006) believe that inequality in the change of poverty refers to the change of poverty caused by the change of income deviation trend when the mean income remains unchanged. Lv Wei et al. (2020) believe that inequality in income level, family economic status or social status is the transformation of inequality in individuals' early educational opportunities after they enter society. Zhu Ziyun (2014) made an empirical analysis of the reasons for the widening income gap between urban and rural residents through the double-layer decomposition model, and believed that the main reasons for the widening income gap between urban and rural residents were the difference in output distribution rate, the worsening difference in old-age payment between urban and rural areas, and the migration of rural population to cities.

The third is the literature on the possible impact of the digital economy on urban-rural income inequality. Song Xiaoling (2017) takes Internet finance as the entry point and uses Theil Index to measure the income gap between urban and rural residents in various provinces. The results show that the development of digital inclusive finance can effectively narrow the income gap in various provinces. Cheng Mingsheng et al. (2019) made a theoretical analysis of the nonlinear relationship between Internet penetration and the income gap between urban and rural residents, and verified it with provincial panel data. The results showed that there was an "inverted U-shaped" relationship between Internet penetration and the income gap between urban and rural residents. Liu Jun (2017) conducted an empirical study based on the artificial neural network method, and the results showed that the urban-rural digital divide continued to widen the urban-rural income gap.

The existing research results on digital economy are abundant, which provides a series of ideas for the development of this paper. However, the current research mainly has the following characteristics: First, most of the research is mainly focused on the national scope, and few research on the internal differentiation analysis of a single province; Second, most studies on the impact of digital inclusive finance on urban-rural income gap lack the correlation between the measurement of digital economy development and urban-rural income gap. To sum up, few literatures analyze the impact of digital economy on urban-rural income inequality in Anhui Province. Based on this, this study uses the panel data of 16 prefecture-level cities in Anhui Province from 2011 to 2020, adopts the entropy method to measure the digital economy development index of Anhui Province, and uses the dual fixed effect model to explore the impact of the digital economy on the urban-rural income gap in Anhui Province.

2. Model Building, Variable Selection and Data Source

2.1. Entropy Method

In this paper, entropy method is selected to measure the digital economy index of Anhui Province, calculate the weight of each index, and calculate the digital economy development

index of 16 prefecture-level cities. The selected indicators in this study are all positive indicators, so there is no need to carry out non-negative processing.

$$y_{it} = \sum_{j=1}^n w_j \times x'_{ij} (i=1,2,\dots,16; j=1,2,\dots,8) \quad (1)$$

Where, x'_{ij} represents standardized value, w_j represents index weight, and j represents 8 indexes that constitute the evaluation system of the development level of digital economy. The larger the digital economy index is, the higher the digital degree of the city is, and the lower the digital degree is. The larger the variance value of the sample index is, the stronger the volatility of the digital economy of the city, and the more stable it is.

2.2. Double Fixed Effect Model

This paper uses the dual-fixed effect model to test the impact of digital economy development on urban-rural income gap. The benchmark regression model is set as follows:

$$y_{it} = \alpha + \beta d_{it} + \gamma controls_{it} + \lambda_i + \mu_i + \varepsilon_{it} \quad (2)$$

Where, i represents region, t represents year, explained variable y_{it} represents urban-rural income gap level in year t of prefecture-level city i , explanatory variable d_{it} represents digital economy development level in year t of prefecture-level city i , $controls_{it}$ represents control variable. λ_i represents the year fixed effect; μ_i is individual fixed effects; α, β, γ are estimated parameters; ε_{it} is random disturbance.

2.3. Interpretation of Variables

2.3.1. Explained Variables

The ratio of the per capita disposable income of urban residents to the per capita disposable income of rural residents in 16 prefecture-level cities in Anhui Province was selected to measure the urban-rural income gap (URIG), and used as the explained variable.

2.3.2. Explanatory Variables

Based on the research results of Sheng Bin et al. (2022), this paper selects 8 indicators from four aspects of digital infrastructure, digital industrialization, industrial digitization and digital technology to construct the evaluation system of the development level (DE) of digital economy (see Table 1). On the basis of constructing the evaluation system of the development level of digital economy, the entropy method is used to give weight to each index, and finally the digital economy development index of each prefecture-level city can be calculated.

Table 1. Evaluation system of digital economy development level

Criterion layer	Index layer	Unit
Digital infrastructure B1	Number of mobile phone users X1	Ten thousand households
	The number of fixed Internet broadband access users X2	Ten thousand households
Digital industrialization B2	The total volume of telecom services X3	Ten thousand yuan
	Employment in information transmission, computer services and software X4	Person
Industry digitization B3	Express total X5	Ten thousand pieces
	Digital Financial Inclusion Index X6	—
Digital technology B4	R&D internal expenditure X7	Ten thousand yuan
	The number of authorized patent applications X8	item

2.3.3. Control Variables

In order to avoid interference from other factors, the following control variables are selected in this paper: (1) regional employment status (RES), represented by the urban unemployment registration rate; (2) Education level (EL), the proportion of college degree or above in the total number of people as a measurement index; (3) Urbanization level (UL), the urbanization rate of 16 prefecture-level cities was selected as the measurement index; (4) Government intervention (IGI), the proportion of government expenditure in GDP is selected as the measurement index.

2.4. Data Sources

By establishing panel data model, this paper explores the impact of digital economy development on urban-rural income gap by using data from 16 prefecture-level cities in Anhui Province from 2011 to 2020. Relevant data are mainly from Anhui Provincial Statistical Yearbook and Peking University Digital Financial Inclusion Index. Part of the index value is calculated twice.

Table 2. Descriptive statistical results of variables

Variable type	Variable	Symbol	Sample size	Mean value	Standard deviation	Maximum value	Minimum value
Explained variable	Urban-rural income gap	URIG	160	2.442	0.225	3.353	1.778
Explanatory variable	Development level of digital economy	DE	160	0.176	0.338	1	0.019
Control variable	Regional employment situation	RES	160	0.031	0.006	0.042	0.015
	Educational level	EL	160	0.104	0.051	0.269	0.025
	Urbanization level	UL	160	0.532	0.115	0.823	0.313
	Intensity of government intervention	IGI	160	0.209	0.057	0.356	0.116

3. Analysis of Regression Results

This paper uses the dual fixed effect model to explore the impact of digital economy development (DE) on urban-rural income gap (URIG), and the regression results are shown in Table 3. The regression results show that the regression coefficient of DE is significantly negative and that of DE2 is significantly positive, indicating that the digital economy has a U-shaped impact on the urban-rural income gap. In other words, in the early stage of the development of digital economy, the construction of rural infrastructure was significantly improved, which provided more jobs for rural residents and brought more favorable effects on the increase of rural residents' income, thus effectively narrowing the urban-rural income gap. However, the rapid development of digital economy has also brought about a digital divide between urban and rural areas. In the later stage of the development of the digital economy, the digital economy mainly promoted the industrial development and innovation ability of the cities and towns, while the rural areas could not keep the same pace of development as the cities and towns, which resulted in an increasing income gap between urban and rural areas.

Table 3. Regression results

Variable	URIG		
	(1)	(2)	(3)
DE	-2.0166**	-6.0111***	-4.3698***
	(0.9231)	(1.6734)	(1.5321)
DE2		10.1115***	6.0190*
		(3.5713)	(3.2721)
RES			7.9852
			(4.8436)
EL			-1.5770
			(0.9763)
UL			-2.1796***
			(0.4495)
IGI			-1.6217*
			(0.9051)
Individual	Yes	Yes	Yes
Time point	Yes	Yes	Yes
N	160	160	160

For control variables, the regression coefficient of urbanization level (UL) on urban-rural income gap is negative and significant at 1%, which indicates that accelerating urbanization process, absorbing agricultural population and alleviating the imbalance of regional economic development are helpful to reduce the income gap between urban and rural residents.

The regression coefficient of government intervention (IGI) on urban-rural income gap is negative and significant at the 10% level. This is because the increase of the proportion of government fiscal expenditure in GDP will effectively improve the construction of public services, improve the public service system, comprehensively support the modernization drive, improve the living standard and income level of rural residents, and narrow the urban-rural gap.

4. Conclusions and Suggestions

4.1. Conclusions

Based on the panel data of 16 prefecture-level cities in Anhui Province from 2011 to 2020, this paper uses the entropy method to build the evaluation system of Anhui digital economy development, and uses the dual fixed effect model to explore the impact of Anhui digital economy on the urban-rural income gap, and draws the following main conclusions: (1) Hefei, Wuhu and Fuyang have a high level of digital economy development, and the digital economy index of Hefei is particularly ahead. The development level of digital economy in Chizhou City, Tongling City and Huangshan City is relatively backward; (2) At the present stage, the development of digital economy in Anhui Province will significantly narrow the urban-rural income gap, which is conducive to the realization of common prosperity; (3) The development of digital economy will have a nonlinear U-shaped impact on urban-rural income inequality. In the early stage of development, the urban-rural income gap will be reduced, and in the later stage, there will be a digital divide. (4) The level of urbanization and the intensity of government intervention will significantly narrow the gap between urban and rural income inequality.

4.2. Suggestions

(1) Optimize the overall layout of the digital economy and promote coordinated development among regions. It can be seen from the conclusion of this paper that the development of digital

economy in Anhui province is not balanced, so Hefei, Wuhu and other developed areas of digital economy can be encouraged to play a leading role in reducing the "digital divide" between regions. On the one hand, it will accelerate the development of advanced areas of digital economy, create a greater radiation effect and drive the development of backward areas. On the other hand, functional redistribution in developed areas can provide new development opportunities for backward areas, such as employment opportunities, which can reduce the urban-rural income gap in backward areas.

(2) Promote the digital development of industries and improve the income level of traditional industries. Anhui Province should actively support the use of digital technology and data resources to improve the output and efficiency of traditional industries, and use modern technology to transform traditional industries in an all-round and whole-chain way, which can not only achieve industrial cost reduction and efficiency improvement and increase industrial income, but also upgrade industrial mode and build traditional industries into modern industries, so as to improve farmers' income at the root.

(3) Improve rural infrastructure and promote the integration of digital technology with agriculture and rural areas. The government should increase investment in rural areas. First, it is necessary to increase the construction of infrastructure in rural areas, increase the quantity and improve the quality of infrastructure, and support the development needs of strong agriculture, beautiful countryside and rich farmers. Second, we will promote the development of information infrastructure in rural areas, further extend Internet Plus services to rural areas, and accelerate the construction of a "digital village".

(4) Provide targeted assistance to poor rural areas by relying on digital economy and technology. At present, the focus of the country's "agriculture, rural areas and farmers" work has shifted from poverty alleviation to comprehensive rural revitalization. In this process, the platform economy based on artificial intelligence, big data and blockchain can connect the upstream and downstream of various industries and form resonance, thus creating a huge spillover effect, introducing resources such as technology, capital, products and services to poor areas. Bridge the "digital divide" between urban and rural areas to achieve the optimal allocation of resources. The digital economy is injecting new impetus into consolidating the achievements made in poverty alleviation and advancing rural revitalization, and gathering strong synergy from all sectors of society.

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