The Impact of Digital Divide on the Income Gap between Urban and Rural Residents in the Context of Digital Economy Development

-- Analysis based on Provincial Panel Quantile Model

Jiayi Lu*

Anhui University of Finance and Economics, Bengbu, 233030, China

Abstract

Based on The relationship between digital economy development and urban-rural income gap in the context of rural revitalization is analyzed based on provincial panel data of 31 provinces in China from 2010 to 2020. The results show that the overall relationship between digital economy and urban-rural income gap is "inverted U type" relationship. When the level of human capital is low, innovation is weak and urbanization rate is low, the digital economy will widen the urban-rural income gap; while when the level of human capital is high, innovation is strong and urbanization rate is high, the digital economy will narrow the urban-rural income gap. The regression results of the impact paths show that the digital economy can reduce the urban-rural income gap through three paths, namely, raising the level of human capital, enhancing innovation dynamics, and The regression results show that the digital economy can narrow the urban-rural income gap through three paths: improving human capital, enhancing innovation dynamics, and promoting urbanization.Drawing on the measurement of international authoritative system of digital economy, the article constructs digital economy development indicators from six dimensions, forms 2012 - 2018 provincial balanced panel data, and explores the impact of digital economy development on the income gap between urban and rural residents. The empirical study finds that there is a U-shaped relationship between the development of digital economy and the income gap between urban and rural residents, i.e., the initial development of digital economy will reduce the urban-rural income gap, but the further development of digital economy will widen the urban-rural income gap and generate the problem of digital divide. This conclusion still holds after a series of robustness tests. The mechanism test finds that digital economy development affects the urban-rural income gap by influencing urbanization and the relative entrepreneurship level of urban and rural residents, and in the early stage of digital economy development, digital economy development can promote urbanization and increase the entrepreneurship level of rural areas, but in the later stage of digital economy development, it will lead to "reverse urbanization" and increase the entrepreneurship level of However, in the later stages of digital economy development, it leads to "reverse urbanization" and more entrepreneurship in urban areas. The study further finds that the promotion of rural infrastructure development and the improvement of rural financial development can significantly moderate the U-shaped relationship between digital economy development and the income gap between urban and rural residents, enhancing the positive effect of the initial development of the digital economy on alleviating the urban-rural income gap and suppressing the negative effect of the digital economy on widening the urban-rural income gap in the later stage of development. The findings of the article suggest that increasing investment in rural infrastructure and accelerating rural financial development are important guarantees to ensure that the development of digital

economy benefits rural residents, thus forming policy recommendations to promote the inclusive development of digital economy in China.

Keywords

Digital Economy; Urban-Rural Income Gap; Rural Financial Development; Rural Infrastructure Development; Panel Quantile Model.

1. Introduction

As an important symptom of urban-rural inequality As an important symptom of urban-rural inequality, the wide income gap between urban and rural residents has always been a prominent problem faced by developing countries in the process of economic development. After the reform and opening up, the resources of China's national economy were once focused on the cities, with less support for rural development, leading to a significant income gap between urban and rural residents, which is much higher than the international average. In recent years, it has become an important direction for policy formulation to make the majority of farmers rich as soon as possible and to continuously narrow the income gap between urban and rural residents[1].

As an important driver of China's high As an important driver of China's high quality economic growth, the digital economy is playing an increasingly important role in the economy and society, and has a profound impact on the urban-rural income gap. On the one hand, the development of the digital economy, including e-commerce, has reduced information asymmetry across regions, bridged the physical gap between urban and rural areas, and undertaken the mission of the times to help reduce rural poverty; but on the other hand, when digital technology is applied in rural areas to improve the efficiency of economic operation, the problem of urban-rural digital divide has become increasingly prominent due to the weakness of rural technical infrastructure and the lack of talent pool, especially in the areas of artificial intelligence, blockchain, cloud computing, big data, etc. In the context of the change of productivity by advanced digital technology represented by artificial intelligence, blockchain, cloud computing, big data, etc., there is a risk of further widening the gap between the rich and the poor in urban and rural areas. This means that at a time when the central government is vigorously developing the digital economy, there is a need to actively explore targeted policies to guide the development of the digital economy to help narrow the income gap between urban and rural residents and achieve the inclusive development of the digital economy[2].

2. Literature Review

In the era of comprehensive digital economy In the era of deepening, it is difficult to avoid the impact of the development of digital economy when exploring the income gap between urban and rural residents. However, there has not yet been a study on the impact of digital economy on the income gap between urban and rural residents and the mechanism of its impact in the literature. Compared with the existing literature, the contribution of this paper is reflected in the following aspects[3].

First, it expands the existing research on the digital economy. The existing literature on the digital economy focuses on the measurement of the size of the digital economy (García - Herrero and Xu, 2018; Brynjolfsson and Collis, 2019; Xu Xianchun and Zhang Meihui, 2020) and the impact of digital economy development on residential consumption (Brynjolfsson et al., 2003), employment (Wang, 2020), and economic development (Jiang, Song, and Sun, Yuxin, 2020). Drawing on the authoritative systems of the Organization for Economic Cooperation and Development and the U.S. Bureau of Economic Analysis for measuring the digital economy, this

paper constructs provincial digital economy development indicators from six dimensions to explore the impact of digital economy development on the income gap between urban and rural residents, extending existing research on the economic impact of digital economy development. Most relevant to the research topic of this paper is Cheng, Mingwang, and Zhang, Jiaping (2019) on the impact of Internet penetration.They found that there is an inverted U-shaped relationship between Internet penetration rate and income gap between urban and rural residents. And based on the digital economy development indicators constructed in this paper, we find a U-shaped relationship between the digital economy and the income gap between urban and rural residents. The significant differences between this paper and the findings of Cheng, Ming-wang, and Zhang, Jia-ping (2019) are mainly due to the differences in the selection of research topics and sample time intervals: first, Internet development is only part of the digital infrastructure, and Internet penetration is only part of the digital infrastructure. In fact, the current digital economy development is increasingly driven by emerging technologies such as artificial intelligence, big data, cloud computing, blockchain, etc. Based on the constructed digital economy development index with wide coverage, this paper explores the relationship between digital economy development and urban-rural income gap, which is different from the specific research topics of Cheng, Mingwang and Zhang (2019). Second, the sample time interval of Cheng and Zhang (2019) is from 2003 to 2016, and the inflection point of their inverted U-shape is in 2009, while the sample time interval of this paper is from 2012 to 2018, so the Internet penetration rate discussed in Cheng and Zhang (2019) The late stage of Internet development in which the increase in Internet penetration helped to reduce the urban-rural income gap discussed in this paper can be regarded as the early stage of digital economy development explored in this paper[4].

Second, it enriches the urban-rural existing research on the income gap between residents. Existing studies show that urbanization (Lu, Ming, and Chen, Zhao, 2004), transportation infrastructure (Yang, Xi, and Shi, Daqian, 2019), financial development (Wen, Tao, and Wang, Yongcang, 2020), and population structure (Wang, Jiaxu, et al., 2017) can affect the income gap between urban and rural residents. The findings of this paper suggest that the digital economy is also an important factor influencing the income gap between urban and rural residents, while the mechanism of its influence is explored, suggesting that the development of the digital economy can influence the income gap between urban and rural residents by affecting urbanization as well as the relative entrepreneurship levels in urban and rural areas. The research closest to the contribution of this paper is the study on the impact of digital inclusive finance on the income gap between urban and rural residents. It is generally believed that digital inclusive finance can significantly reduce the income gap between urban and rural residents (Liang, Shuanglu, and Liu, Peipei, 2019). However, digital finance is only a reflection of the application of digital technology in the financial field, which reflects more the convenience of investment and financing brought by the digital economy to economic individuals, and does not reflect the impact of other economic aspects such as industrial structure changes and human capital demand changes brought by the development of the digital economy. The study of the impact of digital economy development on the income gap between urban and rural residents and its mechanism is of contemporary urgency at the time of great development of digital economy[5].

Third, it provides practical policy recommendations for alleviating the urban-rural digital divide provides practical policy suggestions. The urban-rural digital divide has attracted widespread academic attention (Xu, Zhuqing et al., 2013; Hu et al., 2016), especially its impact on affecting urban-rural income disparities. For example, Tan Yanzhi et al. (2017) pointed out that the digital divide that exists between urban and rural areas in the information age makes the Internet development bring significant income increasing effect to urban residents while the income impact on rural residents is not significant. This paper finds that the existence of

the urban-rural digital divide makes the digital economy increase the urban-rural income gap in the later stages of its development. Mitigating the adverse effects of the urban-rural digital divide becomes the key to achieving coordinated development of urban and rural residents' income in the digital economy era. The empirical study in this paper shows that rural infrastructure construction and rural financial development can alleviate the adverse effects of the urban-rural digital divide in the late stage of digital economy development and enable rural residents to gain more economic benefits in the digital economy era. Therefore, in order to promote the inclusive development of the digital economy, the government should increase its support for urban-rural infrastructure construction and rural financial development[6].

3. Theoretical Analysis

This paper argues that the development of digital economy The development of digital economy can affect the income gap between urban and rural residents in the following ways. First, the digital economy can affect the income gap between urban and rural residents by influencing the urbanization process. Urbanization is accompanied by the transformation of industrial structure, population occupation, and urban geographic space (Ding et al., 2011). On the one hand, the urbanization process can improve the income level of migrant workers in urban areas, alleviate the human land tension in rural areas, improve agricultural productivity, and increase farmers' income (Mu Huaizhong and Wu Peng, 2016); on the other hand, the urbanization process can suppress the excessive growth of urban residents' wage level, which is conducive to the equalization of urban and rural factor rewards and reduce the income gap between urban and rural residents (Xiao Yao, 2013)[7]. The development of the digital economy can contribute to urbanization. The promotion effect of digital economy development on urbanization First, the development of digital economy makes it easier for urbanization to obtain financial resources support. The development of digital finance in the digital economy can enhance the scale of debt financing of local governments by improving the allocation efficiency and financial transparency of financial resources (Hou Shiying and Song Liangrong, 2020), solving the more prominent problems of financing difficulties and expensive financing for local governments (Cai Shukai and Ni Pengfei, 2014), thus supporting local governments to expand urban infrastructure investment and accelerate the urbanization process; secondly, the digital economy promotes the development of SMEs. The digital economy promotes the development of small and medium-sized enterprises (SMEs)[8]. Small and medium-sized enterprises (SMEs) are the main body that absorbs urban migrant workers. The development of e-commerce, for example, provides SMEs with new sales channels and expands the demand for product production, thus increasing the demand for labor and enhancing the opportunities for surplus rural laborers who migrate to cities to obtain jobs; third, it helps break the information barriers in the labor market. The development of digital economy enables the rural surplus laborers who migrate to cities to discover suitable jobs conveniently and at low cost, reduce job search time and participate in employment as soon as possible, thus accelerating the urbanization process.

Although China's current economic economic structure is still dominated by labor-intensive industries, the changes in production technology in the digital economy are reshaping the traditional production model and accelerating the process of replacing living labor with physical labor (Wang, Mengfei, and Zhang, Xinwei, 2020), and the enterprises' requirements for employees' human capital are increasing. Since rural residents generally have lower education levels than urban residents and insufficient human capital reserves (Guo, Jianxiong, 2005), it is more difficult to master and apply intelligent technological products and services in the digital economy, and it is difficult for the surplus rural labor force to meet the urban demand for new talents in the digital economy. The digital economy promotes urban employment in

knowledge- and technology-intensive productive services and high-end services (Wang, 2020), and the digital divide faced by rural migrant workers makes it difficult for them to obtain more employment opportunities in the new round of tertiary employment expansion, thus posing the problem of "reverse urbanization". Liu Huan (2020) shows that industrial intelligence reduces the job stability and income level of agricultural migrants and significantly widens the income gap between urban and rural residents. Therefore, although the development of digital economy can promote urbanization and narrow the income gap between urban and rural residents at the initial stage, the digital divide brought by the further advancement of digital economy has a negative impact on the rural surplus labor force moving to urban areas for work, thus widening the income gap between urban and rural residents[9].

Second, the digital economy can influence the level of farmers' entrepreneurship, which in turn affects the income gap between urban and rural residents. Capital and technology are the most desired resources for farmers' entrepreneurship (Luo et al., 2012). Compared to urban residents, the lack of collateral and credit history makes rural residents face greater financing constraints. Although rural credit unions and other financial institutions supporting rural areas are common in rural areas, they largely serve as important channels for urban "siphoning" of rural capital and do not fundamentally address the problem of rural financial exclusion (Xu Shengdao and Tian Lin, 2008). Difficulties in accessing financial resources inhibit rural residents' entrepreneurial motivation. Lu, Yajuan et al. (2014) found that the availability of financial resources was significantly and positively associated with farmers' entrepreneurship, with an increase of 10,000 yuan in total household loans increasing the probability of rural households starting a business by 8. 8%. In the digital economy, digital financial institutions can use big data to obtain credit accumulation points from people's daily consumption records, provide credit records (Zhang, Xun et al., 2019), and generally do not require borrowers to provide collateral, lowering the loan threshold (Bruett, 2007), which will alleviate the financing constraints of rural residents' entrepreneurship and stimulate their entrepreneurial intentions (Zhu, Honggen, and Kang, Lanyuan , 2013). Meanwhile, in the era of digital economy, the huge national investment in communication infrastructure has made mobile Internet popular in rural areas, and rural residents can easily access information using cell phones and better learn what they need to start their own businesses, which reduces the threshold and risk of rural entrepreneurship. The use of the Internet has become an important driving force for rural residents' entrepreneurship (Su Lanlan and Kong Rong, 2020). The initial development of the digital economy can effectively stimulate entrepreneurial behavior of rural residents, which in turn can increase the income of rural areas, thus reducing the income gap between urban and rural residents[10].

Based on the above analysis The initial stage of digital economy development can improve the urbanization process and entrepreneurship level of rural residents, thus increasing rural The income gap between urban and rural residents can be narrowed by increasing the income of rural residents. However, with the development of digital economy, the digital divide between urban and rural areas becomes more obvious, and the phenomenon of "reverse urbanization" and the effectiveness of digital economy in supporting rural residents' entrepreneurship will decrease, leading to the widening of the income gap between urban and rural residents. On the whole, the relationship between the level of digital economy development and the income gap between urban and rural residents is not a simple linear relationship, but a U-shaped relationship. Therefore, the following research hypothesis is proposed in this paper.

Hypothesis H1: Digital economy There is a U-shaped relationship between the level of development and the income gap between urban and rural residents.

Hypothesis H2: Higher investment in rural infrastructure moderates the U-shaped relationship between the digital economy and the rural-urban income gap, i.e., higher rural infrastructure development can enhance the positive effect of reducing the urban-rural income gap in the

early stage of digital economy development and reduce the effect of increasing the urban-rural income gap in the later stage of digital economy development.

Hypothesis H3: An increase in the level of financial development in rural areas can moderate the U-shaped relationship between the digital economy and the urban-rural income gap, i.e., a higher level of rural financial development can strengthen the positive effect of reducing the urban-rural income gap in the early stage of digital economy development and reduce the effect of increasing the urban-rural income gap in the later stage of high digital economy development. In other words, a higher level of rural financial development can strengthen the positive effect of reducing the urban-rural income gap in the early stage of digital economy development, and reduce the effect of increasing the urban-rural income gap in the later stage of high digital economy development.

4. Study Design

4.1. Data Source

This paper investigates the impact of digital economy development on urban-rural income disparity by using 31 provinces, municipalities directly under the Central Government and autonomous regions from 2012 - 2018 as the research objects. The main sources of data are China Rural Statistical Yearbook of all years, Regional Statistical Yearbook of all years in each province, municipality and autonomous region, and Wind database; relevant missing data are obtained by manually collecting the annual statistical bulletins of each region, and other Other data were obtained from the Internet. We finally obtain 217 observations, which constitute the balanced panel data. All continuous variables are scaled down at the 1% and 99% levels to eliminate the effect of extreme values on the study.

4.2. Measurement of Digital Economy Development

Authoritative measures of the level of Authoritative measures of the level of development of the digital economy worldwide include those of the Organization for Economic Cooperation and Development (OECD) and the U.S. Bureau of Economic Analysis (BEA) (Chen, Menggen, and Zhang, Xin, 2020). Among them, the OECD portrays digital economic development in four dimensions, including ICT for economic growth and job growth, ICT for digital society, digital technology innovation capacity, and intelligent infrastructure investment (OECD, 2015); the BEA measures the level of digital economic development in three dimensions, including digital media, e-commerce, and digital infrastructure. Referring to the design of these two international authoritative measurement systems, considering the two main paths of China's digital economy development around digital industrialization and industrial digitization, and taking into account the availability of data at the provincial level, this paper gives six dimensions to characterize the digital economy development in sub-provinces: digital technology innovation capacity, digital infrastructure construction level, ICT for digital society, ICT for economic growth, emerging Digital economy industry development level, and digital economy enterprise capitalization level. Regarding the measurement of digital technology innovation capacity, considering that artificial intelligence, blockchain, cloud computing and big data are the digital technology innovation technologies that are of most concern to the government and market in China at present, and also have the potential to bring about a new productivity revolution, this paper uses the number of patent applications for these four technologies to reflect the current status of the latest underlying technology development that facilitates digital transformation. For the development level of the emerging digital economy industry, based on the fact that the e-commerce industry is the most representative of the emerging digital economy industry in China, and that e-commerce is included in the three major indicators of the development level of the digital economy measured by BEA, the development

level of the emerging digital economy industry measured in this paper is composed of e-commerce-related indicators. One innovation in the synthesis of indicators is to refer to M ueller et al.'s (2017) study on the level of development of cross-country digital economy and introduce digital indicators. (2017) to measure the level of development of cross-country digital economy, and introduce the level of capitalization of digital economy enterprises to measure the effectiveness of digital economy development in each region from the perspective of capital market. By logarithmizing the values of the synthetic index formed by the six dimensions, this paper obtains the final index (Digital) to measure the digital development level of each provincial regional economy. The digital economy development index constructed in this paper has expanded in both depth and breadth compared with existing indicators[11].

Considering the possible correlation among indicators In the process of synthesizing the secondary indicators into the primary indicators and the primary indicators into the digital economy development level index, the CRITIC method is used to generate the indicator weights. The weights are designed as follows.

$$\omega_i = \frac{C_i}{\sum_i^n C_i}, i = 1,2,3 \dots, n \tag{1}$$

where $\omega_i = \sigma_i \sum_j^n (1 - r_{ij})$, i = 1, 2... , n, i ≠ j , and σ_i is the value of , n, i ≠ j, σ_i is the is the standard deviation of indicator i, and r_{ij} is the correlation coefficient between indicator i and indicator j.

In terms of data sources, the data for the four level indicators of The data of the four primary indicators, including the level of digital infrastructure construction, ICT for digital society, ICT for economic growth and the level of development of new digital economy industry, are all from the China Statistical Yearbook, in which the data of the secondary indicators of the level of development of new digital economy industry are only disclosed in the China Statistical Yearbook for 2013 and later, and the data of 2012 are the data of the following years The data for 2012 are obtained by compiling the year-on-year growth data disclosed in the consultancy report of e-commerce by Ai Rui, the website of China Electronic Commerce Center, and the reports of provincial departments of commerce, the work reports of provincial governments, and the special reports of provincial statistical bureaus. Digital Economy The data on capitalization level are obtained by summing the year-end market value of A-share listed companies in the information transmission, software and information technology service industry by province in the W ind database. The original data was obtained by crawling the data of international patent applications published on the official website of the World Intellectual Property Organization (W IPO)[12].

4.3.   Construction of the Model

Given the digital economy In view of the possible non-linear effects of digital economy development on the urban-rural income gap, this paper constructs the following econometric model.

$$Theil_{i,t} = \beta_0 + \beta_1 Digital_{i,t} + \beta_2 Digital^2{}_{i,t} + \beta_3 AGDP_{i,t} + \beta_4 Secondary_{i,t} + \beta_5 Primary_{i,t} + \\ \beta_6 FDI_{i,t} + \beta_7 Expenditure_{i,t} + \beta_8 Education_{i,t} + \mu_i + v_t + \varepsilon_{i,t} \tag{2}$$

where t denotes the year and i denotes the province, municipality or autonomous region. Referring to the econometric models set by Cheng Mingwang and Zhang Jiaping (2019), Yang Xi and Shi Daqian (2019) and Wen Tao and Wang Yongcang (2020), this paper selects the following control variables: the level of economic development (AGDP), which is portrayed by annual per capita gross regional product; the structure of industry, which controls the

proportion of primary industry output (Primary) and the proportion of secondary industry output (Secondary), respectively; the level of external openness (FDI), which is portrayed by foreign direct investment; the level of government expenditure (Expenditure), which is portrayed by government fiscal expenditure; the level of education (Education), which is portrayed by foreign direct investment; and the level of education (Education), which is portrayed by foreign direct investment. Secondary); openness to foreign investment (FDI), measured by foreign direct investment (FDI); government expenditure (Expenditure), measured by government fiscal expenditure; and education (Education), measured by the average number of years of schooling in the region. In addition, the model incorporates area fixed effects (μ) and time fixed effects (v) to control for the effects of time-invariant factors and time trends on the urban-rural income gap, respectively. Our coefficients of interest are β1 and β2 , and β1 is predicted to be negative while β2 is positive.

The mean value of the Thiel index is 0. 10, while the minimum and maximum values are 0. 02 and 0. 21 respectively, which indicates that the income gap between urban and rural residents has a large variability in different regions. In addition, the development level of digital economy in different regions of China has large differences, with the eastern region having the highest level of digital economy development and the western region having the lowest level of digital economy development, which is in line with the reality of China. The eastern regions such as Zhejiang, Guangdong and Beijing are at the forefront of the digital economy. The eastern region, such as Zhejiang, Guangdong and Beijing, is at the forefront of the digital economy in China, with leading companies in the digital economy such as Alibaba, Tencent, Jingdong, Headline and Baidu, while some provinces in the western region have The information and communication infrastructure in some provinces in the western region is still being gradually improved. Due to the lack of relevant data in Tibet, Tangi and The number of observations for Finance is only 210.

5. Empirical Analysis

5.1. Baseline Return

In column (1), this paper does not include other control variables. The regression coefficient of Digital is negative and significant at the 1% statistical level, while the regression coefficient of Digital 2 is positive and significant at the 1% statistical level, which tentatively indicates that the relationship between the development of digital economy and the level of income disparity between urban and rural residents is U-shaped. In column (2), we control for the level of economic development, the share of secondary industry, the share of primary industry and foreign direct investment, and the signs and significance of the regression coefficients of Digital and Digital 2 do not change. In the last column, we further control for other control variables, and the sign and significance of the regression coefficients of Digital and Digital 2 remain unchanged. This indicates that the income gap between urban and rural residents can be significantly reduced at the initial stage of digital economy development, but with the further development of digital economy, the income gap between urban and rural residents will be further widened, which supports the hypothesis H1 of this paper[13].

The inflection point value of the U-shaped relationship between digital economy development and urban-rural income gap is 2. 5, which is close to the 75th percentile level of Digital in the descriptive statistics, indicating that about 25% of the sample lies on the right side of the inflection point. As of the end of 2018, the development level of digital economy in the eastern region is on the right side of the inflection point, while the central region is close to the inflection point. The central region is close to the right side of the inflection point, while the northeast and west regions are still on the left side of the inflection point. This means that for the eastern region, attention needs to be paid to the deterioration of the urban-rural income gap brought about by the excessive development of the digital economy, while for the northeastern and

western regions, the role of digital economy development in alleviating the urban-rural income gap needs to be further strengthened.

5.2. Robustness Tests

Considering that technological advancement progress affects both the urban-rural income gap (Zeng, Peng, and Wu, Gongliang, 2015) and the development of the digital economy. In order to reduce the impact of omitting important variables on the findings of this paper, this paper further controls for the impact of technological progress on the urban-rural income gap. This paper uses the number of regional patent applications in the current year taken as a logarithm to quantify technological progress (Science). The findings of the study remain unchanged after controlling for technological progress. Finally, considering the possible impact of endogeneity issues on the findings of this paper, this paper uses a two-stage instrumental variables approach (2SLS) for regression. In the regression, we consider the level of digital economy development and its squared term as two endogenous variables, and the mean value of digital economy and its squared term of other provinces in the same year are selected as instrumental variables. The level of development of digital economy in other provinces is correlated with the level of development of digital economy in the province, but not with the level of income gap between urban and rural residents in the province, which is consistent with the instrumental variables. The regression results of 2SLS were reported and found to be consistent. Meanwhile, the values of Cragg - Donald Wald statistic F and Kleibergen - Papp LM statistic are 432. 94 and 72. 47, respectively, which pass the weak instrumental variable test as well as the unidentifiable test.

5.3. Mechanism Testing

In the second part of the analysis, this paper points out that the digital economy affects the urban-rural income gap by influencing urbanization and the relative entrepreneurship levels of urban and rural residents. In the early stage of the development of the digital economy, the digital economy will increase the income gap between rural and urban residents by promoting urbanization and increasing rural residents' entrepreneurship. However, as the digital economy develops, the urban-rural digital divide becomes more significant, urbanization is hindered and the entrepreneurship level of rural residents decreases relative to that of urban areas, which makes the digital economy development widen the income gap between urban and rural residents. This makes the development of digital economy widen the income gap between urban and rural residents. Therefore, the effect of digital economy on the income gap between urban and rural residents first decreases and then increases. This section tests the above two mechanisms.

The regression coefficient of Digital is significantly negative while the regression coefficient of Digital 2 is significantly positive, which indicates that the impact of digital economy on the relative entrepreneurship level of urban and rural residents is U-shaped. The regression coefficient of Digital is significantly positive while the regression coefficient of Digital 2 is significantly negative, which indicates that the impact of digital economy on urbanization is inverted U-shape, in the initial stage of digital economy development, the urban-rural digital divide emerges, and the development of digital economy drives more urban residents' entrepreneurship. However, as the digital economy reaches a certain stage of development, the urbanization process will be hindered.

The regression coefficient of Business The regression coefficient of Business is significantly positive at the 10% level, indicating that the increase in the relative entrepreneurship level of urban and rural residents increases the income gap between urban and rural areas. Meanwhile, the regression coefficients of Digital and Digital 2 are significant at the 1% level and their absolute values decrease relative to the absolute values of the regression coefficients, which indicates that the relative entrepreneurship levels of urban and rural residents play a part in mediating the relationship between the digital economy and the income gap between urban

and rural residents. The regression coefficient of Tow n is significantly negative at the 1 % level, indicating that urbanization is beneficial to narrowing the income gap between urban and rural residents. Meanwhile, the regression coefficients of Digital and Digital 2 are both significant at the 1% level and their absolute values decrease relative to the absolute values of the corresponding regression coefficients, indicating that urbanization plays a part in mediating the relationship between the digital economy and the income gap between urban and rural residents.

6. Key Research Findings and Policy Implications

This paper examines the impact of the digital The relationship between the development level of digital economy and the income gap between urban and rural residents is U-shaped. The relationship between the level of development of the digital economy and the income gap between urban and rural residents is U-shaped, and its development can narrow the income gap between urban and rural residents at the early stage, however, with its further development, the income gap between urban and rural residents will widen, creating the problem of urban-rural digital divide. The mechanism test finds that the digital economy affects the income gap between urban and rural residents by influencing urbanization and the relative entrepreneurship level of urban and rural residents. Further study finds that increasing investment in rural infrastructure construction and accelerating rural financial development can strengthen the positive effect of narrowing the urban-rural income gap in the early stage of digital economy development and reduce the effect of widening the urban-rural income gap in the later stage of digital economy development.

Based on the analysis in this paper, the following policy insights can be obtained.

First, in While vigorously developing the digital economy, we need to be vigilant about the digital economy's late development, which will widen the income gap between urban and rural residents The digital divide between urban and rural residents is a problem. The reason for the urban-rural digital divide is the difference between urban and rural residents in their understanding of digital technology and their ability to apply it. The reason for the digital divide is the difference between urban and rural residents in their understanding and ability to apply digital technology, which leads to the reverse urbanization and the digital economy supporting urban entrepreneurship more than rural entrepreneurship in the late stage of digital economy development. The government should strengthen the inclusiveness of digital economy development, enhance the digital skills of rural residents, improve their digital knowledge for employment in urban areas, and promote their entrepreneurship in rural areas based on digital technology, so as to promote digital economy development to serve the continuous improvement of rural residents' income.

Second, improve the rural infrastructure construction and enhance the policy effect of digital economy development to narrow the income gap between urban and rural residents. The government should balance balance the investment in urban and rural infrastructure construction and increase the support for infrastructure construction in rural areas to provide a more solid foundation for rural areas to realize farmers' income increase and economic development in rural areas. In terms of rural infrastructure construction, the government should promote traditional infrastructure construction such as road construction, water supply and electricity supply on the one hand, and new rural infrastructure construction such as "broadband village" on the other. The latest technology to promote the development of digital economy is integrated into the construction of rural infrastructure, forming an upgrade of the construction of intelligent rural areas, in order to strengthen the role of digital economy in helping farmers to reduce poverty.

Third, increase the support for support for rural financial development and enhance the policy effect of digital economic development in narrowing the income gap between urban and rural residents. Relevant regulatory assessment indicators should be established to form rigid regulatory requirements for rural-related loans of financial institutions, especially state-owned financial institutions; moderately relax the access restrictions of the rural financial market and encourage innovation of various types of rural financial institutions; apply financial technology and other technological means to continuously improve the service efficiency of rural financial institutions, lower the threshold of rural financial services, and promote rural residents' continuous improvement of digital technology investment To enhance the innovation and entrepreneurship ability of rural residents based on digital technology.

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