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Digital Economy, Urban-Rural Income Gap and Economic Development Resilience

Lei Wang* and Luyuan Yang

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

Abstract

Based on the panel data of 30 provinces in China from 2011 to 2020, this paper empirically studies the relationship between digital economy, urban-rural income gap and economic development resilience. The results show that the digital economy has a significant positive impact on the resilience of economic development, and this impact has regional heterogeneity, mainly in the East > the middle > the Northeast > the West; The urban-rural income gap has a significant negative impact on the resilience of economic development; The digital economy can improve the resilience of economic development by narrowing the income gap between urban and rural areas, and this impact is particularly significant in the central, Western and northeast regions. In this regard, we need to accelerate the construction of digital economy infrastructure, increase the investment in digital economy construction technology and policy, broaden the scope and depth of digital economy services, and enhance the resilience of economic development.

Keywords

Digital Economy; Urban-Rural Income Gap; Economic Development Resilience; Economic Uncertainty; Regional Heterogeneity.

1. Introduction

Since 2020, the prevalence of trade protectionism, supply chain disruption, high commodity prices and other internal and external changes have expanded the uncertainty and instability of the domestic economic trend. In this context, strengthening the resilience of economic development and improving the resilience and risk response ability of the economic system have become the key to promoting high-quality economic development. In June 2021, the second quarter regular meeting of the monetary policy committee of the people's Bank of China proposed to maintain the overall stability of the economy and enhance the resilience of economic development. In fact, with the accelerated integration and application of digital technology and economy, China's digital economy has grown rapidly and new business forms have gradually increased. By virtue of its self penetration and technological innovation advantages, the digital economy has effectively enhanced the region's ability to withstand the impact of economic recession and realize transformation through economic crisis, strengthened the resilience of regional economic development, and gradually became a new driving force for economic recovery. At the same time, the digital economy has effectively increased the economic income of rural residents and narrowed the income gap between urban and rural residents by providing more jobs and employment information for rural residents with the development characteristics of "inclusive sharing". So, what is the impact of the digital economy, the urban-rural income gap and the resilience of economic development? Can the digital economy empower and enhance the resilience of economic development by narrowing the income gap between urban and rural areas? Studying the above problems can provide a new focus for strengthening the resilience of economic development, and has important

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practical significance for China to cope with economic uncertainty risks and promote high-quality economic development.

For a long time, the academic community has been concerned about the impact of the digital economy on the urban-rural income gap and economic development resilience, but these studies focus on the direct impact of the digital economy on the urban-rural income gap and economic development resilience, and lack of research on whether or how the digital economy affects economic development resilience by narrowing the urban-rural income gap. Therefore, on the one hand, the paper combs the impact mechanism of digital economy and urban-rural income gap on economic development resilience, and empirically tests the relationship between the three to supplement relevant research content; On the other hand, it verifies and reveals the internal mechanism of the impact of digital economy on economic development resilience through urban-rural income gap, and discusses the differences among the eastern, northeastern, central and western regions, which is of reference significance to coordinate and promote the development of China's regional digital economy, narrow the urban-rural income gap and enhance economic development resilience.

2. Literature Review

In the process of reversing the economic downturn, China's digital economy has gradually broken through the dual problems of scale and structure and become an economic "stabilizer". In other words, the digital economy enlivens the economy of this region and neighboring regions mainly by adjusting the industrial structure and optimizing factor resources, thus affecting the resilience of economic development. First, the scale leap and structural optimization of the digital economy can provide basic conditions for the economy to strengthen its resilience and resistance. Hong Wenbo (2019) pointed out that in the stage of resisting economic risks, enterprises using digital technology suffer less impact; In the stage of economic recovery, such enterprises are more resilient. The rapid expansion of the scale and high-quality upgrading of the structure of the digital economy are conducive to accelerating the digital transformation of enterprises, reshaping economic productivity, improving the risk response and resistance of the economy, and enhancing the overall economic development resilience. Second, the digital economy enhances the adaptability and innovation and transformation of the economy by improving the reorganization ability and operation efficiency of factor resources. Tang Hongtao et al. (2021) pointed out that the digital economy has brought more opportunities for the economy to adapt to the new economic development and boost economic vitality by improving the resistance and resilience of the networking of commercial supply and demand and the diversification of commercial structure, thus significantly improving the economic resilience of urban commerce. That is to say, the development of digital economy has brought technological innovation and factor redistribution, reconstructed the new ecology of economic development, brought new opportunities for boosting the vitality of urban economic development and enhancing the immunity of urban economy, and then improved the resilience of economic development.

3. Theoretical Mechanism

The impact of urban-rural income gap on the resilience of economic development is directly reflected in the mechanism of income distribution on the quality of economic development. In general, the impact of urban-rural income gap on economic development resilience is mainly shown in the following aspects: first, urban-rural income gap affects economic development resilience through residents' consumption. The increasing income gap between urban and rural areas will polarize residents' consumption tendency, that is, low-income groups tend to consume basic necessities, while high-income groups pay more attention to high-end product

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consumption. Under the influence of the polarization of residents' consumption, the economic development capacity and recovery capacity will be destroyed, and the resilience of economic development will be reduced accordingly. Second, the urban-rural income gap affects the resilience of economic development through government transfer expenditure. In the process of improving the quality and growth of the economy, the greater the income gap between urban and rural areas, the more the government spends on helping low-income rural groups to maintain local economic stability. To a certain extent, this limits the positive role of fiscal funds in resisting risks and recovering in the economic field, and will damage the resilience of economic development. Third, the urban-rural income gap affects the resilience of economic development through labor mobility. In recent years, with the gradual narrowing of the income gap between urban and rural areas, the tide of returning urban surplus labor has emerged, which is conducive to preventing rural poverty and reducing the pressure of urban development. Moreover, the flow of urban labor to rural areas can provide advanced technology and management experience for rural development, improve the level of rural economic development, bridge the gap between urban and rural development, and further enhance the resilience of economic development.

As an important driving force to narrow the income gap between urban and rural areas, the digital economy can reduce the cost of information acquisition for rural residents, improve the income level of rural families and narrow the income gap between urban and rural areas with the help of digital facilities, information sharing platforms and other equipment. At the same time, narrowing the income gap between urban and rural areas can reduce the number of poor people, increase the activity of consumer demand, and improve the total factor productivity of the production sector. And the improvement of total factor productivity is conducive to achieving stable growth of the national economy and enhancing the resilience of economic development. In a word, giving full play to the joint force of promoting the development of the digital economy and narrowing the income gap between urban and rural areas can provide a stable consumer market for economic growth and improve the resilience of economic development.

4. Research Design

4.1. Variable Selection and Data Description

The explained variable is economic development resilience (ECO). Generally speaking, the resilience of economic development is mainly reflected in basic bearing capacity, internal resilience, structural adjustment capacity and innovative development capacity. Among them, the basic bearing capacity is the basic reaction capacity of an economy when it faces the risk of external shocks, such as its absorption and resistance to risks. Internal resilience is the ability of an economy to recover to its original state after experiencing shocks, including the ability to restore economic balance and development. Structural adjustment is the ability of an economy to adjust itself in time after an impact, involving adjustment adaptability and factor allocation. Innovation and development is the ability of an economy to explore new development paths after being impacted, including technological innovation and development and reform. It can be said that the indicators of economic development resilience are a collection of comprehensive factors. Based on this, the article constructs a comprehensive evaluation index system of economic development resilience (Table 1).In terms of quantitative measurement of indicators, the article uses the entropy weight method to weight various indicators of economic development toughness, and the specific method refers to the practice of Zhang Jing (2021).

Digital economy (DIG). Referring to the identification of the digital economy in the white paper on China's digital economy development and employment issued by the China Academy of information and communications in 2020, and the practice of Wang Yanjie et al. (2022) on the

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measurement index system of the development level of the digital economy, the article adds the transaction level index on the basis of selecting the four dimensional indicators of digital foundation, application capacity, industrial support and development capacity. Among them, the digital foundation is reflected in three aspects: per capita broadband access, website ownership and long-distance optical cable length; Application ability is measured from four aspects: Internet penetration rate, online government index, digital life index and mobile phone penetration rate; Industrial support is measured from three aspects: the structure index of the electronic information industry, the profit margin of the main business of the electronic information industry, and the information transmission; Development capacity is measured from three aspects: R & D intensity, information economy development mode index and network society index; The transaction level is measured from the proportion of e-commerce, e-commerce sales and online retail sales. Secondly, the principal component analysis method is used to standardize and reduce the dimension of the data of the five indicators, and finally the digital economy development index is obtained. Urban rural income gap (CJ). It is measured by the ratio of per capita disposable income of urban and rural residents. The closer the ratio is to 1, the smaller the urban-rural income gap, and vice versa.

Based on the principle of data availability, the paper selects the data of 30 provinces (except Hong Kong, Macao, Taiwan and Tibet) from 2011 to 2020 as the research sample. The measurement indicators and data of the digital economy are derived from the white paper on the development of China's digital economy; Urban and rural income data, various measurement indicators of economic development resilience and data in control variables are mainly from National Statistical Yearbook, local statistical yearbook, Guotai Junan Securities and wind database. For individual missing data values, the article mainly uses the average growth rate to interpolate and supplement. In addition, according to the research needs, 30 provinces in China are divided into four regions: the East, the central, the West and the northeast. According to the research needs, stata22.0 software was used to deal with the original data. See Table 2 for the description of statistical characteristics of variables.

4.2. Model Introduction

This part builds a panel quantile regression model to conduct an empirical analysis of the consumption promotion effect of tax cuts and fee reductions in the context of the new dual-cycle development. The panel quantile regression model is also a weighted minimization residual error that modifies the traditional linear panel model. The regression estimation method of the sum of absolute values,in the form of:

$$Y_{it}(_T|\, X_{it}, D_{it}) = \alpha_i + \beta_T X_{it} + \theta_T D_{it} + \varepsilon_{T,it} \cdot \quad (1)$$

Among them: Yit is the explained variable,Xit is the explanatory variable,Dit is the control variable,βT and θT are the marginal effect parameters at the Tth quantile,and εT,it is the unobserved random item.

In the traditional mean linear model,all sample points are given the same weight in the estimation procedure,so the relative importance of the sample points has nothing to do with the position of the sample points in the sequence;and in the quantile represented by equation (1) In the numerical model,the relative importance of the sample points is constrained by the weight of the sample points in the sequence. The sample points within a given quantile level are given a higher weight.

Therefore,the parameters βT,θT and εT,it are actually conditional estimates under the conditions of a given quantile and a sample set {Yit,Xit,Dit}. In the estimation procedure,the panel quantile model described by equation (1) is estimated by minimizing the conditional loss function in equation (2):

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$$\min_{\alpha_{T,i},\beta_T} \sum_{T=1}^{T=M} \sum_{i=1}^{i=N} \sum_{t=1}^{t=T} \left| W_T L_T \right| \quad . \tag{2}$$

Among them: WT is the weight of the quantile of T ∈ (1,2,...,M-1,M);LT is the loss function of the panel quantile model parameter estimation,LT is expressed by equation (3):

$$L_T = Y_{it}(_T | X, D_{it}) - \left(\alpha_i + \beta_T X_{it} + \theta_T D_{it}\right) + \lambda \left(\sum_{i=1}^{i=N} \left| \alpha_{T,i} \right| \right) . \tag{3}$$

5. Demonstration and Result Analysis

5.1. Benchmark Regression Analysis

In order to explore the internal impact mechanism of digital economy, urban-rural income gap and economic development resilience, we use the panel data of 30 provinces in China from 2011 to 2020, and use the fixed effect model (FE) and random effect model (RE) in the Stata panel data to carry out regression test to verify the regression results of digital economy on urban-rural income gap; Examine the resilience of digital economy and urban-rural income gap to economic development; Test the regression results of the interaction between digital economy and urban-rural income gap on economic development resilience.

First, the impact of the digital economy on the urban-rural income gap. The regression results were subjected to hosman test, and the chi square measurement value of hosman test was 26.33 (the concomitant probability was 0.0000). This means that the original assumption that the coefficients of the random effect model and the fixed effect model are not related is rejected, which indicates that the standard error of the fixed effect regression model (that is, model 1) is smaller and more effective. The influence coefficient of digital economy on urban-rural income gap is -0.367, -0.429, and both pass the significance test of 10%, indicating that the improvement of digital economy can narrow the urban-rural income gap. This result is consistent with the research results of Chen Wen and Wu Ying (2021), and H3 is confirmed.

Second, the impact of the digital economy and the urban-rural income gap on the resilience of economic development. The hosman method is used to test, and it is found that the chi square measurement value of the hosman test is 24.68 (random probability is 0.0000), which also rejects the original assumption that the coefficients of the random effect model and the fixed effect model are not related, proving that the effect of the random effect model is more significant. The regression results show that the digital economy and the income gap between urban and rural areas are positively and negatively correlated with the resilience of economic development, respectively. Among them, the impact coefficient of digital economy on economic development toughness is 0.431, and through the 10% significance level test, it shows that digital economy development is conducive to improving economic development toughness, which is verified by H1. The impact coefficient of urban-rural income gap on economic development resilience is -0.224, and through the 10% significance level test, it shows that reducing urban-rural income gap can improve economic development resilience, which is verified by H2. In addition, the influence coefficient of the interaction between digital economy and urban-rural income gap is significantly positive, indicating that the interaction between digital economy and urban-rural income gap has a significant positive impact on economic development toughness, further proving that hypothesis H4 is tenable.

Third, the impact of the digital economy on the resilience of economic development through the urban-rural income gap. The impact of digital economy on the resilience of economic development is the result of both direct and indirect effects. It can be seen that: first, the digital economy has a significant positive impact on the resilience of economic development, which

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means that there is a direct relationship between the two. Second, the impact of the digital economy on the resilience of economic development can play an indirect role by narrowing the income gap between urban and rural areas. The regression results show that the digital economy has a negative impact on the urban-rural income gap, the urban-rural income gap has a significant negative impact on the economic development resilience, and the interaction between the digital economy and the narrowing of the urban-rural income gap has a significant positive impact on the economic development resilience. In general, the digital economy can improve the resilience of economic development by narrowing the income gap between urban and rural areas.

Fourth, the influence of control variables. From the perspective of the influence coefficient of control variables, first, the influence coefficient of market size and economic development toughness is positive, which indicates that they are positive, that is, the larger the market size and the more it tends to be stable, the stronger the economic development toughness; Second, the impact coefficient of financial level on economic development resilience is negative, indicating that the two are negatively related, that is, the higher the level of financial development, the greater the volatility of the financial market, the more economic instability will increase and the economic development resilience will be reduced; Third, the impact coefficient of traffic conditions and economic development toughness is significantly positive, which indicates that the two are positively related, that is, the better the traffic conditions, the more complete the traffic infrastructure, and the better the economic development toughness; Fourth, the impact coefficient of foreign investment and economic development toughness is positive, which indicates that the two are positively related, that is, the higher the scale of foreign investment, the more conducive to enhancing the stability of economic development.

5.2. Analysis of Regional Heterogeneity

China has a vast territory, and the economic development level and resource endowment of different regions are different to some extent. According to regional differences, there may be regional heterogeneity in the impact mechanism of digital economy on economic development resilience. However, it is difficult to accurately investigate the regional differences of the regression results if we only conduct regression tests on the research samples from the national perspective. Therefore, based on the above research results, we will test whether the impact of digital economy on economic development resilience shows different mechanisms due to regional differences. Specifically, the eastern, central, Western and northeast regions are represented by virtual variables dx1, DX2, DX3 and DX4 respectively, and then these virtual variables are respectively substituted into the regression model with four variables: digital economy, urban-rural income gap, economic development toughness and the intersection of digital economy and urban-rural income to obtain new regression results.

First, through the hosman test of the regression results, the hosman chi square statistic value can be obtained as 27.13 (concomitant probability 0.0000), which indicates that the coefficients of the random effect model and the fixed effect model are related, that is, the fixed effect model is more effective. In the eastern, central, Western and northeast regions, the impact of digital economy on urban-rural income gap is positive, and H3 is verified.

Second, the regression results of model 3 and model 4 in Table 4 are tested by the hosman test method. It is found that the result of the hosman chi square statistic is 28.02 (concomitant probability 0.0000), indicating that the fixed effect model (model 3) is more appropriate. Further synthesizing the results of model 3 and model 4, it can be seen that the regional differences of the impact of digital economy on economic development toughness in the four regions are obvious, of which the digital economy in the eastern region has the largest positive impact on economic development toughness, followed by the central and northeast regions, and the digital economy in the western region has a small positive impact on economic

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development toughness. In addition, the impact of urban-rural income gap on economic development resilience in the four major regions is negative, but the difference is not large, which means that the expansion of urban-rural income gap in the four major regions is not conducive to improving economic development resilience.

Third, the hosman test was carried out, and the chi square value of the hosman test was 5.62 (the accompanying probability was 0.0000), indicating that the random effect model test was better. The interaction between the digital economy and the narrowing of the urban-rural income gap in the central, Western and northeast regions has a significant positive impact on the resilience of economic development, which is consistent with the H4 conclusion, but this conclusion is not applicable to the eastern region. The possible reason is that compared with the other three regions, the eastern region has its own advantages in the development of digital economy, and the income gap between urban and rural areas is not significant, which has a weak effect on improving the resilience of economic development. In other regions except the eastern region, the pulling effect of the digital economy on narrowing the urban-rural income gap is becoming prominent, and the economic development resilience of these regions is further improving. In short, accelerating the development of digital economy in the central, Western and northeast regions has a significant impact on narrowing the regional urban-rural income gap and has a positive impact on improving the resilience of economic development; Narrowing the income gap between urban and rural areas in the central, Western and northeast regions has an important impact on improving the resilience of economic development; Improving the quality of digital economy development can achieve the dual goals of narrowing the income gap between urban and rural areas and improving the resilience of economic development.

6. Conclusion and Enlightenment

6.1. Research Conclusion

Based on the panel data of 30 provinces from 2011 to 2020, and with the help of the fixed effect model and the random effect model in the spatial econometric model, this paper examines the relationship between the digital economy, the urban-rural income gap and the resilience of economic development. The results show that: first, the digital economy has a significant negative impact on the income gap between urban and rural residents. Speeding up the digital economy will help narrow the income gap between urban and rural residents; The development of digital economy in the four regions has a significant negative effect on narrowing the income gap between urban and rural areas. Second, the digital economy plays a positive role in promoting the resilience of economic development, that is, the rapid development of the digital economy can improve the resilience of economic development, and this impact has regional heterogeneity. Among them, the digital economy development in the eastern region has the largest positive impact on the economic development toughness, followed by the central region and the northeast region, and the digital economy development in the western region has a small positive impact on the economic development toughness. Third, the urban-rural income gap has a negative impact on the resilience of economic development, that is, the narrowing of the urban-rural income gap is conducive to improving the resilience of economic development. Fourth, the interaction between the digital economy and the urban-rural income gap has a significant positive impact on the economic development resilience, that is, the combined effect of the improvement of the digital economy level and the narrowing of the urban-rural income gap can improve the economic development resilience, and this effect is particularly significant in the central, western and northeast regions.

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6.2. Policy Enlightenment

First, accelerate the construction of digital economy infrastructure and play a role in adjusting the resilience of economic development. The above research shows that digital economy can improve the resilience of economic development, so we should further focus on the construction of digital economy infrastructure, promote the reform of digital technology, and develop the adjustment role of digital economy on economic development resilience. On the one hand, the government and digital enterprises can adopt direct investment or other modes to jointly build digital infrastructure and optimize various forms of digital economic development. On the other hand, regional enterprises can make strategic cooperation with big data and artificial intelligence enterprises with the help of ecological cooperation alliances to form application solutions for the digital economy infrastructure industry.

Second, increase investment in relevant technologies and policies to enhance the resilience of digital economy development. First, we should increase investment in digital technology and give full play to the network effect of the digital economy. In other words, market players should cooperate to build intelligent digital information sharing platforms based on big data, blockchain, Internet, etc., so as to realize the interconnection of information systems among enterprises, platforms and rural residents and minimize the income gap between urban and rural areas. Second, establish differentiated support policies to realize the leading role of technology. For areas with relatively backward digital technology development, the government should implement active policy guidance, attract the multi-dimensional integration of rural market, science and technology industry and non science and technology industry through policy preference and tax preference, and narrow the income gap between urban and rural residents as soon as possible by integrating with multiple resources, so as to improve the resilience of digital economy development.

Third, expand the breadth and depth of digital economy services, and enhance their matching with urban and rural income needs. The digital economy will improve the resilience of economic development by narrowing the income gap between urban and rural areas. In this regard, we should broaden the scope and depth of digital economy services in urban and rural areas, innovate the types of science and technology credit, flexibly, quickly and conveniently meet the income generating needs of urban and rural residents through the application of digital platforms, scenarios and mobile terminals, and improve the overall efficiency of resource allocation. In addition, enterprises should make use of advanced technologies such as big data and cloud computing to continuously accelerate the innovation of digital economy products and services, enrich the types and coverage of innovation and entrepreneurship, give full play to the guiding role of the digital economy in increasing urban and rural income, and enhance the resilience of economic development.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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