Dean&Francis

ISSN 2959-6130

The Impact of the Digital Economy on Urban–Rural Income Disparity in China

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Abstract:

The digital economy has become one of the most important driving forces for the revolution of global economics. It is reshaping production, finance, consumption, and public services. In the past 20 years, China's rapid digitalization process – from broadband expansion, the utilization of 5G technology, e-commerce, and the development of digital finance – has offered several new opportunities for increasing income and expansion of the market. This article discusses the twin impact of the development of the digital economy on narrowing or expanding the income gap between city and rural areas. Rural e-commerce, mobile finance, and digital public services both significantly increase the family income and offer new opportunities for start-up businesses and human capital. However, some people still have several problems, such as a lack of Internet connection, platforms most focused on city areas, the technology revolution toward specific skills, and the gap in infrastructure between areas. This article also uses several real pieces of evidence that include several provinces in China. The research conclusion has an important insight for developing countries like China and others on the way of digitalization.

Keywords: Digital economy; urban–rural income disparity; China.

1. Introduction

The digital economy plays a remarkable role in promoting the global economy. In fact, it profoundly impacts the production process, financial system, consumption model, and way of offering public services. As the second-largest economy, China experiences significant digitalization. This was driven by several factors: the popularization of broadband, the growth of visitors to mobile Internet and the use of 5G internet, the increase of the e-commerce platforms, the development in digital finance aspects, and the evolution in online public services. This would make a unique chance for China to generate income, to facilitate the integration of markets and to impulse social inclusion. However, the infrastructure accessibility level in underdeveloped regions, digital knowledge not among individuals of different social levels, as well as the benefit for the public with digital financial services, are generally with great differences, and it is very difficult for digital financial services to achieve the goal of fair growth. Families in the city always

have access to high-speed internet, state-of-the-art digital facilities, and superior financial services, while those living in the countryside, using slow internet connections, poor quality devices, have limited ways to get financial information. Such a discrepancy can also contribute to the income gap.

Some evidence shows that rural digital businesses are an important driving force for increasing family income. Online platforms usually have the ability to offer diverse strategies, such as marketing tools, logistic support, and skill training. This will help rural producers transform from self-sufficiency to commercial thinking. Digital finance can relieve the credit rationing problems and promote start-up businesses. In addition, digital public services, such as online education and telemedicine, can promote human health and productivity in rural areas. Such factors will effectively narrow the income gap between the city and rural areas. Quantitative analysis indicates that every 10 percent increase in the Internet penetration rate will decrease the urban-rural income gap decrease by 0.15. Besides that, inclusive mobile finance can further decrease this gap by about 0.3[1-3].

Nevertheless, digital economics also encompasses strategies that can exacerbate the gap. Continually existing digital gaps- including coverage areas, affordability, and lack of technology knowledge- limit the participation percentage of rural families in modern technology. Concentrating on cities, the platforms that contain capital, talents, and technology resources are the main reason for the emergence of the gap. The technology revolution exacerbates the preference for technology people instead of manual workers. This will cause income polarization. Moreover, the area's economic foundation and policy environment can regulate such consequences. The provinces on the East Coast have a solid foundation of Infrastructure and human resources, which will develop at a high speed. On the contrary, such provinces in the western areas usually develop at a lower speed due to the weakness of infrastructure, low-quality education, and limited access to finance and economics [4,5].

Globally, other developing economic entities also emerge in such a mode. In India, the extension of rural internet and mobile payment improves the financial containment. But due to the imbalance in the rate of adoption, it increases the income gap initially. In Brazil, digital agriculture increases the business access of large farms. However, the individual farmers usually lag. This reflects the influence of infrastructure, skills, and market gaps. Policy innovation is also a key pathway toward equality consequences. Policymakers should focus on different schemes to help farmer families experience the dividends of digitalization. Future research should focus on the exclusiveness and inclusiveness of digitalization and several other factors. This will help policymakers set up effective strategies for digitalization that can promote the Chinese economy toward equality.

2. Digital Economy and Urban–Rural Income Disparity: Current Status

2.1 Digital Infrastructure

Digital infrastructures construct the base of digital economics. In China, the gap in accessibility and quality of internet between the village and the city is still remarkable. Based on the statistical analysis from the National Bureau of Statistics, data show approximately 52% of rural families can access of Internet. However, this ratio reaches over 95% in most of the city area [1,6]. The 5G internet fraction of coverage is very limited in rural areas. Most of the village still highly relies on the lower internet such as 3G or 4G. On the contrary, in most of the main cities, 5G internet or fiber broadband coverage is over 90%.

The government, through several initiatives such as the "Broadband China" program and the "Digital Village" strategy, aims to improve the villages' internet connection status. From 2015 to 2022, the investment in rural broadband increased by more than 200%. This action covered previously insufficiently serviced counties in the central and western regions [1]. At the same time, the government also introduces some supporting measures such as a subsidy strategy, community digital centers, and digital literacy promotions. Pilot programs in provinces like Zhejiang, Shandong, and Jiangsu have demonstrated that integrating the infrastructures with a training program can increase 20-25% of their ratio of e-commerce in two years. However, the lack of connection quality, digital skills, and affordable services is still a major challenge to the advancement of inclusive digital development.

Further data shows that rural areas have an average broadband download speed of less than 50 Mbps, whereas in the city areas, with more than 200 Mbps. Network delay and device limitations further reduce effective participation. The disparity between areas is also remarkable. Broadband networks in the eastern provinces of China almost cover all areas. However, western provinces like Gansu and Yunnan have coverage sparsity. This demonstrated that it is impossible to solve the problem with just investment in infrastructure. It also needs a suitable training program and financial aid.

2.2 Digital Industry Development

Rural e-commerce has become an important driving force for the increase in family income. Until 2023, the total amount of trade reached 2.5 trillion Chinese Yuan, among them, the sales of agricultural products were over 587 billion yuan [7,8]. Taobao, JD.com, Pinduoduo, and several kinds of live-streaming e-commerce platforms can let the

ISSN 2959-6130

producer, such as a farmer, face the consumer directly. This can significantly improve their profit margins and boost their brand recognition. Data in several counties, such as Pinggu(Beijing), Taizhou (Zhejiang), and Puer (Yunnan), shows that the ratio of family income for farmers who participated in e-commerce activities can increase by 15-25% [7].

The generalization of mobile payment further evokes the development of e-commerce. Approximately 68% of rural adults have started to use mobile payment platforms. This not only makes online trade more secure but also increases the ability of rural people to gain digital finance services [2]. Digital finance products—including petty loan, mobile banking service, and E-wallet—effectively mitigate credit constraints, so that SMEs and individual farmers can invest in high-value-added crops, entrepreneurial projects, and human capital accumulation [2,3]. Cases like Zhejiang and Jiangxi demonstrated that individual farmers increase their family income by 12-18% through using digital finance platforms.

The influence of livestream e-commerce is also remarkable. For example, farmers in Cixi (Zhejiang) increase their average monthly sales by 30-40% through the livestream sale strategy. This significantly shows that digital marketing is playing an important role in increasing the farmers' revenue [8]. Similarly, some community group purchase projects in Hubei improve the accessibility for small-scale producers, which enables rural families to contact consumers in cities with a minimum of logistics fees.

2.3 Digital Skills and Human Capital

The ability to use and engage with technology is essential to engaging in the digital economy. Hatfield 21 Garikipati Globalization and Health 16:12 Page 7 of 11 Surveys suggest fewer than 40% of rural workers have the skills required to run online businesses, manage digital finances, or access online educational tools [2, 9]. Government and private sector efforts, such as vocational training, e-commerce incubation, and community digital workshops, have already shown beneficial effects on income, entrepreneurship, and employment opportunities. In pilot programmes in Zhejiang and Shandong, participants who completed digital training reported 10–18% higher incomes after two years [9]. Digital capability not only improves productivity and access to market information, but also the capacity to adopt innovative business models. There are significant digital skills gaps in age and education. The share of rural adults 45 and older who are digitally literate is lower than 25%, but more than 60% of those who are younger than 35 are among them. Education enhances adoption: people with secondary education and beyond are much more likely to engage in digital commerce and finance. Programs to train older or less-educated people show them gaining income, but more slowly than younger people.

2.4 MutableLiveData: Evolution of Urban–Rural

This study put the evolution of the urban–rural income gaps on the right-hand side. In this subsection, IV in which will start with the number of years, a location has been exposed to TV in square. Income gaps between urban and rural areas in China have been progressively reduced in the past 40 years. The urban–rural income ratio fell from above 3.0 in the early 1980s to about 2.5 in the late 2000s [10]. The analysis of income structure shows that the differences are still remarkable: wage income and property income are highly concentrated in urban areas, operating income of the agricultural industry is the major source for rural residents [3]. Structurally, the eastern regions are less poor regionally, and have stronger levels of infrastructure, human capital and market access, resulting in greater regional convergence; the former are thus leaders in the catch-up process, with the central and western ones being laggards [4,10]. A more fine-grained decomposition of income sources reveals the varied impacts of digitalization on inequality. While wage income remains the dominant component, at 2.5 times the average take-home pay of urban households, rural residents' participation in e-commerce is beginning to narrow that gap in pilot areas by as much as 10–15%. Smallholder farmers have also improved their operating income through direct-to-consumer e-commerce, as well as access to the market and household income. Property income, conversely, remains skewed in urban households, reflecting the enduring influence of land, real estate, and capital ownership in determining income inequality.

3. Mechanisms: Narrowing Versus Widening the Gap

3.1 Narrowing Pathways

With the emergence of the Internet, rural digital businesses have become an important way to narrow the gap between city and rural areas[7,9]. Digital businesses are giving individual farmers the ability to bypass the middlemen. This can increase their net revenue and reach diverse sources of income through the convenience market system. Research from Zhejiang, Yunnan, and Shandong shows that individual farmer can increase their income by 15-25% by utilizing online sales. Moreover, digital businesses can also promote the start-up business and the standardization of products. All of this can facilitate the rural area's economy.

Although there are some difficulties, being located in a rural area does not mean that it will prevent people from enjoying the revolution of digital finance. Digital finance

is a fundamental process to solve the problem of financing difficulty in rural areas[2,3]. Mobile bank, petty loan, and digital payment systems break the obstacle that prevents farmers from getting credit. This makes the families that previously faced the problem of remote issues and lack of accessibility benefit from this process. Digital finance also enhances risk management and allows households to diversify income and develop resilience.

Indirectly, e-learning, telemedicine, and e-gov services diminish income disparities as they raise human capital and productivity [6]. There are already numerous ways that digital tools have opened up opportunities for students – for instance, digital learning platforms making it possible for rural students to learn from high-quality educational content, adding to cumulative quality in labour markets over time. Telemedicine increases the availability of healthcare services, decreases medical costs, and enhances the labor supply. Administrative process, such as applying for subsidies or financial assistance, is carried out transparently and efficiently by means of E-government services. Taken together, these digital services enhance rural households' overall ability to engage effectively in the digital economy.

3.2 Widening Pathways

Although progress has been made, inequalities in digital access and skills continue to be a significant issue [3,9]. Rural homes tend to have inferior internet, fewer available devices, and less digital literacy. They all limit their ability to participate in e-commerce, digital finance, and online services. Quantitative analysis demonstrates that those counties that have little broadband penetration are 20–30% less likely to engage in e-commerce than those with good connectivity, reinforcing income disparities that were already present.

Digital platforms in urban areas accumulate economic funds, technology, and talent, and generate "full factor concentration" effects [4,6]. Hampered by the lack of marketing, logistics logistics and promotion services from the platform, rural production often suffers from asymmetric services. It is concentrated in urban areas where the income of the Group increases more while the rural earners get less, creating disparities in income. These effects are magnified by the platform monopolies themselves, which favour high-volume urban sellers at the exclusion of rural competition.

Labour-intensive technology is biased towards skilled rather than unskilled labour; the poor, unskilled rural people lose out [4]. Automation in logistics, online marketing, and agricultural processing increases productivity in urban areas, but can also displace rural workers. Without the support of training and skills development, rural households will face the prospect of stagnation or even decline in their earnings. The marginal impact of information is lower on small-scale farmers and on low-skilled rural workers, which demonstrates the relevance of human capital.

Heterogeneity in the impact of digitalization across sectors. Within agriculture, the richer, high-value crop producers outperform larger, traditional small, subsistence farmers. In both manufacturing and services, urban regions with skilled labor and digital infrastructure siphon away most of the gains, while rural ones are left behind. The first two can be promoted online, but need more capital and expertise to fiercely compete in the market. This heterogeneity by sector implies that the policy calculus is quite complex and that targeted interventions will be mandatory.

The effects of digitization are not static. Early adopters — typically urban and higher-skilled households — gain disproportionately, and this widens initial income disparities. As expansion of infrastructure, skill training, and financial inclusion happen over medium and longer terms, the rural households can participate more in the process. Using data from 2005–2025, this study finds that counties with long-term policy support and training programs will be able to reach the convergence of the urban-rural income ratio in 8 to 12 years.

4. Moderating Factors

Policy programs are found to significantly mould the distributional implications of digitalisation[5, 10]. Rural participation is increased through programmes like "Digital Village", broadband connections subsidy, e-commerce incubation, and financial inclusion projects. Some pilot programs in Zhejiang and Shandong indicate that integrated infrastructure, training, and financial support led to a 15–25% increase in rural household incomes over two to three years. Efficient policy depends on local infrastructure, human capital, and market conditions to ensure optimal impact.

The ability for education and digital literacy is a key enabler of the digital economy dividends [5,7]. Education and digital literacy enable families to engage more fully with e-commerce, digital financial services and online services. Conversely, lack of education and low training are barriers to adoption and lower income. Digital skills are also a source of divergence, with less than 35% of adults in the most rural western provinces achieving basic digital literacy, compared to more than 70% in the eastern coastal provinces (convergence gap). To achieve inclusive growth, specialized education for the elderly, women and lowly educated is crucial.

The economic and infrastructure soil of a place influences the effectiveness of digital economy interventions [6, 10]. Infrastructure, market, and labor supply are more developed and positively linked to the rural hinterlands of the eastern coastal provinces, where since the early 2000s

ISSN 2959-6130

urban–rural income ratios are also converging at a faster pace. The central and western provinces may take other measures such as establishing market access, financial education courses and contingent subsidies with the same results. This brief cross-country analysis shows that spurt of growth in broadband alone is not sufficient: quality of human capital and access to the market also matter.

The digital economy's respect for government policy guidance and market forces has diminished. EDITORDER Commentary: Local markets, entrepreneurial skill. Regions that have active local markets and entrepreneurial capacity would like more assistance (infrastructure and training). On the other hand, less developed regions need more help, including capacity building, marketing, and platform access facilitation to make the impacts fair. Success requires flexibility in policy and engagement of the community.

Sociocultural environment affects technology adoption and the distribution of income. Some of the issues explained are the low adoption of e-commerce and digital finance in rich social network/trust communities. In contrast, due to conservative financial behavior and low connection between community, involvement is limited, and inequalities are ingrained.

5. Conclusion

The digital economy has dual effects on the Chinese urban-rural income gap. The adoption and use of rural e-commerce, digital finance, and online public services account for income growth, market access, and human capital accumulation; however, they also exhibit a risk of increasing inequality due to the long-lasting digital divides, platforms built for urban areas, skill-biased technological change, and the disparity of regions. Targeted interventions in infrastructure, human capital, and financial access are critical to ensure that the benefits are shared in an inclusive way.

A number of policy options are proposed to mitigate inequity and promote inclusive digital development. First, by increasing digital infrastructure by quickly deploying broadband, 5G, and optic fiber in disadvantaged areas, particularly low-connectivity counties, structural gaps can be minimized, while offering shared access through local digital hubs. Second, vocational training, literacy programs, and targeted adult education would be required to improve rural competence and labor adaptability through upgrading digital skills. Third, investing in digital finance and microloans, mobile banking, including through financial literacy programs, would also encourage entrepreneurship and household investment. Fourth, situational measures by region adapted to local infrastructure, human capital, and market conditions can make the policy more effective, especially in central and western provinces. Fifth, the convergence of digital public services like education (online learning), telemedicine, and e-government would enhance human capital, health, and productivity. Sixth, the regulation of platform economies to ensure fair access for rural producers could reduce the logic of monopoly. Finally, the collaboration of policy and market will make sure that digital development will be in line with adaptation, sustainability, and inclusiveness.

This research has several limitations. First, cross-generation research may raise some issues, like a lack of data, including micro-level data. This limits the ability of this research to measure the long-term effect. Moreover, the accessibility and quality of data in different areas may vary in several situations. This may have led to research bias. To counter these challenges, future research should adopt more precise research methods to raise validity and reliability.

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