



Analysis of Digital Economy Development and Urban-Rural Income Gap: A Case Study of Greater Bay Area

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Abstract. Chinese modernization means keeping common prosperity up to date and minimizing the difference in urban residents' and rural residents' income is an essential path to materialize it. An analysis of the urban-rural income gap in eight major cities of the Guangdong-Hong Kong-Macao Greater Bay Area has been presented, demonstrating that growing the digital economy can help reduce this gap. The internet penetration rate and the proportion of industry practitioners have significant effects as well. Additionally, industrial structure, external development, and financial development also help greatly achieve a better balance in income between urban and rural areas.

Keywords: digital economy, urban-rural income gap, industrial structure.

1 Introduction

The "Research Report on the Development of China's Digital Economy (2024)" released by the China Academy of Information and Communications Technology (CAICT) shows China's digital economy contributed RMB 53.9 trillion in 2023, RMB 3.7 trillion more than that of the previous year. The digital economy accounts for more in the overall economic development and its status has become increasingly stable. In 2023, nearly 43% of China's GDP come from the digital economy. In the process of global economic industrialization, there exists a widespread phenomenon of income disparity between urban and rural residents, which is an inevitable issue in the course of economic development. In 2023, the per capita disposable income of Chinese residents was RMB 39,218. Specifically, this figure for urban residents was RMB 51,821, while that for rural residents was RMB 21,691, resulting in an absolute income gap of RMB 30,130. In other words, urban residents in urban areas were capable of spending 1.39 times more than residents in residual areas in 2023. Since the 18th National Congress of the Communist Party of China, General Secretary Xi Jinping has kept illustrating the happiness of the people is our fundamental goal and that addressing the shortcomings in people's livelihoods and resolving the urgent concerns and difficulties of the people are pressing tasks for social development. The report to the 20th National Congress of the Communist Party of China proposed to achieve Chinese-style modernization that leads to common prosperity for all people.

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Given that, reducing the urban-rural income gap is one of the most important tasks. Thanks to reform and opening up which China started 40 years ago, the whole world has been amazed by the impressive results of China's economic development. Nevertheless, the fact that rural areas are less developed than urban areas and the persistent urban-rural income gap have been important factors preventing China from achieving economic development with quality and the realization of common prosperity. In 2023, the per capita disposable income of urban residents was 2.36 times that of rural residents in Guangdong Province, indicating significant differences in income between urban and rural residents. Addressing this issue is urgent. In 2023, the scale of Guangdong's digital economy reached RMB 6.9 trillion. The prosperity of this new economic form has disrupted traditional economic organization methods and offered a new growth point for economic transformation and upgrading. It has also reduced the gap in terms of employment, shortened the distance, and brought opportunities to enable the incomes of rural residents to get closer to that of urban residents.

2 Literature Review

JiZeng Peng (2022) studied panel data (from 2010 to 2020) from various provinces in China, constructing measurement indicators to assess how well the digital economy develops based on four dimensions: digital economy prevalence, infrastructure, development level, and application level. Their empirical analysis revealed an inverted U-shaped relationship between digital economy development and the income gap between urban and rural residents. An empirical analysis proposed by ZiFeng Wang (2023) measured how the digital economy mitigates the income gap. They found that there is a clear trend of digital economic growth coinciding with a largely narrowed income gap between urban and rural residents both nationally and regionally in China. Huaizhen Xing (2023) conducted an analysis of 7 years of panel data from 30 provinces in China since 2013 from the dual perspectives of income level and income structure, showing an "inverted U" shape relationship between digital economy development level and the urban-rural income. YuXin Li(2022) focused on rural revitalization and illustrated the key effects of the digital economy on the differences in income between urban and rural areas, taking the level of human capital, urbanization rate, and innovation vitality into account: narrow it or widen it. Tang(2023) also did similar studies using more latest provincial panel data (2015 to 2022). It has been shown that the digital economy benefits rural residents by improving agricultural productivity and growing income, hence reducing the urban-rural income gap. The increasing level of economic development also contributes to the continuous shrinking of the urban-rural income gap. Yao Zhang et al. (2023) did an empirical study on selected panel data from 201 prefecture-level cities to get more insights into which way the digital economy contributes to common prosperity. The results demonstrated a typical "club convergence" phenomenon that the urban-rural balanced development is more inhibiting in the eastern regions than in the central regions. Meanwhile, the level of regional economic development exhibits a dual threshold effect in this impact path, characterized by a trend of "initial inhibition, subsequent promotion, and then

re-inhibition". XiaoZhong Li's study (2022) also revealed a similar "inverted U-shaped" relationship between a wide urban-rural income gap followed by a narrow one attributed to the digital economy. Aspects including the level of per capita income and the research and development intensity affect the effectiveness of the digital economy, indicating the existence of a threshold effect. Wen Zhong's work (2023) presented a similar "inverted U-shaped" relationship to Xiaozhong Li's study (2022). Wen Chen(2021), however, reached a different conclusion that the digital economy development first helps to narrow the urban-rural income gap and then widens it due to a digital divide that has been created when it continues to develop. Zengchuo Si(2023) found out that there is a nonlinear increasing characteristic of the "marginal effect." that the more developed the digital economy is, the more effective it is to reduce the income gap between urban and rural residents. Fujun Ji(2023) also empirically demonstrated that reducing the urban-rural income gap can largely benefit from the development of the digital economy. Several factors like digital infrastructure, talents, and finance play significant roles. It is also crucial to upgrade industrial structures in rural areas to maximize the contracting effects of the digital economy. Rui Li(2023) empirically examined the converging effect of the digital economy on the urban-rural income gap and the role of rural household human capital investment therein to a moderate level. ChaoFeng Xie(2024), based on panel data from 276 prefecture-level and above Chinese cities, found that the development of the digital economy optimizes the economic environment, alleviating information asymmetry, and enhancing entrepreneurial activity, resulting in a narrowed income gap between urban and rural residents.

Because the digital economy grows fast and penetrates economic life, Chinese scholars have reached different conclusions on its effects on the income gap between urban and rural residents. There are three major differing research conclusions: first, it exhibits a "U"-shaped result in narrowing the gap; second, it shows an "inverted U"-shaped result; and third, the digital economy contributes positively to the narrowed urban-rural income gap solely. In 2023, the digital economy represented a huge portion of China's economic development as it contributed to nearly 43% of GDP. As reducing the income gap between urban and rural residents is critical to achieving common prosperity and high-quality economic development, it is extremely important to have in-depth insights into the role of the digital economy. In 2023, Guangdong's GDP amounted to RMB 13.57 trillion, with the digital economy accounting for RMB 6.9 trillion, representing 50.85% of the total GDP. The per capita disposable income of urban residents was 2.36 times that of rural residents in Guangdong was 2.36. It is worth further in-depth research to explore whether the rapidly developing digital economy has positive effects on reducing this gap in Guangdong.

3 Research Design

3.1 Model Construction

Drawing on relevant research literature [1,2,3,4] and aligning with the research content of the present work, a mathematical model is proposed:

$$CXCJ_{it} = \alpha_0 + \alpha_1 D_{it} + \alpha_2 D_{it}^2 + \beta_i X_{it} + \varepsilon_{it} \quad (1)$$

CXCJ is the dependent variable, representing the urban-rural income gap; D is the explanatory variable, representing the level of digital economy development; D^2 is the square of the digital economy development level, indicating a possible nonlinear relationship; X stands for a selected collection of control variables; i is the region identifier, t is the year identifier, and α_0 , α_1 , α_2 , and β_i are the coefficients to be estimated in the model, while ε_{it} is the random error term.

3.2 Data Selection

Panel data from 8 cities in the Pearl River Delta region (Shenzhen excluded due to the unavailability of data) for the years 2016-2023 are chosen to conduct empirical research. The data analysis software used is Stata while data mainly come from the "Guangdong Statistical Yearbook" and the Guangdong Communications Administration Bureau, among others.

3.3 Indicator Analysis

The urban-rural income ratio is considered to be the dependent variable in this work. When studying this issue, many domestic scholars have adopted various indicators such as the Gini coefficient, Theil index, and urban-rural income ratio, as seen in literature [4, 5, 6]. The last one is particularly favored because it can intuitively and dynamically reflect how urban and rural residents' incomes change.

Considering the convenience and accuracy of data acquisition, we have decided to use the urban-rural income ratio to measure the variations in the income gap between urban and rural residents. This indicator is calculated by dividing the rural residents' per capita disposable income by their per capita disposable income. The method is simple and straightforward, and it can accurately reveal the differences between urban and rural residents' income.

A smaller urban-rural income ratio means the income gap between urban and rural residents is significant, while a larger ratio means the opposite. This indicator provides a clear and quantitative way to assess the extent of income inequality between urban and rural areas, making it a valuable tool for policymakers and researchers to understand and address this important economic and social issue.

The explanatory variable here is the level of digital economy development. To quantify the level of digital economy development in cities within the Greater Bay Area, this paper mainly uses four aspects: internet penetration rate, expenditure on related businesses, proportion of industry practitioners, and mobile phone penetration rate. The internet penetration rate that is the number of internet users per 100 people expenditure on related businesses is measured by per capita telecommunications business revenue, the proportion of industry practitioners refers to the percentage of employees in the computer services and software industry, and the mobile phone penetration rate refers to the number of mobile phone users per 100 people.

Control Variables. Drawing on relevant literature, this paper selects five control variables: the level of economic development, government intervention, the structure of industry, openness to the outside world, and the level of financial development. The level of economic development is measured by the total GDP divided by the capital of each city; government intervention is gauged by the proportion of government fiscal expenditure to GDP; the structure of the industry is assessed by the ratio of the value added of the tertiary industry to that of the secondary industry; openness to the outside world is measured by the proportion of foreign direct investment to GDP; and the level of financial development is evaluated by the number of financial institution branches per 10,000 people.

4 Empirical Research

4.1 Descriptive Statistics

Table 1. Descriptive Statistics of Main Variables.

Variable	N	Min	Max	Mean	Std. Dev.
Urban-Rural Income Ratio	64	1.42	2.38	1.78	0.23
Internet Penetration Rate	64	0.83	8.18	2.61	1.71
Per Capita Telecommunications Revenue	64	682.02	2392.31	1484.21	423.54
Industry Practitioners (Proportion)	64	0.00	0.03	0.01	0.01
Mobile Phone Penetration Rate	64	0.76	1.88	1.38	0.27
Economic Development	64	45151.00	170306.37	96746.3	34440.60
Government Intervention	64	0.07	0.20	0.13	0.03
Industrial Structure	64	0.65	2.86	1.14	0.57
Openness to the Outside World	64	(24.40)	(21.06)	(22.82)	0.76
Financial Development Level	64	1.21	2.59	1.59	0.34

It can be observed from the above table that, the urban-rural income gap varies among various cities in the selected area. As table 1 shows, the maximum urban-rural income ratio is 2.38. This implies that if the per capita income of rural residents is 1 yuan, that of urban residents is then 2.38 yuan. The minimum ratio is 1.42, which is considered to be a relatively reasonable urban-rural income gap. Although all these cities are part of the Greater Bay Area, an imbalance in urban and rural economic development is still observed. A similar phenomenon has been observed in Guangdong Province where significant disparities exist in economic development levels among cities, as well as industrial structure, economic development level, government intervention, and financial development level.

4.2 Empirical Results Analysis

Stata software for analysis and a two-way fixed effects model has been adopted for regression analysis in this work. As shown in Table 2, the urban-rural income gap is

affected largely by factors related to the development level of the digital economy. Negative coefficients mean that these factors are able to reduce the urban-rural income gap when they are developed. Among them, it is necessary to highlight the coefficients for internet penetration rate and industry practitioners due to their statistical significance. Obviously, the development of internet penetration and the increase in industry practitioners will help to achieve a better balance in incomes between urban and rural residents. Per capita telecommunications revenue can also contribute to narrowing the gap, although the result is not statistically significant. Among the control variables, the coefficients for industrial structure, openness to the outside world, and financial development level are negative and important at the 10% level, implying their positive effects on reducing the urban-rural income gap. The results show that the impact of economic development level is rather limited. Among the eight cities, Guangzhou has the best economic development. Although Guangzhou's urban-rural income ratio has been declining over the past years, it is the only city among the eight where the urban-rural income ratio exceeds 2. The development of the digital economy may allow urban residents to benefit more from economies of scale, while rural residents benefit limitedly, thus widening the urban-rural income gap.

Table 2. Empirical Results.

	urban-rural income ratio
Internet Penetration Rate	-0.0161* (0.42)
Per Capita Telecommunications Revenue	-0.0001 (-0.47)
Industry Practitioners (Proportion)	-3.6736* (-0.47)
Mobile Phone Penetration Rate	0.3406 (1.65)
Internet Penetration Rate Squared	-0.0060* (-1.82)
Per Capita Telecommunications Revenue Squared	0.0000* (1.89)
Industry Practitioners Squared	-16.9985 (-0.08)
Mobile Phone Penetration Rate Squared (per 100 people)	-0.1206* (-1.76)
Economic Development	-0.0000 (-0.43)
Government Intervention	-0.0052 (-0.02)
Industrial Structure	-0.0881* (1.86)
Openness to the Outside World	-0.0092* (1.24)
Financial Development Level	-0.1610*

	(-1.29)
_cons	2.4795***
	(6.99)
Area	YES
Year	YES
N	64
F	351.5020

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed test); the values in parentheses are t-test values.

5 Conclusion

The better the digital economy develops, the narrower the urban-rural income gap is. Specifically, the internet penetration rate and the proportion of industry practitioners have significant effects on reducing this gap. The role of economic development level, as a control variable, is not significant. Upon reviewing data from the "Guangdong Statistical Yearbook," it is found that Guangzhou, among the cities in the Greater Bay Area, has the largest urban-rural income gap, while Zhongshan has the smallest, followed by Zhuhai. The empirical results fit the actual economic situation. Additionally, reducing the urban-rural income gap will benefit from industrial structure, the level of foreign development, and financial development. Currently, high-quality development is the higher priority when it comes to China's economic development. The digital economy can promote the upgrading of the industrial structure in the Greater Bay Area. The policy-makers should leverage the digital economy to foster regional innovation, thereby further driving regional economic and industrial upgrading.

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References

1. Wen Chen, et al. 2021. Digital Economy Development, Digital Divide, and Urban-Rural Income Gap [J]. *Southern Economy* (11), 1-17.
2. YiXia Fan, et al. 2022. Characteristics and Mechanisms of How the Digital Economy Affects the Income Gap Between Urban and Rural Residents [J]. *China Soft Science* (06), 181-192.

3. FuJun Ji.2023. The Impact of the Digital Economy on the Urban-Rural Income Gap: An Analysis Based on the Moderating Effect of Industrial Structure Upgrading [J]. Economic Issues (02), 35-41.
4. XiaoZhong Li,et al.2021. A Study on the Impact of Digital Economy Development on the Urban-Rural Income Gap [J]. Agricultural Technology and Economics (09), 77-93.
5. JiZeng Peng. 2022.Digital Economy, Marketization and the Urban-Rural Income Gap [J]. Finance and Economy (12),67-76.
6. HuaiZhen Xing.et al.2023. The study on the impact of digital economy development level on urban-rural income gap [J]. Statistics & Decision (18),78-82.

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