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Analysis of the Impact of New Digital Infrastructure Construction on the Urban-Rural Income Gap: A Mediation Perspective Based on Agricultural Industrial Agglomeration

Yanxing Li[1]

[1] School of Economics and Management, Chongqing Normal University, Chongqing, China

Correspondence: Yanxing Li, School of Economics and Management, Chongqing Normal University, Chongqing, China.

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Abstract

Narrowing the urban-rural income gap is an essential requirement and a crucial focus for achieving common prosperity. Based on panel data samples from 30 Chinese provinces (excluding Hong Kong, Macao, Taiwan, and Tibet) from 2014 to 2023, this study empirically examines the impact effects, mechanisms, and heterogeneity of new digital infrastructure on the urban-rural income gap using a two-way fixed effects model. The findings indicate that, overall, the construction of new digital infrastructure widens the urban-rural income gap, a result which holds under a series of robustness checks. Examining sub-samples by region across the country reveals that the widening effect of new digital infrastructure on the urban-rural income gap is concentrated in the less developed central and western regions, with no significant impact observed in economically developed regions. Further analysis demonstrates that new digital infrastructure indirectly narrows the urban-rural income gap through the mediating mechanism of agricultural industrial agglomeration.

Keywords: new digital infrastructure, urban-rural income gap, mediation effect, agricultural industrial agglomeration

1. Introduction

Common prosperity is an inherent requirement of the socialist system and a key component of Chinese modernization. Achieving common prosperity is both a long-term vision and a protracted development process. The report of the 20th National Congress of the Communist Party of China explicitly states that China must resolutely prevent polarization, promote common prosperity, and achieve social harmony and stability. Jiang Yongmu et al. (2021)[1] As China's economy transitions from a phase of high-speed growth to one of high-quality development, entering the new century has seen rapid economic growth, steady social progress, and gradual improvement in people's living standards. However, income disparities between regions, urban and rural areas, and different social groups have also widened. Li Shi et al. (2022)[2] The persistent urban-rural income gap has become a key constraining factor in achieving the goal of common prosperity. Entering the second decade of the 21st century, with the deepening development of digitalization, informatization, and intelligence, new digital infrastructure has become a focal point for governments and enterprises worldwide. This includes 5G networks, the Internet of Things, artificial intelligence, big data centers, and industrial internet. Governments have introduced various policies to promote digital infrastructure development. For example, the Chinese government proposed the "new infrastructure" policy, identifying new infrastructure such as 5G, AI, and industrial internet as key development directions; the U.S. government has also increased investment in data centers and cloud computing infrastructure. In 2019, the General Office of the CPC Central Committee and the General Office of the State Council issued the "Digital Village Development Strategy Outline," identifying accelerating digital infrastructure construction in rural areas as a key task, particularly emphasizing significantly improving rural network and information facilities and deepening the Network Poverty Alleviation Action. In 2023, five departments including the Cyberspace Administration of China, the Ministry of Agriculture and Rural Affairs, the National Development and Reform Commission, the Ministry of Industry and Information Technology, and the National Rural Revitalization Administration jointly issued the "Key Tasks for Digital Village Development in 2023," proposing to continuously enhance the supply capacity of communication infrastructure in rural and remote areas and gradually extend 5G network and gigabit optical network coverage to villages. Digital infrastructure construction is a crucial measure in implementing the national digital village development strategy. This raises the questions:

Will digital infrastructure construction significantly promote the narrowing of the urban-rural income gap? What are the underlying mechanisms? And how can the positive role of digital infrastructure construction in promoting common prosperity between urban and rural areas be better leveraged?

Literature closely related to this paper falls into two main categories: First, examinations of the economic effects of digital infrastructure. Some scholars believe digital infrastructure has a positive impact on income development. For instance, Xia Jiechang et al. (2023)[3] argue that as the foundation for digital economic development, digital infrastructure construction can promote resource sharing and information flow, enhance social productivity by improving production efficiency, drive economic transformation, and thereby provide a material and technological foundation for achieving common prosperity. He Xiaoyu et al. (2023)[4] contend that new digital infrastructure can significantly promote the quality of regional economic growth, with resource allocation effects, technological innovation effects, and industrial upgrading effects being important pathways through which new digital infrastructure influences the enhancement of economic growth quality. Second, discussions on the impact of the digital economy on the urban-rural income gap. Zhao Kangjie (2025)[5] argues that due to the objective existence of the "digital divide," the income-increasing effect for urban residents is higher than for rural residents, and new digital infrastructure exacerbates urban-rural income inequality. In recent years, an increasing number of scholars have begun studying the non-linear impact of the digital economy on the urban-rural income gap. Bai Xu (2023)[6] posits that the digital economy can narrow the urban-rural income distribution gap through the urban-rural integration effect of reduced communication costs and the rural revitalization effect of agricultural technological progress, but it can widen the gap through the employment substitution effect of industrial structure upgrading. The impact of digital economy development on the urban-rural income distribution gap shows a trend of first strengthening and then inhibiting. Li Xiumin et al. (2023)[7] argue that the impact of new digital infrastructure on economic growth exhibits an "inverted U-shaped" pattern, and new digital infrastructure has a significant spatial spillover effect on economic growth. Additionally, Luo Mingzhong et al. (2023)[8] argue that rural digitalization has a single human capital threshold effect on the income gap and ecological environment; the higher the level of human capital in the rural labor force, the greater its effect.

Currently, in recent years, research on the digital economy and the urban-rural income gap has continuously emerged, yielding many valuable theoretical and practical results. However, most scholars focus their research perspective on the overall level of the digital economy, lacking studies that take new digital infrastructure as the entry point. Therefore, exploring the relationship between new digital infrastructure and the urban-rural income gap holds significant theoretical and practical value. By studying the correlation between digital infrastructure and the urban-rural income gap, it can provide scientific and forward-looking theoretical support and decision-making basis for local governments to enhance the level of digital infrastructure construction and optimize the urban-rural income distribution pattern. Hence, this research is significant for promoting digital economic development and narrowing the urban-rural income gap.

2. Theoretical Analysis and Research Hypotheses

2.1 The Impact Mechanism of New Digital Infrastructure on the Urban-Rural Income Gap

Xu Mengmeng et al. (2024)[9] identify issues such as inadequate relevant laws and regulations, weak digital infrastructure, a relative lack of agricultural technical talent, and the "digital divide" further exacerbating the risk of income imbalance in rural digital development. While promoting social progress, the construction of new digital infrastructure may also exacerbate the urban-rural income gap through various channels. From a technical perspective, these high-tech facilities often require high operational skills and professional knowledge. Rural areas, due to relatively scarce educational resources, generally have lower digital literacy among residents, making it difficult for them to fully master and utilize these new technologies, placing them at a more disadvantageous position in the digital economy era. From an economic structure perspective, the construction and operation of new digital infrastructure require substantial capital investment. This capital-intensive nature naturally concentrates resources in economically developed urban areas, while rural areas, due to funding shortages, find it harder to obtain equal development opportunities. The unequal distribution of data factors is also an important reason. In the digital economy era, data has become a key production factor, but rural residents are often merely data providers rather than beneficiaries, with most of the value generated from data flowing to urban enterprises that control the technology and platforms. This imbalance in data factor distribution further widens the urban-rural income gap. Furthermore, the agglomeration effect of new digital infrastructure is evident, with high-quality resources such as talent, capital, and technology accelerating their concentration in cities, creating a "Matthew effect," while rural areas face the dilemma of resource outflow. From an institutional environment perspective, the current digital skills training system tailored for rural areas is still incomplete, making it difficult for farmers to quickly adapt to digital transformation. Simultaneously, digital financial services and business models suitable for rural characteristics still need development, all of which constrain rural residents' ability to benefit equally from new digital infrastructure. These factors collectively mean that new digital infrastructure, in the absence of effective intervention measures, may become a new factor widening rather than narrowing the urban-rural gap.

Therefore, this paper proposes the theoretical hypothesis: H1: New digital infrastructure exacerbates the urban-rural income gap.

2.2 Regional Heterogeneity in the Impact of New Digital Infrastructure Construction on the Urban-Rural Income Gap

In economically developed regions, the impact of new digital infrastructure on exacerbating the urban-rural income gap is not significant, primarily because these regions already possess a relatively complete infrastructure network, higher levels of human capital, and mature industrial systems, enabling them to effectively absorb and transform the development opportunities brought by digital technology. Urban and rural residents in developed regions generally possess strong digital literacy and skill adaptability. Various market actors can access digital resources relatively equally, while the government also possesses stronger fiscal capacity and policy execution power to promote the balanced distribution of digital dividends. Therefore, the popularization of digital infrastructure actually helps promote urban-rural integrated development. Currently, China's digital village construction faces many shortcomings, such as a lack of overall planning, the urban-rural digital divide, and regional development imbalances. The difficulty in bridging the urban-rural digital divide has become a major obstacle in digital village construction. Zhao Hui et al. (2025)[10] and Zhao Ruonan et al. (2024)[11] argue that the urban-rural digital divide brought about by informatization development is also one reason for the widening income gap between urban and rural residents. The digital divide hinders the development of Chinese-style modernization by reducing market vitality, widening the urban-rural income gap, and slowing down industrial structure upgrading. Therefore, in economically less developed regions, due to constraints such as weak foundational conditions, human capital shortages, and insufficient marketization, the introduction of new digital infrastructure is more likely to produce a differentiation effect: urban elite groups, leveraging their educational background and social resources, can quickly master digital technology and benefit from it, while rural residents, due to insufficient digital skills and poor financial accessibility, find it difficult to effectively participate in the digital economy, leading to a further widening of the "digital divide." Simultaneously, governments in less developed regions often lack sufficient fiscal investment and institutional innovation capacity to guide the balanced allocation of digital resources, causing digital technology to tend to agglomerate in urban areas, ultimately forming a "the strong get stronger" development pattern, significantly exacerbating the urban-rural income gap.

Therefore, this paper proposes theoretical hypothesis H2: In economically developed regions, new digital infrastructure has no significant impact on exacerbating the urban-rural income gap. Conversely, in economically less developed regions, new digital infrastructure has a significant impact on exacerbating the urban-rural income gap.

2.3 The Transmission Mechanism of New Digital Infrastructure's Impact on the Urban-Rural Income Gap

Agricultural industrial agglomeration is the process where production factors, business entities, and related institutions concentrate in specific geographical areas and form a synergistic network. It represents the meso-level form of the evolution of rural industries towards modernization and organization. New digital infrastructure effectively catalyzes agricultural industrial agglomeration by optimizing factor allocation and strengthening industrial synergy. The scale economies, knowledge spillovers, and industrial integration effects brought about by agglomeration constitute another key structural mediating pathway influencing the urban-rural income gap.

Therefore, this paper proposes theoretical hypothesis H3: New digital infrastructure can indirectly narrow the urban-rural income gap by promoting agricultural industrial agglomeration, meaning agricultural industrial agglomeration plays a partial mediating role.

3. Research Design and Data Description

3.1 Baseline Regression Model

Based on the previous theoretical analysis, to examine the impact of new digital infrastructure on the urban-rural income gap, the following baseline regression model is constructed:

$$Theil_{i,t} = \alpha_0 + \alpha_1 infra_{i,t} + \alpha_2 lnGdp_{i,t} + \alpha_3 control_{i,t} + \gamma_i + \rho_t + \varepsilon_{i,t} \quad (1)$$

3.2 Variable Measurement and Description

3.2.1 Dependent Variable

The dependent variable in this paper is the urban-rural income gap (Theil). Existing analyses mostly use three methods to measure the urban-rural income gap: the ratio of urban to rural residents' disposable income per capita, the Gini coefficient, and the Theil index. Following the approach of Xu Wenzhuan (2023)[12]. The ratio of urban to rural residents' disposable income per capita does not include the proportion of urban and rural populations and is a static indicator that cannot reflect population mobility between urban and rural areas. The Gini coefficient measures overall income inequality and is more sensitive to income changes in the middle class. However, the main body of the urban-rural income gap lies at the two ends, and the Gini coefficient cannot reflect the urban-rural income gap situation. This paper uses the Theil index to represent the urban-rural income gap. This index can more scientifically reflect the level of income disparity, considers the factor of population change and differences between and within groups, and more comprehensively captures the diversity and complexity of the urban-rural income gap. Additionally, this paper uses the ratio of urban to rural residents' disposable income per capita (Urir) as a substitute indicator for the dependent variable to conduct robustness checks. The specific measurement method for the Theil index is as follows:

$$Theil_{i,t} = \sum_{j=1}^{2}\left(\frac{I_{it}}{I_t}\right)\ln\left(\frac{I_{it}/p_{it}}{I_t/p_t}\right) \quad (2)$$

3.2.2 Explanatory Variable

There is limited literature involving the measurement of digital infrastructure construction, with only a few individual studies including new digital infrastructure among multiple dimensions for evaluating the digital economy. This paper draws on the measurement method of Wu Xianfu (2021)[13] to measure new digital infrastructure, selecting 3 first-level indicators and 18 second-level indicators to reflect the development level of new digital infrastructure. As shown in Table 1, information infrastructure mainly reflects China's information infrastructure from five dimensions: optical cable line length per square kilometer, internet ports per capita, mobile phone base stations per square kilometer, mobile internet penetration rate, proportion of internet access users, and domain names per capita. Integrated infrastructure mainly reflects China's integrated infrastructure from eight aspects: length of public tram operation per capita, railway operating mileage per capita, road length per capita, expressway mileage per capita, proportion of e-commerce enterprises, proportion of information industry personnel, e-commerce sales per capita, and software business revenue per capita. There are fewer indicators for measuring innovation infrastructure, mainly reflecting it from four aspects: proportion of R&D personnel, proportion of science and technology expenditure, R&D funding intensity, and patent applications per capita.

Table 1. New Digital Infrastructure Indicator System

	First-level	Second-level	Indicator Attributes
New Digital Infrastructure Construction	Information Infrastructure	Optical cable line length per sq. km	+
		Internet ports per capita	+
		Mobile phone base stations per sq. km	+
		Mobile internet penetration rate	+
		Proportion of internet access users	+
		Domain names per capita	+
	Integrated Infrastructure	Length of public tram operation per capita	+
		Railway operating mileage per capita	+
		Road length per capita	+
		Expressway mileage per capita	+
		Proportion of e-commerce enterprises	+

		Proportion of information industry personnel	+
		E-commerce sales per capita	+
		Software business revenue per capita	+
	Innovation Infrastructure	Proportion of R&D personnel	+
		Proportion of science and technology expenditure	+
		R&D funding intensity	+
		Patent applications per capita	+

3.2.3 Control Variables

To objectively and comprehensively measure the impact of the explanatory variable on the dependent variable, this paper refers to studies on the urban-rural income gap by Xie Xuemei (2021)[14], Chen Wen et al. (2021)[15], and Li Xiaozhong (2021)[16], selecting marketization level (Market), economic development level (pgdp), urbanization rate (urb), industrial structure (stru), human capital level (edu), openness to the outside world (fdi), etc., as control variables.

3.3 Sample Selection and Data Sources

The sample data for this study are panel data from 30 Chinese provinces/municipalities/autonomous regions (excluding Hong Kong, Macao, Taiwan, and Tibet) for the period 2014-2023. Data for the various variables involved in this study mainly come from sources such as the China Statistical Yearbook, the Ministry of Commerce Statistical Database, and the China Macroeconomic Database.

4. Research Results and Analysis

4.1 Descriptive Statistics

The descriptive statistical results for all variables are shown in Table 2. From Table 3, it can be seen that the mean of the urban-rural income gap (Theil) is 0.083, with a standard deviation of 0.038, indicating that areas with large urban-rural income gaps are relatively few. The maximum value is 0.21, and the minimum value is 0.017, indicating significant differences in urban-rural income inequality across different regions of China. The table shows that each variable has a relatively large range of variation, which can better reflect developmental differences among regions, indicating that the basic data for studying the relationship between new digital infrastructure and the urban-rural income gap are reasonable.

Table 2. Descriptive Statistics

Variable Symbol	Sample Size	Mean	S.D	Min	Max
theil	300	0.083	0.038	0.017	0.21
urir	300	2.524	0.446	1.682	3.808
infra	300	0.147	0.113	0.019	0.61
market	300	8.351	1.882	3.58	12.864
pgdp	300	10.946	0.432	10.003	12.155
urb	300	0.614	0.114	0.379	0.896
stru	300	1.417	0.757	0.665	5.283
edu	300	0.022	0.008	0.006	0.114
fdi	300	0.259	0.257	0.008	1.257

4.2 Baseline Regression Analysis

Before conducting the baseline regression, F-tests and Hausman tests were first performed on the regression model. The models rejected the null hypothesis, and a two-way fixed effects model was used for regression analysis. This means the model controls for both time-fixed effects and individual-fixed effects simultaneously to eliminate potential individual heterogeneity that does not vary over time and time trends that do not vary across individuals. The results are shown in Table 4. Column (1) in the table shows the regression results for the core explanatory variable without including any control variables. Its impact coefficient is 0.092 and significant at the 1% level, indicating that new digital infrastructure has a positive impact on the urban-rural income gap. Specifically, a one-unit increase in the new digital economy index leads to a corresponding increase of 0.092 units in the degree of the urban-rural income gap. Columns (2) to (7) show the regression results after gradually adding control variables for marketization level (market), economic development level (pgdp), urbanization rate (urb), industrial structure (stru), human capital level (edu), and openness (fdi). The results show that after adding control variables, the coefficient of the core explanatory variable ranges between 0.036 and 0.103, still significantly positive at the 1% level. The magnitude of the regression coefficients after adding control variables shows little difference from the single-variable analysis results, so the empirical conclusion of the baseline regression is robust. This indicates a significant positive correlation between new digital infrastructure and the urban-rural income gap, i.e., the construction of new digital infrastructure widens the urban-rural income gap. This conclusion aligns with hypothesis H1. For the control variables, economic development level and urbanization degree are both significantly negative at the 1% level, indicating that economic development and urbanization construction are conducive to narrowing the urban-rural income gap, which also proves the importance of economic development and urbanization construction. Conversely, industrial structure is significantly positive at the 1% level, proving that industrial structure upgrading widens the urban-rural income gap. The adjustment of industrial structure increases the demand for labor skills, making rural residents lacking skills unable to qualify for jobs, leading to reduced income. Additionally, marketization level, human capital level, and openness have no significant impact on the urban-rural income gap.

Table 3. Baseline Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	theil	theil	theil	theil	theil	theil	theil
infra	0.092***	0.099***	0.103***	0.047***	0.041***	0.041***	0.036***
	(0.014)	(0.014)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)
market		-0.004***	-0.003***	0.001	0.001	0.001	0.001
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
pgdp			-0.067***	-0.042***	-0.036***	-0.035***	-0.036***
			(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
urb				-0.297***	-0.280***	-0.281***	-0.260***
				(0.032)	(0.032)	(0.032)	(0.036)
stru					0.008***	0.008***	0.009***
					(0.003)	(0.003)	(0.003)
edu						-0.040	-0.052
						(0.059)	(0.060)
fdi							-0.011
							(0.008)
_cons	0.099***	0.127***	0.832***	0.709***	0.622***	0.619***	0.616***
	(0.002)	(0.007)	(0.090)	(0.080)	(0.085)	(0.085)	(0.085)
N	300	300	300	300	300	300	300
R2	0.809	0.819	0.854	0.890	0.893	0.894	0.894
Year	YES	YES	YES	YES	YES	YES	YES
ID	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.3 Robustness Checks

To verify the validity of the previous regression results, the following three methods were used for robustness checks:

1. Winsorization. To make the data smoother, this paper performed winsorization at the 1% and 99% percentiles for the data of the explanatory variable, dependent variable, and control variables. The regression results are shown in Column (1) of Table 4. Digital infrastructure still has a significant positive impact on the urban-rural income gap at the 1% level, with an impact coefficient of 0.035.

2. Lagged Explanatory Variable. Since digital infrastructure construction takes time, the construction effectiveness of digital infrastructure in the previous year may affect the current year's urban-rural income gap. Therefore, this paper lagged the new digital infrastructure construction variable by one period for regression. The results are shown in Table 4 Column (2). The results show that new digital infrastructure still has a positive impact on the urban-rural income gap.

3. Replacing the Dependent Variable. Referring to existing literature, this paper uses the ratio of urban to rural residents' disposable income per capita (urir) to measure the urban-rural income gap. The results are shown in Column (3) of Table 4. Digital infrastructure still has a positive impact on the urban-rural income gap, consistent with the baseline regression results of this study.

Table 4. Robustness Check Results

Variable	(1) Winsorization	(2) Lagged Explanatory Var.	(3) Replace Dep. Var.
infra	0.035***		0.664***
	(0.012)	0.027**	(0.133)
linfra		(2.370)	
market	0.001*	-0.001	0.003
	(0.001)	(-0.790)	(1.016)
pgdp	-0.031***	-0.027***	-0.044*
	(0.008)	(-6.173)	(-1.920)
urb	-0.245***	-0.211***	-0.240**
	(0.034)	(-8.161)	(-2.162)
stru	0.010***	0.012***	0.014
	(0.003)	(6.079)	(1.402)
edu	-0.101	-0.144***	-1.349
	(0.109)	(-3.074)	(-0.996)
fdi	-0.011	-0.005	0.045
	(0.008)	(-0.781)	(1.526)
Observations	300	270	300
Adjusted R-squared	0.981	0.881	0.546
Year	YES	YES	YES
ID	YES	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.4 Heterogeneity

4.4.1 Heterogeneity Analysis

Considering the differences in resource endowments and economic development stages across regions in China[^1], and the significant gaps in new digital infrastructure, this study conducts a classified analysis of regional heterogeneity. First, this study conducts separate regressions for the eastern, central, and western regions. The regression results are shown in Columns (1) and (2) of Table 5. The results show that in both the eastern and central-western regions, the regression coefficient for digital infrastructure construction is significant, meaning the effect of digital infrastructure construction widening the urban-rural income gap holds in the eastern and central-western regions. Therefore, since coastal areas have a better foundation in digital infrastructure construction compared to non-coastal areas, this study further conducts separate regression tests for economically developed and less developed regions. The regression results are shown in Columns (3) and (4) of Table 5. The results indicate: In economically developed regions, the regression coefficient for new digital infrastructure construction is not significant. From the above sub-regional test results, it can be seen that the impact effect of new digital infrastructure construction widening the urban-rural income gap is mainly manifested in economically less developed regions. The dividend effects brought by digital infrastructure construction include the following aspects: First, digital infrastructure construction is conducive to the development of agricultural industries, promoting agricultural products from villages to cities and increasing farmers' income levels; second, digital infrastructure construction facilitates the return of talent to rural areas, providing intellectual support for agricultural industry development; third, digital infrastructure construction provides new platforms for industrial development, such as e-commerce and live streaming, expanding sales channels for agricultural products, all of which become new platforms for increasing farmers' income. Regional development imbalance is a basic national condition in China. Due to the existence of the digital divide, economically less developed regions have deficiencies in accessing and utilizing digital infrastructure, meaning the positive effect of digital infrastructure construction on narrowing the urban-rural income gap has not yet manifested. Therefore, in economically less developed regions, digital infrastructure construction widens the urban-rural income gap. This conclusion aligns with hypothesis H2.

Table 5. Heterogeneity Analysis Regression Results

	(1) Eastern	(2) Central-Western	(3) Developed Regions	(4) Less Developed Regions
infra	0.047***	0.084**	0.014	0.180***
	(3.372)	(2.608)	(1.196)	(4.761)
market	-0.000	0.003	-0.000	0.003**
	(-0.229)	(1.643)	(-0.410)	(2.084)
pgdp	-0.046***	-0.004	-0.027**	-0.039***
	(-4.026)	(-0.315)	(-2.576)	(-3.444)
urb	-0.216***	-0.331***	-0.234***	-0.383***
	(-5.898)	(-3.368)	(-5.978)	(-4.420)
stru	0.001	0.013**	0.014***	0.009**
	(0.211)	(2.255)	(3.968)	(2.007)
edu	-0.012	-0.038	-0.025	-0.189
	(-0.291)	(-0.240)	(-0.536)	(-1.073)
fdi	-0.016*	-0.076**	-0.000	-0.078***
	(-1.838)	(-2.244)	(-0.056)	(-3.616)
_cons	0.725***	0.285**	0.509***	0.696***
	(5.782)	(2.153)	(4.486)	(6.076)
Year	Yes	Yes	Yes	Yes
ID	Yes	Yes	Yes	Yes
N	100	80	120	180
R2	0.906	0.932	0.906	0.915
F	44.459	48.053	55.097	97.660

***p<0.01", "**p<0.05", "*p<0.10

4.5 Mediation Effect Test

Based on the above analysis of policy effects, to further study the mechanism through which new digital infrastructure affects the urban-rural income gap, this paper selects agricultural industrial agglomeration as the mediating variable and uses Jiang Ting's method for testing. The mediation effect test results are shown in Table 6. In Column (1) of Table 6, after adding the mediating variable, the test result coefficient is -0.151 and passes the test at the 1% significance level. This shows that agricultural industrial agglomeration plays a mediating role in the relationship between new digital infrastructure construction and the urban-rural income gap, i.e., new digital infrastructure construction narrows the urban-rural income gap by increasing agricultural industrial agglomeration effects, proving the existence of hypothesis H3. The regression results in Column (2) of Table 6 are basically consistent with the baseline regression results.

Table 6. Mediation Effect of Agricultural Industrial Agglomeration

	(1)	(2)
	gig	theil
infra	-0.931***	0.054
	(-4.416)	(0.590)
market	0.009	-0.005
	(0.614)	(-0.886)
pgdp	-0.231**	-0.230***
	(-2.507)	(-5.935)
urb	0.921*	-1.531***
	(1.782)	(-7.083)
stru	0.248***	0.153***
	(6.352)	(8.745)
edu	15.827***	-11.300***
	(3.924)	(-6.545)
fdi	-0.189	-0.032
	(-1.400)	(-0.562)
gig		-0.151***
		(-5.883)
_cons	2.642***	4.532***
	(3.442)	(13.887)
N	300	300
R2	0.320	0.922
F	17.614	384.937

***p<0.01", "**p<0.05", "*p<0.10

5. Conclusions

To achieve common prosperity, it is essential to address the problem of unbalanced and inadequate development to ensure that all people share the fruits of development equally. In the process of high-quality development, it is necessary to continuously increase per capita income, narrow the urban-rural income gap, promote common urban and rural development, and thereby achieve common prosperity. From the perspective of digital infrastructure construction, this study selects panel data from 30 Chinese provinces from 2014 to 2023 and uses a two-way fixed effects model to examine the impact effects, mechanisms, and heterogeneity of new digital infrastructure construction on the urban-rural income gap. The main conclusions are as follows: Digital infrastructure construction widens the urban-rural income gap, a result which holds under a series of robustness checks. In-depth analysis of the mechanism reveals that digital infrastructure helps increase urban residents' disposable income per capita, but its promoting effect on increasing rural residents' net income per capita has not yet manifested. Examining sub-samples by region across the country finds that the effect of digital infrastructure construction widening the urban-rural income gap is more significant in the western regions and economically less developed regions. Tests on mediating variables also found that, by increasing agricultural industrial agglomeration, digital infrastructure construction narrows the urban-rural income gap.

The research results of this paper provide theoretical support for narrowing the urban-rural income gap and achieving common prosperity. To this end, this paper proposes the following policy recommendations: (1)

Accelerate the construction of digital infrastructure and build a sound digital infrastructure system. On the one hand, promote the construction of 5G networks, industrial internet, big data centers, power stations, etc.; on the other hand, use new-generation information technology to digitally and intelligently upgrade traditional infrastructure, thereby providing solid support for digital economic development. (2) Digital infrastructure construction in rural areas lags behind, and per capita income is low, leading to a continuously widening urban-rural income gap. Therefore, it is necessary to scientifically plan and comprehensively coordinate digital infrastructure construction, focusing on strengthening digital infrastructure construction in rural areas, western regions, and less developed regions, providing sufficient funding and technical support, promoting the deep integration of digital technology and the rural economy, bridging the digital divide, thereby increasing per capita income in rural areas and achieving common prosperity. (3) Increase the proportion of education expenditure in fiscal expenditure, strengthen human capital accumulation and investment, improve the quality of education development, optimize the allocation of educational resources, and increase support for human capital investment in backward and rural areas. Simultaneously, optimize the allocation of human capital and improve the efficiency of human capital allocation across industries and sectors. Encourage specialized digital talent to flow to rural and backward areas, transmit advanced digital technology application experience from developed regions, and improve the digital skills of residents in rural areas. (4) Accelerate the development of rural productive service industries such as rural finance, enhance the ability of rural areas to utilize new-generation information technology, realize the value of the network economy, thereby narrowing the urban-rural income gap and achieving common prosperity.

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