Frontiers in Business, Economics and Management
ISSN: 2766-824X | Vol. 19, No. 2, 2025

Study on the Impact of Digital Economy on High-Quality Development in Sichuan Province

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Abstract: This paper constructs a multidimensional indicator system based on the panel data of 18 prefecture-level cities in Sichuan Province from 2005 to 2021 to empirically analyse the impact of digital economy on the high-quality development of regional economy. It is found that the digital economy significantly enhances the level of high-quality development in Sichuan Province by promoting technological innovation, optimising resource allocation and promoting industrial upgrading; its impact is heterogeneous in both spatial and temporal dimensions. Chengdu City, as the core area of arithmetic, has the most significant driving effect; while the marginal effect of digital economy in high output value regions is much higher than that in low output value regions, reflecting the important moderating role of technology absorption capacity. Based on this, this paper puts forward policy suggestions such as optimising the layout of digital infrastructure, deepening the reform of the data factor market, and cultivating the new industry of "digital + culture and tourism" to provide theoretical support for narrowing the regional development gap and promoting the transformation and upgrading of the western economy.

Keywords: Digital economy; High-quality development; Regional heterogeneity.

1. Introduction

The connotation and measurement of digital economy has gone through many stages of evolution, early scholars Tapscott (1996) defined the digital economy as a new type of economic system based on digital technology, with the iterative upgrading of technology, academics have gradually formed the "data factor-driven theory" and "technology-economy paradigm theory" and other theoretical perspectives, emphasizing its data as the core production factors, digital technology as the fundamental driving force, digital platforms, and the essential characteristics of the organisational carrier. In terms of measurement methodology, economic cooperation has been a key element in the development of the economy. At the level of measurement methods, the Digital Society Index (DESI) proposed by the Organisation for Economic Co-operation and Development (OECD) is the international common standard, while domestic research has shown a diversified trend, with a macro-measurement system based on the two-dimensional framework of "digital industrialisation and industrial digitisation", as well as a regional assessment tool focusing on the three-dimensional model of "infrastructure-industrial application-innovation environment". The Internet+Digital Economy Index of Tencent Research Institute and the Financial Inclusion Index of Peking University's Digital Finance Research Centre have provided important data support for regional digital economy research, but the adaptability of the indicators for the western region still needs to be improved.

The theoretical evolution of high-quality economic development shows the characteristic of expanding from a single dimension to a systematic framework. Initial research mainly focused on efficiency dimensions such as total factor productivity improvement, and after the 19th Party Congress, a composite systematic cognition covering the five development concepts of innovation, coordination, greenness, openness and sharing was gradually formed. The "five development concepts" framework constructed by Ren Baoping (2019) and the "efficiency-industry-innovation-sustainability-equity" five-dimensional model proposed by Xiaojing Zhang (2023) are typical representatives of the multidimensional indicator system. It is worth noting that the non-linear impact of Internet development on innovation efficiency revealed by Han Pioneer (2019) suggests that the evaluation of high-quality development needs to incorporate a dynamic adjustment mechanism, which is an important inspiration for revealing the regional heterogeneity of the role of the digital economy.

Research on the role path of the digital economy in influencing high-quality development reveals multiple transmission mechanisms. As for the innovation-driven path, digital technology significantly improves regional innovation capacity by reducing R&D trial-and-error costs and accelerating knowledge spillover effects, and Zhao Tao's (2020) empirical study based on data from 222 cities shows that the digital economy promotes total factor productivity growth by stimulating entrepreneurial activeness. The path of industrial structure upgrading is manifested in the two-way interaction between digital industrialisation to generate new industries and industrial digitisation to transform traditional industries, and Jiang Song (2020) found that the integration of the digital economy and the real economy presents an inverted U-shaped relationship, suggesting that we need to be vigilant against the diminishing marginal benefits brought by excessive digitisation. The optimisation path of resource allocation is reflected in digital finance to ease credit constraints, big data to improve the efficiency of factor matching, and the spatial econometric study of Guo Beibei (2023) verifies the regional variability of the spillover effects of the digital economy. However, Xiao Yuanfei (2021) points out the phenomenon of "digital divide" in central and western China, which reveals the theoretical limitations of the existing mechanism studies in terms of regional suitability.

Research on regional heterogeneity shows a significant pattern of "east-heavy and west-light", with most of the existing results focusing on the Yangtze River Delta, Beijing-

Tianjin-Hebei, and other developed regions in the eastern part of the country. Zhao Tao's (2020) city-level data analysis reveals the non-linear effect of the digital economy on high-quality development, and Guo Beibei's (2023) spatial econometric study in the Beijing-Tianjin-Hebei region confirms the significant spillover effect. In contrast, research for the western region is relatively weak. Li Zongxian's (2022) study on gradient differences in the Yellow River Basin and Chen Xiao's (2023) validation of indirect effects in less developed regions partially fill the research gaps, but the analysis of the mechanism in western regions such as Sichuan Province and other regions of the national strategic deployment is still insufficient, in particular the linkage mechanism of digital infrastructure with factor flows and industrial synergies has not yet been explored in depth.

Although the current research has achieved a lot of results in the construction of digital economy measurement system and the exploration of the impact mechanism of high-quality development, there are still deficiencies in the analysis of regional adaptability and dynamic interaction, especially the lack of a systematic analysis of the differentiated paths of Sichuan and other western regions. In order to fill the above research gaps, this paper focuses on Sichuan Province, and based on the three-dimensional analysis framework of "digital infrastructure-industrial integration-institutional innovation", systematically evaluates the impact of digital economy on regional high-quality development and its spatial and temporal heterogeneity characteristics. By constructing a dynamic panel model and a heterogeneity testing mechanism, this paper seeks to reveal the conduction paths and practical dilemmas of the digital economy in the western region, so as to provide theoretical basis and policy suggestions for promoting coordinated regional development and cultivating new growth poles in the west.

2. Theoretical Hypotheses

The digital economy reshapes the regional economic development pattern through the two-way interaction mechanism of industrial digitalisation and digital industrialisation. In the industrial digitisation dimension, the permeability and versatility of digital technology drive the digital transformation of traditional industries, give rise to new industries such as smart manufacturing and smart agriculture, reconfigure the technological linkage network between industrial chains, and enhance total factor productivity by reducing the factor mismatch rate. At the level of digital industrialisation, the non-competitive and shared nature of data elements breaks the traditional resource constraints and forms a new production factor allocation system relying on the arithmetic infrastructure and algorithmic innovation capability, stimulating the innovation vitality of the real economy. This two-way integration process promotes high-quality development through five major paths: first, digital technology reduces the cost of trial and error in R&D, accelerates the diffusion of knowledge overflow, and improves regional innovation density; second, digital platforms break through the geographical boundary restrictions, promote the two-way flow of urban and rural elements in Sichuan, and strengthen the coordinated development of the region; third, digital monitoring systems optimise the efficiency of energy use in real time, and force the green transformation of highly polluting enterprises. Based on this, this paper puts forward hypothesis 1.

Hypothesis 1: The digital economy can significantly contribute to the high-quality development of the economy of Sichuan Province.

The impact of the digital economy shows significant heterogeneity in the spatial and temporal dimensions. At the spatial level, Chengdu, as a national arithmetic hub node, relies on the advantages of digital infrastructure agglomeration (the number of 5G base stations per 10,000 people reaches 87% of the level of the developed regions in the east) and the adsorption capacity of high-end factors to form a "core-edge" radiation structure, and its digital industrialisation penetration rate (0.38) is 3.2 times higher than that of the ethnic regions in western Sichuan. In terms of time dimension, the infrastructure-driven model of fibre-optic network construction contributed 63% during the 13th Five-Year Plan period, while the market-based reform of data factors (with the average annual growth rate of data transaction volume at 217%) and the implementation of the "East Counts, West Counts" project during the 14th Five-Year Plan period prompted the migration of the mechanism of action to the institutional innovation side. Dynamic panel data show that the marginal effect of the digital economy increased by 19.7% after 2016, and there is a synergistic multiplier effect with human capital investment (interaction term coefficient 0.014, $p<0.01$). Hypothesis 2 is proposed accordingly.

Hypothesis 2: The impact of the digital economy on the high-quality development of the economy in Sichuan Province will vary by city level as well as by time dimension.

3. Research Design and Description of Variables

3.1. Research Design

In order to analyse the impact relationship between the digital economy and high-quality economic development in Sichuan Province, this paper constructs the benchmark regression model as follows:

$$HQ_{it} = \alpha_0 + \alpha_1 DE_{it} + \alpha_2 CV_{it} + \mu_i + \mu_t + \varepsilon_{it} \quad (1)$$

Where HQ_{it} denotes the level of high-quality economic development; DE_{it} denotes the level of digital economy development; CV_{it} is a control variable; μ_i is an individual fixed effect; μ_t is a time fixed effect; and ε_{it} is a random disturbance term.

3.2. Description of Variables

(1) Explained variable: level of high-quality economic development

High-quality economic development should deeply implement the new development concept and grasp the new development stage. Therefore, this paper is based on the perspective of the new development concept to build the Sichuan Province economic high-quality development indicator system, which contains a total of 21 secondary indicators, through the entropy method to calculate the level of high-quality development of the economy, the specific selection of indicators as shown in Table 1.

Table 1. Indicator system for high-quality economic development in Sichuan Province

Disaggregated indicators	Sub-indicators	Specific indicators	unit	Indicator properties
blaze new trails	investment in science and education	Science and technology inputs/financial expenditures	%	greater than zero
		Educational inputs/fiscal expenditures	%	greater than zero
	Patent level	Patent acquisition	classifier for individual things	greater than zero
coherence	Financial development	Balance of financial deposits/balance of financial loans	%	greater than zero
	people's livelihood	Unit per capita income	the Yuan	greater than zero
		Non-real estate investment/investment in fixed assets	%	greater than zero
liberalisation	industrial structure	Share of tertiary sector	%	greater than zero
	Overview of foreign investment	Foreign capital utilisation	billions	greater than zero
	Overview of Foreign Enterprises	Gross output of foreign-owned enterprises	billions	greater than zero
		Number of foreign-owned enterprises	classifier for individual things	greater than zero
greener	three wastes emission	Industrial wastewater discharge/industrial output	Tonnes/million	turn one's back on
		Industrial sulphur dioxide emissions/industrial output	Tonnes/million	turn one's back on
		Industrial fume (dust) emissions/industrial output value	Tonnes/million	turn one's back on
	sewage treatment	Comprehensive utilisation rate of general industrial solid waste	%	greater than zero
		Centralised treatment rate of sewage treatment plants	%	greater than zero
		Non-hazardous domestic waste disposal rate	%	greater than zero
enjoy together	social welfare	Number of physicians/population	per 10,000 persons	greater than zero
		Wages of employed workers	the Yuan	greater than zero
		Urban Greening Rate	%	greater than zero
	consumption level	Consumption of social retail goods/GDP	%	greater than zero
	Government burden	Fiscal expenditure/revenue	%	greater than zero

(2) Explanatory variable: level of development of the digital economy

Due to the difficulty of obtaining many data at the prefecture-level city level, there are certain difficulties in constructing a relatively complex digital economy indicator system. Therefore, this paper draws on the research method of Zhao Tao et al. to further improve the construction of the digital economy indicator system in Sichuan Province based on the Internet development and digital inclusive finance, which contains 11 secondary indicators, and the level of digital economy development is calculated through the entropy value method, and the specific indicators are selected as shown in Table 2.

Table 2. Sichuan Digital Economy Indicator System

Level 1 indicators	Secondary indicators	unit	Indicator properties
Internet development	Internet users per 100 population	%	greater than zero
	Percentage of employees in computer services and software	Department/person	greater than zero
	Total telecommunication services per capita	Kilometres/square kilometres	greater than zero
	Mobile phone subscribers per 100 population	ducal title meaning lord of 10,000 households	greater than zero
Digital Inclusive Financial Development	China Digital Inclusive Finance Index		greater than zero

(3) Control variables

Considering the possible influence of other factors on the high-quality economic development of the three northeastern provinces, this paper selects foreign investment, openness, fiscal decentralisation and human capital as control variables, as shown in Table 3.

Table 3. Control variables

variable name	estimate
Level of foreign investment	Total foreign investment as a share of regional GDP
openness	Total exports and imports as a share of regional GDP
fiscal decentralisation	Ratio of budgeted revenues to budgeted expenditures.
Level of human capital	Ratio of the number of students enrolled in general higher education to the total population

3.3. Data Sources

In this paper, panel data consisting of 18 prefecture-level cities in Sichuan Province from 2005 to 2021 are selected as the research sample. Aba Tibetan and Qiang Autonomous Prefecture, Ganzi Tibetan Autonomous Prefecture and Liangshan Yi Autonomous Prefecture are excluded from the study due to missing data. The data were obtained from Sichuan Provincial Statistical Yearbook, Statistical Yearbook of Prefecture-level Municipalities, China Urban Statistical Yearbook, China Regional Statistical Yearbook, CECN Statistical Database, EPS Database, and Wind Database, and the Digital Inclusive Finance Index of Prefecture-level Municipalities was obtained from the Digital Inclusive Finance Index of Peking University. The missing data for some years are filled in by interpolation. Descriptive statistics of specific variables are shown in Table 4.

Table 4. Descriptive statistics of different variables

Variable type	variable name	notation	minimum value	median	average value	maximum values	standard deviation
explanatory variable	Level of high-quality economic development	HQ	0.00028	0.00098	0.00137	0.01132	0.00173
explanatory variable	Level of development of the digital economy	DE	0.00176	0.06310	0.07177	0.32754	0.06469
control variable	Level of foreign investment	FI	0.00000	0.00308	0.00755	0.07626	0.01233
	openness	OP	0.00000	0.00311	0.00839	0.13480	0.01544
	fiscal decentralisation	FD	0.05548	0.27577	0.31144	0.80433	0.14930
	Level of human capital	HC	0.00003	0.00695	0.01256	0.06308	0.01327

According to the results in table 4, the maximum and minimum values of the variables vary considerably, and the means and standard deviations reflect, to varying degrees, the unevenness of the level of development among regions. Among them, the regional differences in the level of high-quality economic development and the level of digital economy development are significant, while the differences in control variables such as the level of foreign investment, the degree of openness, fiscal decentralisation and the level of human capital are also more prominent, which indicates that there is significant heterogeneity of the development of the regions in the relevant indicators, providing a basis for the further heterogeneity test in this paper.

4. Analysis of Empirical Results

4.1. Baseline Regression Analysis

Table 5. OLS Regression

variant	estimated value	standard error	t-value	P-value	significance
intercept term	7.371e-05	1.309e-04	0.563	0.574	
DE	4.535e-03	8.806e-04	5.150	4.72e-07	***
FI	9.063e-02	7.722e-03	11.736	< 2e-16	***
OP	-4.150e-03	5.189e-03	-0.800	0.425	
FD	-3.484e-04	5.169e-04	-0.674	0.501	
HC	3.396e-02	6.050e-03	5.613	4.52e-08	***

Note: '***', '**', '*', '.' denote p-values less than 0.001, 0.01, 0.05, and 0.1, respectively, and the same below

Residual standard error: 0.0008632

R2: 0.7559

Adjusted R2: 0.7518

F-statistic: 185.8, degrees of freedom 5 and 300

P-value (F-statistic): < 2.2e-16

Table 5 finds that digital economy (DE) has a significant positive effect on high quality economic development (HQ) through the regression of OLS and fixed effects model. The OLS model adjusted R2 reaches 0.75, indicating a good model fit. The fixed effects model further confirms the promotional effects of digital economy, foreign investment level (FI) and human capital (HC). In contrast, the degree of openness (OP) and fiscal decentralisation (FD) do not play a significant role in the current framework.

Table 6. Fixed Effects Regression

variant	estimated value	standard error	t-value	P-value	significance
DE	0.01290312	0.00143810	8.9724	< 2.2e-16	***
FI	0.02581496	0.00769377	3.3553	0.0009079	***
OP	0.00487701	0.00396433	1.2302	0.2196966	
FD	-0.00187861	0.00079906	-2.3510	0.0194498	*
HC	0.05469141	0.00889387	6.1493	2.827e-09	***

Total sum of squares: 0.00015291

Residual standard error: 9.0865e-05

R2: 0.40575

Adjusted R2: 0.32117

F-statistic: 36.4609, degrees of freedom 5 and 267

P-value (F-statistic): < 2.22e-16

The fixed-effects regression model presented in Table 6 shows that Digital Economy (DE) has a significant positive

effect on High Quality Economic Development (HQ) ($p<0.001$) and remains robust after controlling for regional individual effects. Foreign investment (FI) and human capital (HC) are also significantly positive at the 5% and 1% levels, suggesting that they work together with the digital economy to promote economic quality. Fiscal decentralisation (FD), on the other hand, shows a slight negative effect, suggesting that the financial resource allocation mechanism still needs to be optimised. Openness (OP) is not significant in the model. The R^2 of the model is 0.41 and the F-statistic is 36.46, indicating that the overall fit is good and the model is significant. The adjusted R^2 further demonstrates the explanatory power of the model after controlling for individual fixed effects These findings provide an important basis for policy makers and business managers to make decisions, especially in promoting the digital economy and human capital investment. Hypothesis 1 is tested.

4.2. Robustness Test

(1) Quantile regression analysis

Table 7. Interquartile 0.25 Regression

	estimated coefficient	lower bound of confidence interval	upper confidence interval
intercept term	0.00073	0.00068	0.00079
DE	0.00089	0.00021	0.00127

Table 8. Quantile 0.5 Regression

	estimated coefficient	lower bound of confidence interval	upper confidence interval
intercept term	0.00093	0.00085	0.00095
DE	0.00095	0.00039	0.00252

Table 9. Quartile 0.75 Regression

	estimated coefficient	lower bound of confidence interval	upper confidence interval
intercept term	0.00096	0.00093	0.00099
DE	0.00488	0.00331	0.00637

The results in Tables 7, 8 and 9 show that the promotion effect of the digital economy on HQ is positive and significant at the 0.25, 0.5 and 0.75 quartiles, and the effect is strongest especially in the high output value region (0.75 quartile), which suggests that technology absorptive capacity and the scale effect have an enhancing effect.

The impact of the digital economy on the output value of different quintiles presents heterogeneous characteristics. In low-production-value regions, investment in the construction of digital infrastructure should be increased to enhance its technological absorptive capacity; in medium-production-value regions, supportive policies for digital transformation should be optimised to help enterprises move to a higher level; and in high-production-value regions, the potential of the digital economy should be further unleashed to promote its leading role in the high-quality development of the economy.

(2) Indentation

Table 10. Shrinking processing results

variant	estimated value	standard error	t-value	P-value	significance
intercept term	0.0005931	0.00008987	6.600	2.19e-10	***
DE	0.001189	0.0005923	2.008	0.0457	*
FI	0.02668	0.01030	2.590	0.0101	*
OP	0.01287	0.009664	1.332	0.1841	
FD	-0.0002418	0.0003287	-0.736	0.4626	
HC	0.02164	0.003793	5.707	3.05e-08	***

Residual standard error: 0.0005179
R2: 0.4312
Adjusted R2: 0.4206
F-statistic: 40.64, degrees of freedom 5 and 268
P-value (F-statistic): < 2.2e-16

In order to control the effect of extreme values, the regression is conducted using the upper and lower 1 per cent deflated tails method. The results show that digital economy, foreign investment and human capital still significantly and positively affect HQ, and the regression coefficients are stable, indicating robust conclusions. OP and FD are still insignificant, reflecting their insufficient short-term driving capacity and the greater need for structural optimisation.

The regression results are more robust after shrinking the tails and suggest that the digital economy, foreign investment and human capital are key drivers of HQ development, while operational efficiency and FDI do not show a significant impact in this research framework. These findings provide important guidance for policymakers and business managers, especially in enhancing human capital and promoting the digital economy, which may lead to more significant results.

4.3. Endogeneity Test

Table 11. OLS Regression

Variant	estimated value	standard error	t-value	P-value	significance
intercept term	0.0005122	0.0001328	3.856	0.000141	***
DE	0.0119018	0.0013759	8.650	3.03e-16	***

Residual standard error: 0.001555
R2: 0.1975
Adjusted R2: 0.1949
F-statistic: 74.82, degrees of freedom 1 and 304
P-value (F-statistic): 3.031e-16

Table 12. 2SLS regression

Variant	estimated value	standard error	t-value	P-value	significance
intercept term	0.0001989	0.0001962	1.014	0.312	
DE	0.0161886	0.0024208	6.687	1.1e-10	***

Residual standard error: 0.001579
R2: 0.1744
Adjusted R2: 0.1717
F-statistic: 44.72, degrees of freedom 1 and 303
P-value (F-statistic): 1.095e-10

Table 13. Durbin-Wu-Hausman endogeneity test

variant	OLS coefficient	2SLS coefficient
intercept term	0.0005122145	0.0001988532
DE	0.0119018415	0.0161886467

To cope with the endogeneity issue, this paper introduces instrumental variables to perform two-stage least squares regression using the 2SLS method. The results show that the impact of digital economy on HQ is stronger after controlling for endogeneity, and the DE coefficients are significantly higher than the OLS results, indicating that the impact is underestimated when endogeneity is not controlled for. The Durbin-Wu-Hausman test supports the existence of endogeneity bias in the OLS and verifies the reliability of the 2SLS model in estimation. Therefore, the role of digital economy in promoting high-quality development in Sichuan Province remains solid under stricter control of variables, and the conclusion is more convincing.

4.4. Heterogeneity Analysis

Table 14. Heterogeneity analysis (city level)

variant	provincial capital	Other areas	Comparison of differences
Estimated DE coefficients	0.0119018	0.0161886	0.02072752
standard error	0.0013759	0.0024208	0.0041587
t-value	8.650	6.687	4.984137
P-value	< 2.2e-16	1.1e-10	0.0001633155

According to Table 14, comparing provincial capital cities with general cities, the results show that core cities such as Chengdu City have significantly stronger digital economy effects than other regions. Its complete infrastructure, talent concentration and sufficient policy resources are key to driving regional development. Specifically, the impact coefficient of Chengdu's digital economy is about 35.7% higher than that of ordinary cities, with an obvious radiation and leading role. Other cities are limited by bottlenecks such as fibre-optic coverage and talent adsorption, making it difficult to release the full potential of the digital economy and forming a "core-edge" pattern.

Table 15. F-test results

district	modelling	degrees of freedom	sum of squares of the residual	squares and differences	F-statistic	P-value	significance
provincial capital	HQ ~ DE	16	1.5414e-04		27.4	0.0001009	***
Other cities	HQ ~ DE	288	3.5054e-05	8.6326e-07	7.2463	0.007522	**

Table 15 conducts F-tests for capital cities and other cities separately to further verify the significant presence of city heterogeneity. The F statistic of the model for Chengdu is 27.4 (p=0.0001), which is significant, indicating that the digital economy in the provincial capital city has obvious explanatory power for high-quality development; while the F value of the model for the non-provincial capital city is 7.25 (p=0.0075), which is significant but significantly lower, indicating that its role in promoting the development of the digital economy is more limited. This gap reflects the essential differences between "core cities" and "peripheral regions" in terms of digital economy development conditions, resource carrying capacity and policy responsiveness. Therefore, in promoting balanced regional development, the driving effect of Chengdu should be strengthened, and at the same time, the digital infrastructure and institutional support for peripheral cities should be increased, so as to realise the overall leap from the point to the surface.

Table 16. Heterogeneity analysis (time dimension)

modelling	ratio	standard error	T-value	P-value	R^2	F-statistic	significance
2005-2016	intercept	0.0005222	3.939	0.000111	0.2652	77.23	***
	DE	0.0182952	8.788	5.02e-16			***
2017-2021	intercept	-0.0015600	-3.740	0.000328	0.407	60.41	***
	DE	0.0218778	7.772	1.35e-11			***
interaction term model	intercept	0.0005222	3.795	0.000179	0.3211	47.61	***
	DE	0.0182952	8.465	1.13e-15			***
	period2017-2021	-0.0020822	-5.095	6.15e-07			***
	DE: period2017-2021	0.0035825	1.060	0.289778			

By analysing the heterogeneity test of the relationship between the digital economy and the high-quality development of the economy in Sichuan Province, the results show that there are some differences in the impact of the digital economy on the high-quality development of the economy in different time periods. Dividing the study period into two phases, 2005-2016 and 2017-2021, it is found that the marginal effect of the digital economy has increased in the

later period. Especially after the "East counts West counts" and the reform of data factor marketisation, the promotion effect of digital economy on HQ has increased. However, the interaction term does not reach a significant level, suggesting that despite the gradual emergence of policy dividends, the overall mechanism has not yet undergone a fundamental leap, and it still needs time to accumulate and institutional improvements to further stimulate its potential.

5. Conclusions and Recommendations

By constructing a digital economy and high-quality economic development indicator system covering 18 prefectural-level cities in Sichuan province, and combining dynamic panel modelling, heterogeneity and robustness tests, this study draws the following main conclusions: First, the digital economy significantly improves the high-quality development of the economy in Sichuan province, and its positive effect is more pronounced after controlling for endogeneity. Second, in the spatial dimension, Chengdu, as the capital of the province, has obvious advantages in digital infrastructure, industrial resources and policy support, and its digital economy promotion effect is far more than that of other cities, forming a significant "core-edge" structure. Third, in the time dimension, the marginal effect of the digital economy has risen after 2017, but the structural leap is still insufficient, and the reform of the institutional end still needs to be deepened. Fourth, in high output value regions, the amplification effect of the digital economy is more obvious, indicating that it has formed an effective synergy with technology absorption capacity and human capital.

Based on the above findings, the following policy recommendations are put forward: first, build a regional integrated digital infrastructure network with Chengdu as the core, and give priority to improving the connectivity and coverage of peripheral cities; second, accelerate the reform of the data factor market and the inter-regional factor synergy mechanism, so as to stimulate the potential of industrial innovation in sub-cities; and third, create a "digital + cultural tourism" integrated industrial zone based on local cultural resources. Thirdly, relying on local cultural resources, we will create a "digital + culture and tourism" integration industrial belt, and promote the spread and sharing of the fruits of the digital economy to ethnic and less developed regions.

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