Empirical Study on the Empowerment of Tourism Development in Southwest China by the Digital Economy

Li Jiayi

Undergraduate student in the School of Economics and Management, Yangtze Normal University, Fuling District, Chongqing, China.
Corresponding Author: Li Jiayi

Abstract: *To investigate the driving effect of the digital economy on tourism development in Southwest China, this study employs linear regression analysis. Taking Southwest China as the research subject, we constructed a multiple linear regression model incorporating digital economy indicators (including software business revenue, mobile phone penetration rate, and e-commerce development) and tourism development indicators (domestic tourism revenue and domestic tourist arrivals), followed by empirical testing. The results demonstrate that the following indicators significantly and positively impact tourism development in Southwest China: proportion of IT professionals in urban areas, mobile phone penetration rate, broadband internet user ratio, enterprise computer adoption rate, e-commerce penetration rate, and e-commerce transaction volume. Based on these findings, recommendations are proposed to promote deep integration of e-commerce with tourism, strengthen digital talent cultivation, and narrow the urban-rural digital divide. This study aims to provide references for the sustainable development of tourism in Southwest China.*
Keywords: *Tourism; Digital Economy; Southwest China; Regression Analysis.*

Date Of Submission: 25-03-2025	Date Of Acceptance: 04-04-2025

I. INTRODUCTION

In the digital era of the 21st century, the digital economy has emerged as a new driving force for global economic growth. With the rapid development and widespread application of information technologies such as the Internet, big data, and cloud computing, the digital economy has not only transformed traditional business models and consumer habits but also brought unprecedented development opportunities to the tourism industry, a traditional service sector. Particularly in the southwestern region, which is endowed with abundant natural and cultural tourism resources, the enabling effects of the digital economy are especially significant.

As one of the pillar industries in the southwestern region, tourism plays a crucial role in driving regional economic development, promoting employment, and enhancing the region's image. However, the traditional tourism development model faces numerous challenges, such as information asymmetry, low service efficiency, and insufficient market competitiveness. The rise of the digital economy provides new ideas and tools to address these issues. Through digital transformation, the tourism industry can achieve more precise market positioning, more efficient resource allocation, and more personalized service experiences.

This study aims to explore the impact of the digital economy on the development of the tourism industry in the southwestern region and how the digital economy can empower tourism to achieve sustainable regional economic development. To this end, this paper employs linear regression analysis to construct a multiple linear regression model incorporating digital economy indicators and tourism development indicators. Through this research, we hope to provide new perspectives and strategies for the development of the tourism industry in the southwestern region and beyond, contributing to the high-quality development of the tourism sector.

II. Indicator Construction and Data Sources

1. Indicator Construction

In his research on the measurement and driving factors of China's digital economy, Professor Liu Jun pointed out that the three dimensions of informatization development, internet development, and digital transaction development collectively measure the level of digital economic development from the perspectives of foundation and impact. Similarly, Song Guofeng, in his study, used indicators such as telephone penetration rate and the number of internet broadband access ports to explore the influence of the digital economy on the development of tourism economy.

Building on the perspectives of these scholars and considering the focus of this study on the southwestern region, we have summarized our indicators as shown in Table 1. This study refines the digital economy indicator system into three levels: the primary indicator focuses on the overall level of digital economic development; the

secondary indicators are further divided into three dimensions—informatization development, internet development, and digital transaction development; and the tertiary indicators specify concrete metrics under each dimension, such as optical cable density, mobile phone penetration rate, and the proportion of e-commerce. These indicators collectively outline the development profile of the digital economy, providing multi-dimensional data support for analyzing its impact on the tourism industry.

Table 1 Digital Economy Evaluation Indicator System

Primary Indicator	Secondary Indicator	Tertiary Indicator
Digital Economy	Informatization Development	Cable Density
		Proportion of Informatization Practitioners (Urban)
		Telecom Revenue (Billion CNY)
		Software Revenue
	Internet Development	Internet Access Port Density
		Mobile Phone Penetration Rate
		Proportion of Broadband Internet Users
		Proportion of Mobile Internet Users
	Digital Transaction Development	Proportion of Enterprises Using Computers
		Proportion of E-commerce
		E-commerce Transaction Volume

In their research on the measurement and pathways of the integrated development of culture and tourism industries in Shandong Province under the context of the digital economy, Feng Yingmei and Liu Xiaolin highlighted the significance of two major tourism indicators: domestic tourism revenue and domestic tourist arrivals. Based on this perspective, we have constructed our tourism industry indicators. Compared to the multi-level indicator system of the digital economy, the tourism industry indicator system is more focused, primarily revolving around two core metrics: domestic tourism revenue and domestic tourist arrivals. These two indicators are critical for assessing the development level of the tourism industry.

2. Data Sources

Considering the availability of data, this study utilizes panel data from four provincial-level administrative regions in China—Chongqing, Sichuan, Guizhou, and Yunnan—spanning the years 2018 to 2022, totaling 20 datasets, to explore the impact of the digital economy on the development of the tourism industry. Data on the digital economy were sourced from the National Data Official Website and the *China Statistical Yearbook*, while data related to the tourism industry were obtained from the National Data Official Website, the *China Tourism Statistical Yearbook*, and the *China Statistical Yearbook*. To mitigate the effects of heteroscedasticity in the statistical analysis, the data were logarithmically transformed. Due to the lag in some data, missing values for specific years were calculated based on adjacent years to ensure the objectivity and authenticity of the research findings.

During the data collection and analysis process, we ensured the accuracy, reliability, and timeliness of the data. All data underwent rigorous verification and screening to guarantee the validity of the research results. Descriptive statistics of the relevant data are presented in Table 2.

Table 2 Descriptive Statistical Analysis of Data

	N	Min	Max	Mean	Variance
Cable Density	20	276.62	555.85	406.03	6125.04
Proportion of Informatization Practitioners (Urban)	20	0.01	0.03	0.02	0.00
Proportion of Mobile Internet Users	20	0.70	0.82	0.74	0.00
Telecom Revenue (Billion CNY)	20	374.15	7526.73	2567.73	4518528.50
Internet Access Port Density	20	1.63	2.11	1.90	0.03
Proportion of Broadband Internet Users	20	0.18	0.30	0.26	0.00
Software Revenue (Billion CNY)	20	87.91	4841.60	1645.21	2799344.45
Proportion of Enterprises Using Computers	20	31.21	51.16	44.27	47.54
Mobile Phone Penetration Rate (%)	20	96.47	123.30	110.90	38.73
Proportion of E-commerce (%)	20	8.80	13.70	11.27	1.89
E-commerce Transaction Volume	20	1415.40	14206.30	4403.66	10368481.24
Domestic Tourism Revenue (Billion CNY)	20	979.18	12318.86	6886.54	10825899.43
Number of Domestic Tourist Visits (10,000)	20	5456.46	113526.60	58457.09	769641164.08

From the differences observed in the aforementioned data, it is evident that there are regional disparities in both the digital economy and the tourism industry within the southwestern region. Not only is there an imbalance in the level of development, but the pace of development is also uneven.

III. Data Analysis

To delve deeper into the specific impact of the digital economy on the development of the tourism industry in the southwestern region, this study employs the statistical analysis software SPSS to conduct multiple regression analysis, constructing a scientifically robust regression model. In the model construction, we use domestic tourism revenue as the dependent variable to capture the economic benefits of the tourism industry. Simultaneously, we select 11 indicators closely related to the digital economy as independent variables. These indicators span multiple dimensions, including informatization infrastructure, e-commerce development, and internet penetration rate, aiming to comprehensively assess the driving effect of the digital economy on the tourism industry. Through this quantitative analysis method, we aim to reveal the intrinsic relationships between various elements of the digital economy and tourism revenue, providing empirical support for the digital transformation of the tourism industry in the southwestern region. Additionally, the model will account for potential interactions and multicollinearity among variables to ensure the accuracy and reliability of the results. Through this analysis, we hope to offer data-driven decision-making support for policymakers, fostering sustained growth and innovative development in the tourism industry of the southwestern region.

1. Reliability and Validity Analysis
(1) Reliability Analysis

Table 3 SPSS Reliability Analysis

Reliability Statistics	
Cronbach's Alpha	Number of Items
0.712	13

Using SPSS software for analysis, the Cronbach's alpha reliability coefficient was calculated to be 0.712, which exceeds the threshold of 0.7. Additionally, the reliability of each measured dimension was also found to be greater than 0.7. Therefore, the data can be considered highly reliable, and the selection of indicators is deemed reasonable.

(2) Validity Analysis

Table 4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.691
Bartlett's Test of Sphericity	Approx. Chi-Square	70.342
	Degrees of Freedom (df)	15
	Significance	0.000

The data test results show a KMO value of 0.691, with 15 degrees of freedom. The Bartlett's test of sphericity yielded a significance level of 0.000, which is less than 0.001. Therefore, the data exhibits high validity and can reliably support subsequent analysis.

2. Regression model significance test

Table 5 ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	184393438.512	10	18439343.851	7.792	0.002[b]
	Residual	21298650.700	9	2366516.744		
	Total	205692089.212	19			

a. Dependent Variable: Domestic Tourism Revenue (100 million yuan)
b. Predictors: (Constant), E-commerce Transaction Volume, Internet Access Port Density, Telecommunication Business Revenue (100 million yuan), E-commerce Proportion, Informationization Employment Proportion (Urban), Mobile Phone Penetration Rate, Optical Cable Density, Enterprise Computer Usage Rate, Broadband Internet User Proportion, Software Business Revenue.

Table 6 Model Summary

Model	R	R-Square	Adjusted R-Square	Std. Error of Estimate	Change Statistics					Durbin-Watson
					R-Square Change	F Change	df1	df2	Sig. F Change	
1	0.947[a]	0.896	0.781	1538.34871	0.896	7.792	10	9	0.002	2.346

a. Predictors: (Constant), E-commerce Transaction Volume, Internet Access Port Density, Telecommunication Business Revenue (100 million yuan), E-commerce Proportion, Informationization Employment Proportion (Urban), Mobile Phone Penetration Rate, Optical Cable Density, Enterprise Computer Usage Rate, Broadband Internet User Proportion, Software Business Revenue.
b. Dependent Variable: Domestic Tourism Revenue (100 million yuan)

①**Goodness of Fit:** The adjusted R-squared value is 0.781, indicating that the model explains approximately 78.1% of the variance in the dependent variable. This suggests that the model has a good fit. Overall, the model meets a relatively high standard of accuracy, making it suitable for further analysis of influencing factors.

②**F-test:** In the ANOVA table, the F-value of the regression equation is 7.792, with a significance level of 0.002, passing the F-test. Since the probability of the significance test is less than the significance level of 0.05, it indicates a significant relationship between the explanatory and dependent variables.

③**T-test:** The significance levels of multiple indicators are less than 0.1, demonstrating clear statistical significance in the data.

In conclusion, the regression model is overall significant and exhibits a good fit, making it a reliable foundation for further analysis.

3. Analysis of Influencing Indicators

To explore the impact of the digital economy on the development of the tourism industry, we constructed the following regression model. The standardized linear regression equation is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_{10} X_{10} + \beta_{11} X_{11} + \varepsilon$$

In the model:

Y： is the dependent variable, representing domestic tourism revenue.

X_i： are the independent variables, encompassing 11 indicators within the digital economy metrics.

B_i： are the regression coefficients, all derived through calculation.

ε ： is the error term.

This model aims to quantify the relationship between the digital economy and tourism revenue, providing a basis for analyzing how specific digital economy indicators influence the tourism industry.

Table 7 Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
	(Constant)	-21906.042	20155.780		-1.087	.305		
	Fiber optic density	5.449	11.941	.130	.456	.659	.143	7.012
	IT workforce % (urban)	862961.558	305931.254	1.630	2.821	.020	.034	29.018
	Telecom revenue (100M)	-.199	.230	-.129	-.865	.410	.520	1.924
	Software revenue	.000	.000	-1.009	-1.288	.230	.019	53.315
	Internet port density	482.587	5915.033	.024	.082	.937	.137	7.307
	Mobile phone penetration	363.655	184.398	.688	1.972	.080	.095	10.574
	Broadband user %	-111463.961	54918.484	-1.161	-2.030	.073	.035	28.455
	Enterprise computer %	533.396	182.575	1.118	2.922	.017	.079	12.723
	E-commerce %	-1568.310	479.188	-.654	-3.273	.010	.288	3.476
	E-commerce volume	-.693	.318	-.678	-2.178	.057	.119	8.435
a. Dependent variable: Domestic tourism revenue (billion)								

According to the regression coefficients, the following indicators exhibit statistically significant impacts on tourism: Informationization Employment Proportion (Urban), Mobile Phone Penetration Rate, Broadband Internet User Proportion, Enterprise Computer Usage Rate, E-commerce Proportion, and E-commerce Transaction Volume. These results demonstrate that the digital economy actively drives tourism development in Southwestern China by enhancing informatization capabilities, accelerating e-commerce integration, and advancing information technology adoption. These findings provide empirical evidence for policymakers, emphasizing the necessity of promoting digital transformation in tourism and offering new momentum for sustainable sectoral growth.

The Widespread Application of Information Technology Facilitates Tourism Development. The increase in Enterprise Computer Usage Rate reflects the expanding adoption of information technology (IT) in tourism enterprises. This not only improves the convenience and security of tourism services but also enhances the interactivity and experiential quality of tourism products. The rise in Mobile Phone Penetration Rate enables more tourists to access travel information and make bookings via mobile devices, democratizing tourism participation across socioeconomic groups. The Broadband Internet User Proportion ensures faster and more stable online tourism services, facilitating seamless information sharing and elevating tourist experiences. IT applications break geographical barriers, transform traditional marketing models, streamline sales processes, expand market reach, accelerate transaction speeds, and reduce operational costs.

The Critical Role of Informatization Professionals. The growth in Informationization Employment Proportion (Urban) signals enhanced digital skills and innovation capabilities in Southwestern China, which are pivotal for tourism digitalization and service quality improvement. These professionals leverage cutting-edge technologies (e.g., cloud computing, big data analytics, and AI) to optimize the quality and efficiency of tourism products and services, driving technological advancement in the industry. By establishing robust data infrastructure, they enhance the sector's innovation capacity and operational efficiency, significantly boosting total factor productivity in tourism. Furthermore, they contribute to smart tourism city initiatives through the development of digital experiential products (e.g., augmented reality tours) and immersive interactive technologies, strengthening regional tourism competitiveness.

The Catalytic Effects of E-commerce on Tourism. E-commerce integrates online and offline resources, enabling tourism enterprises to modernize operations, optimize resource utilization, and deliver diversified, user-centric products/services. It transcends traditional geographical limitations, expands customer bases, increases economic returns, and empowers data-driven decision-making for agile market responsiveness. The rise in E-commerce Transaction Volume underscores its growing influence in tourism, particularly through platforms offering streamlined bookings for flights, hotels, and attractions. These platforms reduce time and effort for tourists, enhance user experiences, and foster satisfaction and loyalty—key drivers of sustainable tourism growth.

IV. Validation Tests

In the previous analysis, we employed a multiple linear regression model using SPSS software, with digital economy indicators as independent variables and domestic tourism data as the dependent variable. The results demonstrated a statistically significant positive impact of the digital economy on tourism development. This finding not only reveals the intrinsic linkage between the digital economy and tourism but also provides robust empirical support for further exploration of this relationship. To strengthen and validate these conclusions, we now shift our analytical perspective by adoptingdomestic tourist arrivalsas the new dependent variable and reapplying the multiple linear regression framework. We anticipate that digital economy indicators will continue to exhibit significant positive effects on tourist numbers, thereby offering a more comprehensive and nuanced explanation for tourism growth. Through this sequential analytical approach, we aim to holistically elucidate how the digital economy drives tourism prosperity across diverse dimensions.

Table 8 ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	13058262066.512	10	1305826206.651	7.510	.003[b]
	Residual	1564920050.933	9	173880005.659		
	Total	14623182117.444	19			

a. Dependent Variable: Domestic Tourist Arrivals (10,000 person-times).
b. Predictors: (Constant), E-commerce Transaction Volume, Internet Access Port Density, Telecommunication Business Revenue (100 million yuan), E-commerce Proportion, Informationization Employment Proportion (Urban), Mobile Phone Penetration Rate, Optical Cable Density, Enterprise Computer Usage Rate, Broadband Internet User Proportion, Software Business Revenue.

Table 9 Model Summary

Model	R	R-Square	Adjusted R-Square	Std. Error of Estimate	Change Statistics R-Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.945[a]	.893	.774	13186.35680	.893	7.510	10	9	.003	2.248

a. Predictors: (Constant), E-commerce Transaction Volume, Internet Access Port Density, Telecommunication Business Revenue (100 million yuan), E-commerce Proportion, Informationization Employment Proportion (Urban), Mobile Phone Penetration Rate, Optical Cable Density, Enterprise Computer Usage Rate, Broadband Internet User Proportion, Software Business Revenue.
b. Dependent Variable: Domestic Tourist Arrivals (10,000 person-times).

As shown in the table, the F-value of the regression equation is 7.510, with a significance level of 0.003, which passes the F-test. This indicates that the regression model as a whole is statistically significant. Additionally, the adjusted R-squared value (R^2) is 0.774, demonstrating that the model has a good fit and meets a relatively high standard of accuracy. Therefore, it is appropriate to proceed with further analysis of the influencing factors.

The digital economy indicators also have a significant driving effect on domestic tourist arrivals, further confirming the role of the digital economy in promoting the tourism industry. Specifically, the development of the digital economy has effectively boosted the growth of tourism through various channels, such as improving the convenience of information access, reducing transaction costs, and enhancing market transparency. For instance, the application of digital platforms has made booking tourism products and services more convenient, intelligent recommendation systems can provide personalized travel plans based on user preferences, and big data analytics help tourism enterprises better understand market demand and optimize resource allocation. These factors collectively not only enhance the tourism experience but also increase tourist arrivals, thereby substantiating the positive impact of the digital economy on the tourism industry.

V. Conclusions and Recommendations

As shown in the table, the F-value of the regression equation is 7.510, with a significance level of 0.003, passing the F-test. This indicates that the regression model as a whole is statistically significant. Additionally, the adjusted R-squared value (R^2) is 0.774, demonstrating that the model has a good fit and meets a relatively high standard of accuracy. Therefore, it is appropriate to proceed with further analysis of the influencing factors.

Based on these conclusions, the following policy recommendations are proposed:

First, enhance the level of informatization. Strengthen collaboration with higher education institutions to cultivate specialized talents in the field of informatization, while attracting high-end talents both domestically and internationally to elevate the informatization level of the tourism industry. Provide ongoing education and training opportunities for existing practitioners to ensure they can keep up with the latest developments in information technology. Formulate relevant policies to offer incentives for informatization talents, including tax benefits, housing subsidies, and other measures, to attract and retain skilled professionals.

Second, strengthen the application of information technology. Increase investment in broadband networks and mobile communication infrastructure, especially in popular tourist areas, to ensure high-quality network services. Encourage tourism enterprises to adopt the latest information technologies, such as artificial intelligence and virtual reality, to enhance visitor experiences and operational efficiency. While promoting the application of information technology, ensure data security and privacy protection to build consumer trust in digital services.

Third, promote the integration of e-commerce. Support tourism enterprises in establishing or optimizing their own e-commerce platforms to provide one-stop tourism services, including booking, payment, and customer service. Facilitate the integration of online and offline resources by using online platforms to promote offline tourism resources, while leveraging offline experiences to enhance the appeal of online platforms. Strengthen the regulation of the e-commerce market to ensure fair competition and provide high-quality customer service, thereby improving consumer satisfaction.

References

[1].   Liu, J., Yang, Y., & Zhang, S. (2020). Measurement and driving factors of China's digital economy development. Shanghai Journal of Economics, (6).

[2].   Feng, Y., & Liu, X. (2024). Measurement and pathway of cultural-tourism industry integration under digital economy: Evidence from Shandong Province. Journal of Qilu University of Technology, 38(1).

[3].   Liu, C., & Zhang, M. (2024). Mechanism of digital economy in promoting cultural-tourism integration. Tourism Forum, 17(4).

[4].   Tang, R. (2024). Effects and mechanisms of digital economy empowering high-quality collaborative development of cultural-tourism industry: Empirical evidence from Yangtze River Delta. Progress in Geography, 43(10).

[5].   Song, G., & Zhang, Y. (2024). Impact of digital economy on tourism economic development. Tourism Economics, 363(9).