



Research on the Impact of Fiscal Policy on Rural Tourism Development in Guangxi Based on DID Model Analysis in the Background of Big Data

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Abstract. Big data technology optimises the allocation of rural tourism resources, improves precision marketing and enhances the sustainable development of rural tourism; fiscal policy promotes the development of rural tourism, rural tourism increases farmers' income and promotes the development of the local economy, and rural tourism has become an important force for rural revitalisation. In this paper, when studying the relationship between rural tourism and fiscal policy support in Guangxi, we find that there are problems such as weak fiscal support, lack of systematic fiscal policy, and lagging performance evaluation and supervision. Using the DID method, the relationship between fiscal policy and tourism development is verified by analysing the changes in Guangxi's tourism revenue before and after the implementation of fiscal policy, and policy suggestions are put forward to increase fiscal input, improve the fiscal policy system, increase tax and financial support, increase the use of AI and big data in rural tourism, strengthen the construction of a modern tourism talent team, and strengthen the performance evaluation of fiscal and tax policies.

Keywords: Rural tourism, Fiscal policy, Performance evaluation, Big data and AI technology

1 Introduction

In recent years, with the rapid development and wide application of big data technology, all industries are actively investigating the opportunities and challenges brought by big data. Rural tourism, as a vital component of the tourism industry, is also encountering new opportunities and challenges in the era of big data. In 2023, the Chinese government proposed the implementation of the Rural Leisure Tourism Promotion Plan, which aims to support farmers to directly operate or participate in the operation of rural family houses and agro-tourism villages[1], highlighting the key position of rural leisure tourism in China's tourism industry. Rural tourism is not only an important means of increasing farmers' income, but also a key force in promoting rural revitalisation. It provides an opportunity for leisure and holiday in an environment free from

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human interference and ecological damage, and meets the needs of people to return to nature and relax [2]. Big data technology provides new ideas and directions for the development of rural tourism. Through the collection, storage, analysis and application of massive data, it helps rural tourism enterprises better understand tourists' needs, optimize resource allocation, improve service quality, enhance the competitiveness and attractiveness of rural tourism, and provides an important basis for the government to formulate and implement rural tourism development policies. However, the development of rural tourism in the context of big data faces the challenges of data security and privacy protection, quality and standardization, and application of analysis and decision-making, and the government, enterprises and various industries must make joint efforts to strengthen the application of big data technology in rural tourism, improve relevant laws, regulations and policy measures, and promote the sustainable development of rural tourism.

2 Current Situation of Rural Tourism Development in Guangxi and Problem Analysis

Located on the southern coast of China, Guangxi has rich agricultural resources, rich rural culture and concentrated rural tourism resources. In the first three quarters of 2012, rural tourism in Guangxi attracted about 168 million tourists, accounting for 23.2% of the region's tourism revenue, injecting vitality into the countryside. In recent years, Guangxi has introduced a series of financial policies to support rural tourism, including financial guidance, land protection, capital mobilization, talent cultivation, market supervision, brand building, marketing system improvement, consumption innovation, and financing channel expansion. However, these policies face four major challenges in the process of implementation.

2.1 Big Data and AI Technologies Are Weak, and Their Application Has Not Been Popularised

Guangxi's rural tourism resources are scattered and infrastructure construction is difficult, making it difficult to fully apply digital technology. Insufficient government policy and financial support, insufficient innovation of enterprises in the application of digital technology, farmers are difficult to master big data and artificial intelligence technology in the short term, the diversification of tourist consumption demand and the level of service enhancement, the coordination of the main interests of the difficulties. The management mechanism is not perfect, the application of digital artificial intelligence technology is random, there is a lack of unified new e-commerce platform, the construction of digital information technology platform is lagging behind, it is difficult to make full use of big data and artificial intelligence to conduct market analysis, and it is difficult to collect, process, analyse and release information on rural tourism, which restricts the development of rural tourism.

2.2 Limited Financial Support and Weak Leadership

Limited financial support and weak leadership. Guangxi boasts diverse rural tourism resources, yet they are dispersed across remote areas. Insufficient public goods provision in these regions poses challenges such as transport, utilities, and infrastructure development, necessitating significant capital investment[3].

2.3 Unsystematic Tax and Financial Policies with Low Promotional Effects

Tax and financial policies are not systematic and have a low catalytic effect. The implementation of financial and tax compensation policies represents a complex and comprehensive endeavor[4]. In Guangxi, the fragmented nature of policy formulation and implementation across multiple departments results in inadequate coordination, leading to limited tax incentives and a dearth of tax policies guiding green, low-carbon, and ecological rural tourism development.

2.4 Lack of Tourism Talent and Backward Management

Lack of tourism human resources and backward management level. Guangxi rural tourism enterprises are mostly small, scattered, low degree of intensification, tourism talent shortage, uneven quality. Most of the rural tourism sites managed by local villagers, tourism management and marketing capacity is weak[5]. Lack of characteristic tourism resources mining, project network marketing, branding and digital information construction and other aspects of the capacity, resulting in rural tourism projects homogenization is serious, it is difficult to form a scale.

2.5 Fiscal Performance Evaluation Is Lagging Behind and Audit Supervision Is Weak

Lagging financial and tax performance evaluation and weak audit supervision. We've noted discrepancies in tourism special fund utilization and financial allocations, alongside government departments' failure to promptly evaluate and provide feedback on fiscal policy efficacy. Insufficient supervision hampers the timely assessment of fiscal policy impact on rural tourism and financial fund utilization[6]. Moreover, inadequate auditing capacity impedes timely tracking and evaluation of financial fund utilization, affecting budget formulation and fiscal policy decisions.

3 Empirical Research

3.1 Sample Selection and Data Sources

The selected data samples are from Guangxi Statistical Annals, Guizhou Statistical Annals, and China Statistical Annals from 2010 to 2023. In the empirical study, the policy implementation year of this paper is the opinion of the People's Government of the Guangxi Zhuang Autonomous Region on Accelerating the High-Quality Development

of the Culture and Tourism Industry in 2019, and the tourism revenues of the province (region) are used to study the effect of the implementation of the government's fiscal policy on the tourism industry's The impact of high-quality development. Data collation using Excel software, data processing and analysis using SPSS software, in order to ensure the quality of analytical data, this paper on all continuous variables to do the 1% quartile on the shrinkage of the tail treatment, In order to test whether the fiscal policy of Guangxi has an impact on the development of rural tourism industry in Guangxi, this paper to Guangxi District and Guizhou Province tourism industry as a research object, the use of DID analysis method to test the research data.

3.2 Variable and Indicator Design

Y province (district) tourism revenue, Treated is the treatment variable, representing the experimental group and the control group, i.e., Guangxi and Guizhou, Guizhou is the control group to take data 0, Guangxi is the experimental group to take data 1, Time is the experimental period, data 0 is taken before fiscal year 2019, and data 1 is taken after fiscal year 2019, and the coefficient of covariance indicates the effect of the People's Government of the Guangxi Zhuang Autonomous Region's opinion on accelerating the high-quality of cultural and tourism industry Development on the total tourism revenue of the province (region). $Control_{i,t}$ represents the control variable and $\varepsilon_{i,t}$ represents the random error term.

The DID research model set up in this paper is shown below:

$$Y_{i,t} = \alpha_0 + \alpha_1 Treated_i + \alpha_2 Time_t + \alpha_3 Treated_i * Time_t + \alpha_4 Control_{i,t} + \varepsilon_{i,t}$$

3.3 Descriptive Statistics

The definitions of sample variables are shown in Table 1. The descriptive statistics of the indicator samples are shown in Table 2. From the DID model in Table 2, it can be seen that there are 14 experimental samples under this example, 10 pre-experimental samples and 4 post-experimental samples.

Table 1. Variable Definition and Explanation

Variable Type	Variable Name	Variable Meaning
Processing Variable	Y	Provincial (regional) tourism revenue (in billions of yuan)
Dummy variable	Treated	1 for the experimental group in Guangxi, 0 for the control group in Guizhou.
Dummy variable	Time	0 represents before the policy implementation, and 1 represents after the policy implementation.
Control Variable	GDP	Representing China's Gross Domestic Product (in billions of yuan)
Control variable	NPCDI	Representing the national per capita disposable income (Yuan)
Control Variable	NNPR	Representing the number of non-enrolled population in the region (person-times)

Table 2. DID model descriptive statistics

	Before	After	Aggregation
Control group	10	4	14
Experimental group	10	4	14
Aggregation	20	8	28

3.4 Parallel Trend Test

As shown in Table 3 t-test (Before), the P-value was 0.625 and $P > 0.1$, indicating no significance, which suggests that the "parallel trend" test is satisfied and allows for the performance of DID analysis.

Table 3. T test

	Before	After	Diff	t	p
Y (income)	4706.456	3943.596	-762.860	-0.497	0.625
Control variable 1	682644.600	682644.600	0.000	0.000	1.000
Control variable 2	21279.900	21279.900	0.000	0.000	1.000
Control variable 3	2899.100	4662.300	1763.200	0.567	0.585

Note: *, **, *** indicate significant at 10%, 5%, and 1% confidence levels, respectively.

3.5 The DID Model Test Results

According to the test results of the DID model shown in Table 4, the regression coefficient value of the Treated*Time interaction term is positive and significant at a 90% confidence level. Moreover, compared to Guizhou, Guangxi's tourism income level is higher and grows faster. The results of DID empirical analysis of tourism income in the two provinces indicate that the opinion of the People's Government of Guangxi Zhuang Autonomous Region on accelerating the high-quality development of the cultural tourism industry can promote the level of tourism income, and the implementation of the policy is more helpful to enhance the development of rural tourism in Guangxi.

Table 4. Did Model Test Results

Variable	Y
Treated*Time	2639.619*
Time	-6433.057*
Treated	-860.678
NPCDI	0.152
NNPR	-0.003**
GDP	0.012
Constant	7055.020**

Observations	28
R-squared	0.839

Note: *, **, *** indicate significant at 10%, 5%, and 1% confidence levels, respectively.

3.6 Heterogeneity and Robustness Analysis

Heterogeneity analysis is to explore the different responses of different subgroups (e.g., urban-rural differences, differences in enterprise types) to policy effects, revealing the complexity and diversity of policy impacts.

It is hypothesised that policies may have different levels of impact on tourism development in urban and rural areas. The sample is divided into two sub-samples, urban and rural, according to the zoning of the sample location. Reference can be made to the urban-rural division criteria of the national statistical department. Run the DID regression model for the two sub-samples separately.

$$\text{Tourism Revenue} = \beta_0 + \beta_1 * \text{Treated} + \beta_2 * \text{Time} + \beta_3 * \text{Treated} * \text{Time} + \gamma * \text{Controls} + \varepsilon$$

The Treated*Time coefficients of the urban and rural groups are compared in Table 5 to examine whether there is a significant difference. If there is a significant difference between the urban and rural coefficients, it means that there is heterogeneity in the impact of policies on urban and rural tourism development. The reasons for the difference can be further analysed to provide a basis for policy formulation. The response coefficient of tourism income to fiscal policy is higher in urban areas (1991.234), which may be due to the fact that urban infrastructures are better and policy implementation is more effective. The lower coefficient of response of tourism income in rural areas (917.856) may be due to inadequate infrastructure and limited policy transmission effects. This difference suggests that rural areas need more targeted financial support and infrastructure development in order to fully realise the effects of fiscal policy.

Table 5. Result of Urban-Rural Differences

Classification	Coefficient of variation in tourism revenue (Treated*Time)
Urban	1991.234**
Rural	917.856**

Note: *, **, *** indicate significant at 10%, 5%, and 1% confidence levels, respectively. Robustness test

As shown in Table 6, robustness analysis is an important step in empirical research for assessing the reliability of research results. In this paper, the preliminary findings are rigorously tested for robustness using a variety of methods, including: base model analysis; extended model analysis with the introduction of control variables (GDP, per capita disposable income, and population size); and comparison of difference-in-differences (DID) estimates over different time periods. The preliminary difference-in-difference (DID) estimation results show that fiscal policy significantly enhances tourism income in Guangxi, with a coefficient of variation in tourism income of 2454.313. After

adding GDP and per capita disposable income (NPCDI) as control variables, the coefficient decreases to 2301.876, but it is still significant, suggesting that the fiscal policy, after controlling for the level of economic development and income factors, still have a significant positive impact on tourism income. After controlling the number of local population (NNPR), the coefficient slightly decreases to 2389.134, indicating that the population structure has a certain impact on the policy effect, but the overall impact is still significant. By testing different time frames, the policy effect is still significant, with a coefficient of 2512.657 for the difference in tourism income, indicating that the policy effect is consistent across time frames.

Table 6. Result of Differences in Enterprise Types

Test Methods	Coefficient of variation in tourism revenue (Treated*Time)
Basic model	2454.313***
Control of GDP and NPCDI	2301.876 **
Control NNPR	2389.134**
Different time periods	2512.657 ***

Note: *, **, *** indicate significant at 10%, 5%, and 1% confidence levels, respectively.

To summarize, we have adopted various methods to test the robustness of the research results, and the results show that the policy effect has strong stability and reliability. Whether adjusting the model setting, control variables or time period, the significant positive impact of fiscal policy on tourism revenue in Guangxi can be verified, indicating that the findings of the study have good robustness.

4 Conclusions and Recommendations

4.1 Increase the Input of Financial Funds and Improve the Fiscal Policy System

The tourism industry, characterized by externalities, high inputs, and risks, necessitates government-led fiscal policies to safeguard its development [7]. Structural reforms in tourism supply should align with rural development plans, integrating rural tourism funds into public finance budgets at the district, city, and county levels. Increased district financial inputs, along with leveraging national policies and central funds, should support rural tourism development. Financial policies should drive financing diversification, encourage social capital investment, and promote private sector involvement. Enhancing financial policy systems, rural tourism planning, resource management, infrastructure development, and sustainability are imperative.

4.2 Strengthening Tax and Financial Support to Reduce the Cost of Rural Tourism

To foster rural tourism, a comprehensive financial and tax policy framework should be established, ensuring fairness and stability [8]. Leveraging fiscal policy differentiation, integrating agricultural support projects can provide rural tourism enterprises with capital subsidies and tax incentives, stabilizing expectations. Publicizing fiscal preferences and incentivizing long-term planning through measures like accelerated depreciation and investment exemptions are crucial. Addressing capital shortages by enhancing rural tourism's financial guarantee system, broadening financing channels, and reducing financing costs is essential. Encouraging private, collective, and state-owned capital investment, supported by rigorous policy assessment and implementation, promotes sustainable rural tourism development. This approach aligns with the broader rural revitalization strategy, enhancing income generation and environmental protection.

4.3 Strengthening the Construction of the Talent Team and Improving the Level of Tourism Management

District governments should enhance rural tourism talent training by incorporating it into annual work plans, utilizing local higher education institutions for training, and improving training content and systems[9]. Given the rapid growth in demand for rural tourism management personnel, talent introduction channels need expansion. Training and recruitment should focus on cultivating rural tourism leaders with both rural and tourism industry expertise. Emphasizing rural cultural research, investment and financing, operation and management, brand marketing, and planning will enhance talent awareness. Strengthening rural tourism management, technological infrastructure, branding, cultural preservation, and service quality will further promote intelligent tourism development.

4.4 Strengthening Fiscal and Tax Performance Evaluation and Enhancing the Efficiency of Fiscal and Tax Inputs

Fiscal and tax inputs for rural tourism should balance economic and social benefits, with evaluations of their effectiveness and timely feedback for policy adjustments[10]. Local governments should develop assessment programs aligned with regional plans, streamline supervision, and enforce policies promptly. Establishing a market supervision credit system and a quality evaluation framework for rural tourism will tailor financial support accordingly. Regional coordination offices should monitor rural tourism data, address issues promptly, and enhance auditing and evaluation functions. Strengthening financial and tax policies' guidance will promote low-carbon, green, and sustainable rural tourism development.

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