International Journal of Sociologies and Anthropologies Science Reviews
Volume 4 Issue 2: March-April 2024: ISSN 2985-2730
Website: https://so07.tci-thaijo.org/index.php/IJSASR/index
DOI: https://doi.org/10.60027/ijsasr.2024.3658

Analysis on the Influence of Rural Tourism on Farmers' Income in Western Hunan

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Received 29/09/2023 Revised 12/10/2023 Accepted 25/10/2023

Abstract

Background and Aim: In 2017, the 19th National Congress of the Communist Party of China first proposed the Rural Revitalization Strategy, and two months later, the Rural Work Conference clarified the three goals of implementing this strategy, pointing out that comprehensive rural revitalization should be achieved by 2050. The vitality of rural areas is linked to the vitality of the nation; the strength of the rural areas is tied to the strength of the nation. Implementing the Rural Revitalization Strategy is a significant measure to promote national prosperity and people's happiness, achieve common prosperity, and construct a modern economic system. It points the way to solving the "issues relating to agriculture; rural areas and farmers" and serves as the primary focus in the new era. With China's victory in the fight against poverty in 2021, the focus on the "issues relating to agriculture; rural areas, and farmers" has shifted from poverty alleviation to comprehensive rural revitalization. The purpose of this study is to assess the relevant factors that affect rural tourism and try to improve the income of farmers in western Hunan.

Materials and Methods: Based on the panel data of Western Hunan from 2010 to 2020, this paper conducts an empirical study on the influence mechanism of rural tourism development on farmers' income increase in western Hunan. This study uses primarily quantitative analysis methods. It is mainly divided into literature analysis and statistical analysis methods, arranged as follows: Firstly, relevant scholarly research findings and literature sources about the subject matter are retrieved from reputable academic databases such as CNKI (China National Knowledge Infrastructure), Wanfang, and Baidu Academic. The perspectives of domestic and international scholars are elucidated, the existing literature landscape is organized, and the research framework of this article is outlined. Subsequently, the theoretical foundations relevant to the study are identified, and conceptual definitions are formulated. Lastly, the fundamental principles of the theoretical foundations are distilled and enhanced, and a concise summary is provided, culminating in the construction of the theoretical model for this article. Finally, explores the relationship between the rural tourism industry and farmers' income, and takes infrastructure construction, urbanization level, and science and technology level as the variables of mediating effect. Through the statistical analysis software SPSS24 in quantitative research, the reliability and validity of variables were tested, and then statistics and correlation analysis were described, finally, regression analysis was carried out, and data charts were displayed.

Results: The results of the model analysis show that the development of rural tourism in western Hunan plays a significant role in promoting the farmers' income. Rural tourism development can not only comprehensively promote the urbanization process, and effectively improve the rural scientific and technological level of Western Hunan, but also contribute to the construction of characteristic ecological civilization and human capital level of western Hunan, and then promote the increase of farmers' income.

Conclusion: Therefore, to deepen the promotion effect of rural tourism development on farmers' income, we

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should first improve the level of rural science and technology and promote the non-agricultural transfer of the rural surplus labor force. Secondly, we should pay attention to the protection of the rural ecological environment and promote sustainable development. At the same time, human capital investment should be strengthened to enhance the quality of farmers themselves. Finally, the government still needs to increase financial support and improve infrastructure construction.

Keywords: Rural Tourism; Farmer Income; Mediation Effect Model

Introduction

From its inception with the "Xu Jia Da Yuan" in 1986, China's rural tourism has journeyed through 36 years, witnessing the transformative progress of China's countryside from underdevelopment to revitalization; guiding Chinese farmers from poverty to prosperity (Ashley C, 2005) and driving the transition of Chinese agriculture from low productivity to high efficiency and modernization. From the birth of "Xu Jia Da Yuan" agritourism to the inclusion of rural tourism in the rural revitalization strategy, rural tourism in China has gradually become standardized, high-quality, and mature (Binyamin et al., 2020). The Central Committee of the CPC's attention to the "issues relating to agriculture; rural areas and farmers" has paved the way for the development of rural tourism, providing robust support in various aspects such as industry, ecology, and production (Lane, Bernard, 1994). Meanwhile, the No.1 Central Document also emphasized, for the first time from an industrial perspective, the importance of agricultural supply-side structural reform and encouraged the vigorous development of the rural tourism industry (Iorio, M., & Corsale, A., 2018). As the saying goes, "When one industry prospers, all prosper." Rural tourism has gradually integrated with primary, secondary, and tertiary industries, becoming a reliable safeguard for farmers' stable income growth (Zhou Ronghua, Xiang Yin, Zhang Xuebing, 2012).

This study focuses on the Western Hunan. Historically, the economic development of Western Hunan has lagged, and it is part of the Wuling Mountain area, one of the 14 contiguous areas with extreme poverty in China. However, Western Hunan is also famous for its breathtaking scenery and minority ethnic culture, attracting tourists from all over the country (Kheiri J, Nasihatkon B., 2016). By 2020, the number of tourists received in Western Hunan had reached 163 million, with tourism revenue of 151.7 billion RMB, and tourism accounted for 47% of GDP (Lane, Bernard., 2002). Tourism has become the pillar industry of Western Hunan, and with the boost from rural tourism, by March 2020, all eight counties and cities in Western Hunan Prefecture, two districts and two counties in Zhangjiajie City, and 13 impoverished counties and urban areas in Huaihua City had been lifted out of poverty (Kheiri J, Nasihatkon B, 2016). The per capita disposable income of rural residents had reached 12,332 RMB. Rural tourism in Western Hunan started early and developed well, and is well-known nationwide; moreover, tourism is an essential driving force for the region's economic growth and plays a vital role in improving farmers' lives and raising their income. Additionally, Western Hunan is a typical area where ethnic minorities live in compact communities, giving it unique characteristics (Tang Lijuan, 2021).

In summary, to quickly lift farmers out of poverty and achieve common prosperity, it is necessary to identify the mechanisms by which rural tourism affects farmers' income and provide relevant policy support to support the development of local rural tourism. Therefore, choosing Western Hunan as the

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research area has certain typicality and practical significance.

Objectives

Based on the research on the impact of tourism industry development on farmers' income in Western Hunan, this study thoroughly analyzes the mechanism through which various factors related to tourism industry development affect farmers' income. The study aims to enrich the theoretical framework of industrial economics in China, with the tourism industry as a representative. The study examines various factors influencing farmers' income and constructs a theoretical framework suitable for promoting farmers' income in the context of tourism industry development in Western Hunan.

Through the analysis of a mediation model, this study identifies the relevant factors influencing farmers' income and investigates how these factors facilitate local farmers' income during the process of tourism industry development in Western Hunan. Furthermore, it proposes strategies to increase local farmers' income in response to these influencing factors.

Literature review

Ashley (2005) took Namibia, a developing country, as an example and analyzed the relationship between rural tourism development and rural income from the perspective of sustainable development. Rural tourism broke through the shackles of a single livelihood mode of farmers and played an important role in improving the material life of farmers and enriching the rural cultural life. In addition, he also emphasized the positive significance of the government in promoting rural tourism.

Chiappa, G.D., et al (2016) studied the economic and social development of rural tourism in early America and the government's implementation of the rural reconstruction program, and showed that rural tourism played a decisive role in stabilizing employment, mobilizing rural households to get out of poverty, and promoting household income.

Nasihatkon (2016) conducted an in-depth investigation of some European rural tourism projects through empirical research to obtain relevant data, and the results showed that rural tourism can increase the competitiveness of farmers' livelihood, reduce the poverty caused by natural disasters, and provide a broader development space for rural workers.

Giaccio, V., Giannelli, A., & Mastronardi, L. (2018) analyzed the income sources of Italian farm tourism enterprises based on data from 365 Italian farms, believing that some economic variables (food services, direct sales, and public subsidies) determined the increase in agricultural income, while the increase in the number of domestic employees may hurt this income.

Deller (2010) Rural tourism can lead to a serious gap between the rich and the poor. Due to the difference in basic accumulation and resource endowment, high-income families can gain more benefits from rural tourists, thus forming a sharp contrast with farmers with fewer resources. However, most scholars believe that rural tourism can increase farmers' income overall and narrow the income gap due to its inclusive nature(Zhao Lei, Zhang Chen, 2018). From a macro perspective, the economic strength of countries that develop tourism is stronger than that of countries that do not develop tourism. However, from the perspective of individual farmers, the current situation of income inequality is intensifying. Due to the basic factors of the local economy and limited capital investment, most of the income from

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tourism is captured by capital investors. The benefits for local farmers are relatively small (Baylari & Montazer, 2009).

Conceptual Framework

Rural tourism

Domestic and foreign experts and scholars' research on rural tourism is becoming more and more mature, and many domestic and foreign scholars have different definitions of rural tourism. Through analysis and comparison, this paper selects the concept definition of rural tourism connotation made by the China International Rural Tourism Development Forum (Wen & Ye, 2014). The forum defines rural tourism from three aspects: First, the core of rural tourism is to have a unique rural folk culture, to enhance the quality and attractiveness of rural tourism; Secondly, to highlight the local nature, farmers should be the main force to carry out rural tourism management activities; Finally, the target tourist source of rural tourism should be located in urban residents to realize the beautiful vision of urban residents to experience rural life. Generally speaking, the differences between rural tourism and tourism are as follows: first, rural tourism activities are carried out in rural areas, while traditional tourism activities are carried out in scenic spots; Second, rural tourism contains local flavor and farmers are an important force to participate in the development, while traditional tourism focuses on highlighting the characteristics of history, culture, and natural landscape, and most of the participants in tourism development are industrial and commercial entities or government entities with strong capital. Third, the target tourist source of rural tourism is mainly located in the surrounding urban residents, while traditional tourism is for the majority of tourism enthusiasts, the target tourist source is abundant; Therefore, there are corresponding differences and connections between rural tourism and traditional tourism. In terms of the types of rural tourism, rural tourism can be divided into very different types according to different criteria(Wu, Y., Yang, G., & Wu, X. 2009). For example, according to the classification of tourist experience, rural tourism has three types of experience types: sightseeing experience type, farm experience type, and folk experience type; According to the location characteristics of rural tourism destinations, rural tourism can be divided into three types: urban and suburban type, scenic area and marginal type. According to the development categories of rural tourism projects, there are many types, such as dining and lodging type, folk customs type, sightseeing experience type, knowledge popularization type, etc. According to the function classification of rural tourism, it can be divided into ecological type, participation type, business type, education type, recreation type, dining type, purchasing type, and comprehensive type. Based on the comprehensive analysis of the categories of tourists' experience, the development mode of rural tourism, the functions carried by rural tourism, and the geographical location of tourist destinations in Bohu County, combined with the factors of local society, culture, and tourism resources, it is considered that rural tourism in Bohu County is a comprehensive rural tourism that integrates dining, sightseeing and picking, and rural folk custom experience (Wen, L., & Ma, X. 2011).

Farmers' income

Farmer income is the basic index to understand the quality of life of farmers, which refers to the sum of income obtained by rural residents through production and operation or provision of labor

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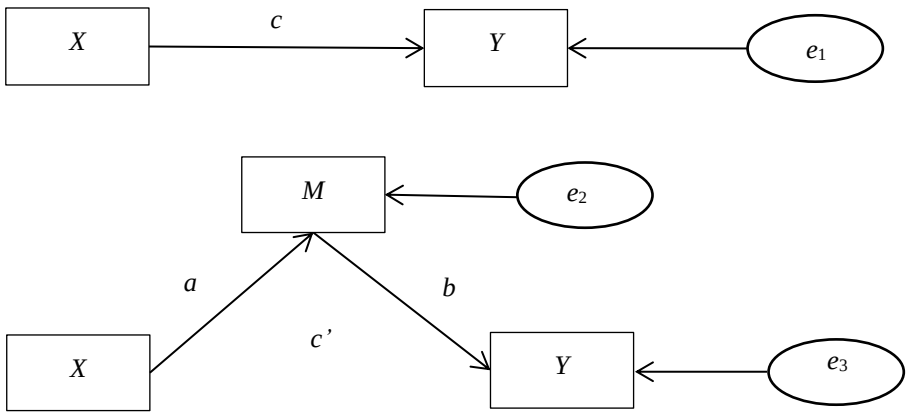
services. According to the income sources, farmers' income mainly includes the following four aspects: First, the product or monetary income obtained from production and operation activities is the household business income, which is obtained through the following ways: the income obtained from rural residents engaged in agricultural product production or operating the service industry of individual businesses on the platform of land; Second, the remuneration earned by providing labor or services is wage income, which is mainly obtained through the following ways: remuneration earned by engaging in labor production in enterprises or business individuals; Third, the income that rural residents can obtain without paying the cost of labor is the transfer income, which is mainly manifested in: agricultural subsidies, livestock and poultry subsidies, agricultural machinery subsidies, subsistence allowances, employment support funds and other national fiscal policy subsidies and social donation funds; Fourth, the income obtained through land transfer, agricultural machinery leasing, house leasing, capital borrowing and storage, etc., is the property income; It is generally believed that household business income and wage income are important sources of farmers' income. The net income of farmers can be calculated from the total income of farmers minus the expenditure, and the function of the net income of farmers is mainly manifested in the direct use of various production and construction activities. The per capita net income of farmers refers to the data index obtained according to the average family population or regional population, which can intuitively show the average income level of rural residents or rural residents in a region (Tang, L. 2021).

Intermediary effect model

When the influence of independent variable X on dependent variable Y is considered, if X influences Y by influencing variable M, M is called the mediator or mediating variable (Reeder and Brown. 2005). The influence of X on Y through the mediating variable M is called the mediation effect. Thus, in the causal path from the independent variable X to the dependent variable Y, the mediating variable is in the middle. It can also be said that the mediating variable transmits the effect of the independent variable on the dependent variable. Moreover, the mediating relation also implies the sequence of variables in time, that is, the occurrence of X precedes M, and the occurrence of M precedes Y (Nosratabadi, S., & Drejeris, R. 2016).



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$$Y = cX + e_1$$

$$\longrightarrow$$

$$M = aX + e_1$$

$$Y = c'X + bM + e_3$$

Methodology

This study uses primarily quantitative analysis methods. It is mainly divided into literature analysis and statistical analysis methods, arranged as follows:

Literature analysis

Firstly, relevant scholarly research findings and literature sources about the subject matter are retrieved from reputable academic databases such as CNKI (China National Knowledge Infrastructure), Wanfang, and Baidu Academic. The perspectives of domestic and international scholars are elucidated, the existing literature landscape is organized, and the research framework of this article is outlined. Subsequently, the theoretical foundations relevant to the study are identified, and conceptual definitions are formulated. Lastly, the fundamental principles of the theoretical foundations are distilled and enhanced, and a concise summary is provided, culminating in the construction of the theoretical model for this article.

Statistical analysis

Finally, explores the relationship between the rural tourism industry and farmers' income, and takes infrastructure construction, urbanization level, and science and technology level as the variables of mediating effect. Through the statistical analysis software SPSS24 in quantitative research, the reliability and validity of variables were tested, and then statistics and correlation analysis were described, finally, regression analysis was carried out, and data charts were displayed.

Results

Theoretical hypothesis

Rural Tourism Promotes the Increase of Farmers' Income

Firstly, tourists directly purchasing goods and services promotes an increase in farmers' income. Secondly, rural tourism fosters employment opportunities for farmers, leading to higher wages and business-related income. Finally, the government's fiscal support policies for agriculture directly provide economic incentives for farmers (Wu et al., 2009).

In light of these influences, this study proposes the hypothesis H_1: The development of rural tourism can stimulate an increase in farmers' income.

Rural tourism industry improves rural infrastructure and promotes farmers' income growth

The development of rural tourism promotes the development of infrastructure for rural production, life, and social development, such as the development of communication and transportation

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industries in rural areas, which promotes rural economic growth and goods transportation. The level of education, medical care, public health environment, and other factors determine the development prospects of the scenic area, which is beneficial to the development of the rural economy and the increase of farmers' income (Tang, 2021).

The development of rural tourism has promoted the improvement of regional infrastructure, leading to the formation of growth poles. The formation of growth poles can effectively drive regional economic growth and indirectly contribute to the increase of farmers' income. Based on this, hypothesis $2is$ proposed: that the development of rural tourism can effectively improve regional infrastructure construction, thereby promoting the increase of farmers' income.

Rural tourism development promotes new urbanization and increases farmers' income

The development of rural tourism has played an important role in promoting the new urbanization process in rural areas of Western Hunan. Firstly, Western Hunan has abundant ecological tourism resources, and the aggregation of population, resources, and industries based on its resource advantages has made tourism the leading and pillar industry to drive regional economic growth. Secondly, the considerable economic benefits brought by the rural tourism industry and the increasing demand for optimizing the industrial structure in rural areas have driven the development of related industries, promoting non-agricultural production and labor force transfer in rural areas, which is beneficial to improving the production efficiency and resource utilization and narrowing the urban-rural development gap. Finally, it can achieve the transformation from traditional countryside to beautiful countryside and new rural areas (Wen & Ma, 2021). Promoting the process of new urbanization is conducive to narrowing the urban-rural income gap, indirectly affecting the increase of farmers' income. Given this, hypothesis H_3 is proposed: that the development of rural tourism can promote the process of rural urbanization and thereby promote an increase in farmers' income.

Rural tourism development promotes technological progress and increases farmers' income

According to the "Dual Economy Structure Theory" proposed by British economist Lewis in 1954, a portion of farmers will transition to the industrial sector. The development of rural tourism has enhanced the level of science and technology in rural areas, leading to a gradual diversification of industries in these regions. The relative income gap between various industries in the rural economy and the diversification of market demand have further triggered changes in the rural labor structure. This promotes the non-agricultural transition of surplus rural labor, broadening the avenues for farmers to earn income and indirectly affecting the growth of farmers' income (Weng et al., 2011).

Given this, hypothesis H_4 is proposes that the development of rural tourism can promote the improvement of rural scientific and technological levels, which in turn can contribute to the increase of farmers' income.

Model setting and research steps

Based on the previous hypothesis analysis, this paper adopts a mediating effect model to examine the influence mechanism of rural tourism development on farmers' income growth using infrastructure development, urbanization, and technological level as mediating variables. Drawing on the approach proposed b Wen and Ye (2014), the meetin is considered as follows: $Y_{it} = \alpha_0 + \alpha_1 T_{it} + \alpha_2 C_{it} + \gamma_1$

(1) $M_{it}\beta_0 + \beta_1 T_{it} + \beta_2 C_{it} + \gamma_2$(2) $Y_{it} = \theta_0 + \theta_1 T_{it} + \theta_2 M_{it} + \theta_3 C_{it} + \gamma_3$(3)

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In this equation, Y_{it} represents the income of farmers in region i at time t; T_{it} represents the level of rural tourism development in region i at time t; M_{it} represents the mediating variable; C_{it} represents the control variable; γ represents the residual term; $\alpha_1$represents the total effect of the independent variable T on the dependent variable Y; $\beta_1 \times \theta_2$represents the indirect effect, or mediating effect, of the independent variable T on the dependent variable Y through the mediating variable M; and θ_1 represents the direct effect of the independent variable T on the dependent variable Y after controlling for the influence of the mediating variable M. The model map of the mediating effect of rural tourism on farmers' income is shown in Figure 7 below.

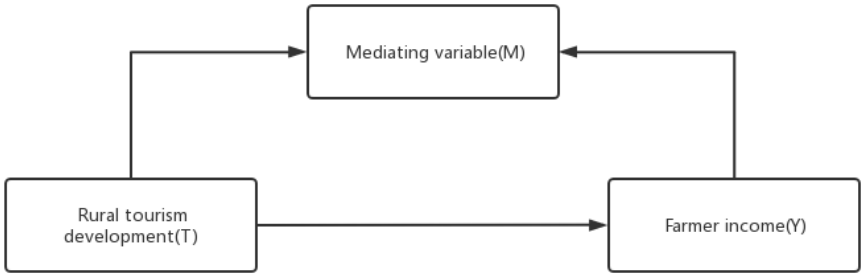

Figure 1: Mediation effect model of the impact of rural tourism on farmers' income

This study conducted a step-by-step test on equations (1) to (3) using the mediation test method. The specific steps are as follows:

Step 1: After controlling the effect of the mediating variable, examine whether the independent variable T has a significant impact on the dependent variable Y, that is, whether the coefficient α_1 is significant. If it is significant, it may indicate the presence of a mediating effect;

Step 2: Test the significance of coefficients $\beta_1$and θ_2, if both are significant, it indicates the presence of a significant mediating effect and can proceed to the fourth step.

Step 3: If the coefficient testing results in step 2 are not significant, then the Bootstrap method [**] is used to test whether $\beta_1 \times \theta_2 = 0$. If it is established, then the mediating effect is significant, and the analysis can continue to step 4. If not, the analysis is terminated.

Step 4: Test the coefficient θ_1. If it is significant, the direct effect is significant and there is a partial mediating effect. If not, there is a complete mediating effect.

Variable specification

Dependent variable: The dependent variable in this study is farmers' income, represented by the per capita disposable income of rural residents.

Independent variable: The independent variable in this study is rural tourism development, represented by the number of tourists received.

** Bootstrap sampling test: This refers to whether the 95% confidence interval of the product of regression coefficient a and regression coefficient b (a*b) includes the number zero. If the 95% confidence interval does not include zero, it suggests that a mediating effect exists. Conversely, if the 95% confidence interval does include zero, it signifies the absence of a mediating effect

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Mediating variables: The mediating variables in this study are the level of infrastructure development, urbanization level, and technological level. The level of infrastructure development is represented by alternative indicators such as the length of highways, mobile phone users, rural electricity consumption, the number of books in public libraries, and the number of health institutions. The comprehensive index of infrastructure development in the study area is obtained by objectively weighting the above five indicators based on the entropy method, as shown in Table 1 below; In this paper, we have borrowed the approach ofผิดพลาด! ไม่พบแหล่งการอ้างอิงand selected four indicators(Pang and Yang 2021), namely the full-time equivalent of R&D personnel[R&D personnel full-time equivalent: the sum of the number of full-time personnel plus the number of part-time personnel converted to full-time personnel based on workload.], the number of valid invention patents, internal expenditure on R&D funds and the total power of agricultural machinery, and assigned them with objective weights based on the entropy method to obtain a comprehensive index of the level of science and technology in the study area, as shown in Table 2 below; the indicator of urbanization level was selected as the proportion of urban population to the total population.

Table 1: Comprehensive System of Indicators for Infrastructure Development

Item	**Information entropy value (e)**	**Information utility value (d)**	**Weight coefficient (W)**
Rural electricity consumption (10,000 kWh)	0.9406	0.0594	10.18%
Length of highways (km)	0.8823	0.1177	20.17%
Number of mobile phone users (10,000 households)	0.9019	0.0981	16.82%
Number of books in public libraries (1,000 volumes)	0.8938	0.1062	18.21%
Number of health institutions (units)	0.7980	0.2020	34.62%

Table 2: Comprehensive Indicator System of Scientific and Technological Level

Item	Information entropy value (e)	Information utility value (d)	Weight coefficient (W)
Total power of agricultural machinery (10,000 kW)	0.9068	0.0932	20.55%
R&D personnel full-time equivalents (person per year)	0.8965	0.1035	22.84%
Internal R&D expenditure (10,000 CNY)	0.8695	0.1305	28.78%
Number of valid invention patents (pieces)	0.8738	0.1262	27.83%

4. Control Variables. The control variables in this study are human capital, level of

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industrialization, and ecological civilization construction. Human capital is measured by the average years of education of the population aged 15 and above in the study area; the level of industrialization is measured by the proportion of industrial-added value to GDP; and ecological civilization construction is measured by the number of units in the environmental protection industry. The above variables and measurement indicators are shown in Table 3 below.

Table 3: Variables and Measurement Indicators

Variable Type	Variable Name	Symbol	Measurement Indicator
Dependent variable	Farmer's income	Y	Disposable income of rural residents
Explanatory variables	Rural tourism development	T	Number of tourists received
Mediating variable			
Infrastructure	I		Calculated by the entropy method
	Urbanization rate	U	Urban population as a proportion of the total population
Technological level	K		Calculated by the entropy method
Control variable			
Human capital	H		Average number of years of schooling
Construction of ecological civilization	E		units of the environmental protection industry
Level of industrialization	G		Share of industrial value added in GDP

Data sources and descriptive statistics

As Zhangjiajie City and Western Hunan Prefecture have relatively early and well-developed rural tourism and strong representativeness, this study selects panel data from 2010 to 2020 in Western Hunan region (Western Hunan Autonomous Prefecture and Zhangjiajie City) for empirical research. The main data sources are the Hunan Provincial Bureau of Statistics, the Statistical Bureau and Tourism Bureau of Western Hunan Tujia and Miao Autonomous Prefecture, the Statistical Bureau and Tourism Bureau of Zhangjiajie City, the sixth and seventh national population censuses, and the EPS data platform. The data is reliable and authentic. Due to the lack of some indicators for measuring the level of technology in Western Hunan Prefecture and Zhangjiajie City in 2010, linear interpolation was used to fill in the missing data *[Linear Interpolation: A method of determining the value of an unknown quantity between two known quantities by using a straight line connecting the two known values.]*. After preliminary processing of the original data, this study uses SPSS24 software for empirical analysis.

Before conducting empirical analysis, simple descriptive statistics of the variable data are presented in Table 4. The average value of farmers' income is 7024 yuan, with a maximum value of 11538 yuan and a minimum value of 3173 yuan, indicating a significant increase in farmers' disposable income over the eleven years. The variation in the minimum and maximum values of the number of tourists received in the Western Hunan area indicates that the rural tourism industry in Western Hunan has developed rapidly and vigorously in the past decade. The mean and extreme values of the composite indexes of infrastructure and technology, which are constructed by the entropy method as the mediating variables, show a significant difference in the development of infrastructure and technology in Western

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Website: https://so07.tci-thaijo.org/index.php/IJSASR/index
DOI: https://doi.org/10.60027/ijsasr.2024.3658

Hunan. In addition, the standard deviation also indicates significant differences within the group in human capital and ecological civilization development in Western Hunan.

Table 4: Descriptive Statistics

	Number of cases	Minimum	Maximum	Mean	Standard deviation
Y	22	3173.00	11538.10	7024.4662	2600.54312
T	22	962.84	6721.28	2828.0686	1787.15600
I	22	0.03	.97	0.3587	0.26789
K	22	0.02	1.00	0.3413	0.25494
H	22	8.01	9.27	8.5841	0.32352
U	22	0.35	0.52	0.4348	0.05249
G	22	0.08	0.35	0.2198	0.07192
E	22	9.00	63.00	30.4091	21.86900

Discussion

The impact of rural tourism development on farmers' income

Before conducting the mediation analysis, we briefly explored the relationship between rural tourism development and farmers' income by conducting a regression analysis, as shown in Table 5 below. The model's R-squared value is 0.856, indicating that rural tourism development can explain 85.6% of the variation in farmers' income, and the regression equation is significant based on the determination coefficient. At the same time, the model passed the F-test ($F=119.353$, $p=0.000<0.05$), indicating that rural tourism development will inevitably have an impact on farmers' income. Therefore, the regression coefficient of rural tourism development is 1.347 ($t=10.925$, $p=0.000<0.01$), indicating a significant positive relationship between rural tourism development and farmers' income.

Table 5: Regression result

	Unstandardized Coefficients		Standardized Coefficients	t	R^2	Adjusted R^2	F
	B	Standard error	Beta				
Constant	3216.002	409.695	-	7.85	0.856	0.849	F (1,20)=119.353 p=0.000
T	1.347	0.123	0.925	10.925			
Dependent variable： Y							
D-Wvalue：1.811							
* p<0.05 ** p<0.01							

Note: T- Rural tourism development; Y- Income (CNY)

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According to the Hausman test results, the null hypothesis of the random effects model is rejected because the p-value is less than 0.05. Therefore, this article adopts a fixed-effects model for estimation. To eliminate dimensional relationships between variables and improve the comparability of data, this article standardized the data before constructing the following models.

Mediating effects of infrastructure

According to Table 6, in Model (1), the coefficient of rural tourism development is 0.57, indicating a significant positive effect on farmers' income growth at a 5% confidence level, which shows that rural tourism has a certain promoting effect on increasing farmers' income. In Model (2), the regression coefficient of infrastructure construction is 0.00009, which is significant at a 5% confidence level, indicating that the development of rural tourism promotes the improvement and development of rural infrastructure. However, Model (3) shows that the regression coefficient of farmers' income on infrastructure construction is 4549.03, which is not significant, indicating that the effect of infrastructure construction on increasing farmers' income is not significant. Therefore, the transmission pathway of rural tourism development → infrastructure construction → farmers' income growth are not established, and hypothesis $2\ is$ not supported.

Table 6: Mediating effects of infrastructure

	Model (1) Y	**Model (2) I**	**Model (3) Y**
constant	-20710.61 (-1.93)	-1.33 (-1.35)	-14678.75 (-1.38)
T	0.57** (2.96)	0.00009** (5.12)	0.16 (0.56)
I			4549.03 (1.82)
E	38.21** (3.14)	0.01** (6.19)	7.02 (0.34)
G	-8693.67 (-1.68)	1.04* (2.20)	-13425.22* (-2.44)
H	3130.49* (2.62)	0.12 (1.06)	2604.15* (2.25)
R^2	0.94	0.95	0.95
Adjusted R^2	0.92	0.94	0.93
F value	F(4,17)=63.30,p=0.00	F (4,17)=81.94,p=0.00	F (5,16)=58.24,p=0.00
*** p<0.05 ** p<0.01 (t values in parentheses)**			

Note: T- Rural tourism development; I- Infrastructure; E- Ecological civilization; G- Industrialization; H- Human capital; Y- Income

Mediating effects of urbanization

Based on the results in Table 7, the mediation effect of urbanization was tested. Model (1) shows that the regression coefficient of rural tourism development, α_1, is significant at the 5% level. Models (2) and (3) test the coefficients β_1 and θ_2 respectively. The estimated value of β_1 is 0.000012, significant at the 10% level. The estimated value is is38611.10, significant at the 5% level. Both $\beta_1$and θ_2 are significant, indicating a significant mediation effect (the indirect effect regression coefficient is $\beta_1 \times \theta_2 = 0.000012 \times 38611.1 = 0.49$). This suggests that a one-standard-deviation increase in rural tourism development will result in a 0.49 increase in farmers' income through the mediating effect of urbanization. The coefficient θ_1 in Model (3) is 0.08 and not significant, indicating that there is no

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direct effect, and urbanization completely mediates the impact of rural tourism on farmers' income, with a mediation effect of 100%. The continuous development of rural tourism has driven rural consumption, industrial integration, and upgrades to the employment structure, providing a strong driving force for regional urbanization. Therefore, the transmission pathway of rural tourism development → urbanization → farmers' income growth is established, and hypothesis H_3 3 is supported.

Table 7: Mediating effects of urbanization

	Model (1) Y	Model (2) U	Model (3) Y
constant	-20710.61 (-1.93)	0.03 (0.11)	-21780.90** (-4.38)
T	0.57** (2.96)	0.00* (2.86)	0.08 (0.72)
U			38611.10** (7.97)
E	38.21** (3.14)	0.00 (1.89)	17.66* (2.85)
G	-8693.67 (-1.68)	-0.23 (-1.95)	346.70 (0.13)
H	3130.49* (2.62)	0.05 (1.71)	1303.13* (2.18)
R^2	0.94	0.92	0.99
Adjusted R^2	0.92	0.9	0.98
F value	F(4,17)=63.30,p=0.00	F(4,17)=47.12,p=0.00	F(5,16)=249.43,p=0.00
	* p<0.05 ** p<0.01 (t values in parentheses)		

Note: T- Rural tourism development; U- Urbanization; E- Ecological civilization; G- Industrialization; H- Human capital; Y- Income

Mediating effects of scientific and technological level

After testing the mediating effect of the technological level, the results are presented in Table 8. In Model 1, the regression coefficient of rural tourism development (α_1) is 0.57, which is significant at the 5% level. In Model 2, the regression coefficient of the technological level is 0.00009. In Model 3, the regression coefficient of farmers' income on the technological level is 6107.87, which is significant, indicating that rural tourism has a significant indirect effect on farmers' income through the technological level (the indirect effect coefficient is $\beta_1 \times \theta_2 = 0.00009 \times 607.87 = 0.54$) is means that for each standard deviation increase in rural tourism, there will be a corresponding 0.54 increase in farmers' income through the mediating effect of scientific and technological levels This suggests that rural tourism can promote the increase of farmers' income by improving the technological level Meanwhile, the regression coefficient of rural tourism on farmers' income is 0.03 in Model 3, which is not significant, indicating that there is a complete mediating effect of technological level on the relationship between rural tourism and farmers' income. Rural tourism development connects urban and rural elements, promotes their mutual flow, and drives the development of iInternetbigdata, and artificial intelligence in rural areas, which promotes the emergence of e-commerce, high-tech industries, and industrial intelligence. Therefore, the transmission path of rural tourism development → technological level → farmers' income growth is established, which confirms the hypothesis H_4.

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Table 8: Mediating effects of scientific and technological level

	Model (1) Y	Model (2) U	Model (3) Y
constant	-20710.61 (-1.93)	-3.40** (-3.62)	48.84 (0.00)
T	0.57** (2.96)	0.00** (5.28)	0.03 (0.10)
U			6107.87* (2.53)
E	38.21** (3.14)	0.00** (4.58)	8.51 (0.54)
G	-8693.67 (-1.68)	1.77** (3.92)	-19534.40** (-3.14)
H	3130.49* (2.62)	0.34** (3.29)	1031.16 (0.77)
R^2	0.94	0.95	0.96
Adjusted R^2	0.92	0.94	0.94
F value	F(4,17)=63.30,p=0.00	F(4,17)=80.67,p=0.00	F (5,16)=67.96,p=0.00
* p<0.05 ** p<0.01 (t values in parentheses)			

Note: T- Rural tourism development; U- Urbanization; E- Ecological civilization; G- Industrialization; H- Human capital; Y- Income

The impact of controlling variables on farmers' income

According to the three mediation variable models mentioned above, it can be observed that the effects of the three control variables, namely ecological civilization and human capital, on farmers' income are significantly positive. This implies that the better the development of ecological civilization and human capital, the higher the farmers' income. This is because the improvement of human capital can enhance workers' technical proficiency, and scientific and cultural literacy, and match them with more rewarding jobs, thereby increasing farmers' income. Meanwhile, the development of rural tourism can promote the improvement of rural ecological environment management awareness and capabilities, which is beneficial for the transformation of rural ecological benefits into economic benefits, and become an endogenous driving force for rural economic development towards a greener and more ecological direction.

Conclusion

Based on the empirical analysis presented above and the results of the mediation model testing, the following three conclusions can be drawn: First, there is a significant positive relationship between the development of rural tourism and the increase in farmers' income, indicating that the development of rural tourism is conducive to promoting the increase of farmers' income. Second, rural tourism can have a mediating effect on increasing farmers' income. Finally, ecological civilization construction and human capital both show a significant positive impact on farmers' income, while the industrialization level shows a negative correlation.

Recommendation

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Recommendations for promoting rural tourism development and increasing income for farmers in the Western Hunan region

Based on the above research conclusions, this study proposed the following recommendations to promote the sustainable and efficient development of rural tourism and increase income for farmers in Western Hunan.

Improving the level of technology and creating a smart scenic area

With technology playing an increasingly important role in modern life, strengthening the integration of rural tourism and technology has become the trend, but the combination of the rural tourism industry and modern technology in Western Hunan is still not close enough and needs to be further improved. Firstly, it is necessary to enhance the marketing capability of smart tourism by utilizing internet platforms and channels such as Weibo, WeChat, Douyin, and Bilibili, and using various forms such as posts on social media and vlogs to deliver information about unique nature and cultural tourism resources such as Yongshun old city, Liye Ancient City, Miao embroidery, and batik in Western Hunan to tourists, and to collect feedback to improve the overall image and reputation of the scenic areas. Secondly, it is necessary to enhance the service capability of smart tourism by using information technology such as big data, the internet, and artificial intelligence to customize exclusive tourism plans based on the preferences of tourists, and adding navigation, video commentary, virtual experience games, and other facilities to meet the needs of different tourists in the scenic areas (Wu Yan, Yang Guoliang, Wu Xiaowen, 2009). Finally, it is necessary to enhance the management level of smart tourism by integrating transportation, entertainment facilities, and visitor flow within the scenic area, and monitoring the operation of various resources in real time to reduce the management burden of scenic area staff.

Focus on the ecological environment and promote a virtuous cycle

During the development of rural tourism, excessive emphasis on short-term economic benefits, without considering long-term future benefits, often leads to ecological destruction, hindering the creation of a comfortable tourism environment (You & Sun, 2017). Tourism is a pillar industry in Western Hunan, and its booming growth has brought substantial economic benefits. However, due to low management levels, uncoordinated overall planning, and closed-minded attitudes, the region's ecological development is facing certain challenges. Therefore, to ensure sustainable development of rural tourism, the government must first adhere to the theme of Eco-tourism, utilizing sustainable development theory as the foundation, to formulate scientifically-based principles for rural Eco-tourism that suit local conditions. Secondly, developers must adhere to the principle of propriety in their operations, formulating development plans from a long-term perspective and protecting the local natural ecology during the development process. Lastly, practitioners and tourists must enhance their environmental awareness, taking responsibility for protecting the ecological environment and preventing behaviors that damage the natural environment, such as littering, spitting indiscriminately, and illegal fishing.

The government increases financial support and improves infrastructure construction

While this study does not find a significant mediating effect of infrastructure development in rural tourism on farmers' income growth, it only suggests that such mediating effects are either not yet

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detected in the current sample or are not detected due to flaws in the selection of measurement indicators, lack of statistical testing power, and so on. It does not conclusively negate the existence of mediating effects.

Unlike other agricultural industries, the development of rural tourism heavily relies on substantial capital investment to improve public services and attract tourists. Imperfections in rural tourism infrastructure can directly impact the tourists' experience, and infrastructure development is a prerequisite for the sustainable and healthy development of the rural tourism industry. Therefore, despite the non-significant mediating effect of infrastructure development on increasing farmers' income in this study, the investment and development of infrastructure in rural areas should still be emphasized. On one hand, efforts should be made to expedite the improvement of transportation networks. The attractions in Western Hunan are relatively dispersed, and tourists visiting this area usually tour multiple scenic spots, hence the apparent regional tourism linkage and integration. Therefore, the development of transportation networks should be enhanced to reduce the time spent by tourists on the road, thereby stimulating their enthusiasm for travel. On the other hand, the improvement of rural public living facilities, such as water supply, electricity, and mobile networks, should be hastened, guaranteeing residents' lives while accelerating infrastructure upgrades to meet the diverse needs of tourists.

Strengthen human capital investment and improve farmers' quality

In an era where rural tourism structures are becoming increasingly homogeneous, enhancing the overall competency of practitioners to provide superior service is key to increasing core competitiveness. Although the education level and professional competence of tourism practitioners in Western Hunan have greatly improved, the overall quality varies significantly. On one hand, emphasizing the importance of compulsory education can be reinforced, encouraging school-aged children and adolescents to receive an education, thereby elevating rural educational standards. On the other hand, vocational skills training for practitioners can be bolstered, by employing professional teachers or promoting study trips to broaden their horizons. This approach enables practitioners to understand development models and experiences from other regions and learn specialized skills such as basic foreign languages, internet applications, and marketing concepts.

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