Empirical Study on the Sustainable Development of Mountain Tourism in the Early Stage of High-Speed Railways—Taking the Southwest Mountainous Region of China as an Example

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Abstract: This study focuses on the early stage of high-speed railways (HSRs) and corrects problems in a timely manner and integrates the direction for tourism development. Its aim is to realize the sustainable development of mountain tourism in the southwest region of China. Based on the panel data from 2010 to 2019 of 39 cities in Guizhou, Guangxi, and Yunnan provinces, which are in the southwest mountainous region of China, and using data envelope analyses, the Malmquist productivity index, the Tobit model, and the intermediary effect, this study verifies the impact of core factors on the development efficiency of mountain tourism in the early stage of an HSR to find the problems existing in tourism development at present and in future stages. Results show the following: (1) In its early stage, an HSR is not yet the key factor to improve the efficiency of tourism development in the mountainous region. (2) The promotion effect of an HSR on the efficiency of tourism development is delayed. (3) In its early stage, an HSR breaks the balance of resource investment and wastes resources. (4) Taking HSRs is born out of the rigid demand of residents in the mountainous region rather than of their income levels. (5) Accessibility in mountain tourism plays a positive role between HSRs and the efficiency of tourism development.

Keywords: high-speed railways; efficiency of tourism development; mountain tourism; sustainable development; DEA–MPI–Tobit model; intermediary effect

1. Introduction

As a result of the development of “The Beijing-Tianjin inter-city HSR” operation, initiated in the year 2008, China has made remarkable achievements in high-speed railways (HSRs) by putting into operation over 71 lines dedicated to high-speed railways (HSRs), covering almost around 35,000 km by the end of the year 2019, reaching speeds of up to 350 km per hour. Thanks to this important achievement, the Asian giant has become the world’s largest high-speed network [1]. It is worth mentioning that this rapid development has also spread to mountainous areas. The economies of China’s mountainous areas are relatively backward due to “congenital deficiencies”. However, with the development of HSRs, the southwest mountainous region has gradually gained a “late developing advantage” of economic development. After the aforementioned, it can be concluded that thanks to the implementation of the HSRs, the less favored areas will see a positive impact
on the tourist economy, resulting in a sustainable improvement in the tourist attractiveness, and thus could see an increase in the number of tourists [2,3].

An HSR adds an air of modernity to the city where it operates, a collective illusion that should not be wasted [4], because following the changes in accessibility of the served territories, the involved actors are expecting economic dynamism in general and tourism in particular [5]. As a representative of modern transportation, an HSR can improve the efficiency of the tourism industry, bring significant changes [6], and promote tourism to become the pillar of economic development [7]. The impact of HSRs on tourism is reflected in many aspects, such as local economic development [8], knowledge economy [9], sustainable development [10], tourism source market [11], tourism attraction [2,3], spatial spillover and economic growth [12], spatiotemporal accessibility [13], selectivity of tourism destination [14], tourism culture and language communication [7], and accessibility gains [15]. Moreover, on a positive note, it should be noted that mountainous areas are safe and reliable due to the fact that they have managed to overcome the negative impacts of earthquakes [16], wind load [17], and long slopes [18] in both railway infrastructure and locomotive and wagons.

It should be noted that there exists a research line focused on the combination of HSRs and the economy of tourism that has been previously studied by other scholars [6,19–21]. However, we must emphasize that the difference between this research and previous studies is that it not only takes the opening of an HSR as the research condition but also pays more attention to the stage of the HSR’s construction. Therefore, this study takes the early stage of an HSR as the research background. Its purpose is to reveal the problems in the development efficiency of mountain tourism in the early stage of the opening of the HSR, correct the problems in time, make the HSR a sustainable investment, and maintain the late development advantage of the HSR’s construction. Moreover, the study suggests that the government make coordinated policy efforts at different life cycle stages of an HSR’s construction so as to achieve the sustainable development of mountain tourism economy in the southwest region of China.

2. Theoretical Background and Hypotheses

2.1. Impact of the Early Stage of HSRs on the Efficiency of Tourism Development

As for the efficiency of tourism development, HSRs can promote it as follows: First, HSRs help enhance the accessibility of tourism destinations [22,23] and improve the efficiency of the tourism industry [24]. Second, the “space–time compression” effect produced by HSRs will form a cross-regional tourism composite economy [25]. Third, HSRs have increased the degree of opening to the outside world, so the degree of knowledge spillover will increase between regions [26]. Fourth, the travel range of tourists has expanded with the opening of HSRs [27]. Fifth, the opening of HSRs is conducive to interregional cultural integration, which is beneficial to the integration of tourism resources and the upgrading of the value of tourism products [28]. Therefore, the following hypothesis is proposed:

Hypothesis 1. The opening of an HSR is the key factor to improve the overall efficiency of tourism development in a mountainous region.

Hypothesis 2. An HSR can efficiently promote the development of sustainable tourism in the areas located in mountainous regions.

Given the short development time of HRSs in these mountainous regions, they are still in the initial stage; and furthermore, taking into account the definitions of pure technical efficiency (PTE) and scale efficiency (SE) [29,30], it is summarized that from the perspective of PTE, there may be a waste of resources invested in HSRs at this stage [31]. From the perspective of SE, with the rational use of resources invested in HSRs and the gradual increase in scale benefits, the best stage of scale benefits will finally be achieved [32]. Therefore, the following hypotheses are proposed:
Hypothesis 3. An HSR has a delayed effect on promoting the overall efficiency of tourism development in a mountainous region.

Hypothesis 4. An HSR does not play a role in the pure technical efficiency of tourism development in a mountainous region.

Hypothesis 5. An HSR promotes the scale efficiency of tourism development in a mountainous region.

2.2. Impact of the Early Stage of HSRs on the Efficiency Mechanism of Tourism Development

The income levels of residents can be increased directly through HSRs or indirectly through the effective labor force transported by HSRs [33]. From the perspective of labor supply and demand, HSRs can promote the supply and demand of labor and the increase in residents’ income, good employment situation, and socioeconomic development will help improve their disposable income [34]. If people will increase their tourism consumption along with the improvement in their income levels, this means that tourism is a normal product rather than a low-grade product. Obviously, the improvement in tourism development efficiency is due to the expanded scale of the tourism market and the increasing tourism income. The increase in residents’ willingness and ability to travel is rooted in the increase in their income and disposable income [35]. Therefore, the following hypothesis is proposed:

Hypothesis 6. An HSR can improve the efficiency of tourism development by improving the income levels of residents.

As a fast and efficient means of transportation, an HSR helps promote regional economic growth [36]. As an indispensable infrastructure for the tourism industry, transportation contributes to the successful operation of tourism enterprises and promotes the development of the tourism industry [37]. The factors of traffic convenience must be considered when tourists choose their destination. Accordingly, the accessibility of tourism transportation plays an important role in improving the efficiency of tourism development. Therefore, the following hypothesis is proposed:

Hypothesis 7. An HSR can improve the efficiency of tourism development through accessibility.

3. Research Design

3.1. Methods

In this section, the research methodology, the index structure, and the variable design of the Tobit model are introduced. The methods used in this study are as follows: data envelope analysis (DEA), the Malmquist productivity index (MPI), and the Tobit model. Index structure refers to the efficiency index of tourism development in the study area while Tobit model variables are composed of explanatory variables, central explanatory variables, control variables, and intermediate variables.

3.1.1. Data Envelope Analysis

DEA is a method to evaluate the relative effectiveness of a decision-making unit (DMU) with multiple inputs and outputs based on known data [38]. From the perspective of input orientation, this research uses DEA to evaluate the efficiency of the early stage of an HSR in the development of mountain tourism. It is assumed that DEA is carried out
under the condition of variable returns-to-scale. OE, PTE, and SE of tourism development in the study area can be calculated. The DEA model is set as follows [39]:

\[
\begin{align*}
\min \theta \\
s.t. & \sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_0 \\
& \sum_{j=1}^{n} \lambda_j y_{ij} \geq y_0 \\
& \sum \lambda_j = 1
\end{align*}
\] (1)

In Equation (1), there are \(n\) DMUs and each DMU \(j\) has \(m\) input variables (represented by \(x_{1j}, x_{2j}, \ldots, x_{mj}\)) and \(s\) output variables (represented by \(y_{1j}, y_{2j}, \ldots, y_{sj}\)); \(\theta\) represents tourism development efficiency; \(x_{ij} > 0, y_{ij} > 0, \lambda_j \geq 0,\) and \(j = 1, 2, \ldots, n\).

By using Equation (1) and DEAP software (2.1), the efficiency of the tourism development of 39 cities has been calculated in a period of time between 2010 and 2019.

3.1.2. Malmquist Productivity Index

The efficiency of tourism development also needs to examine the change trend in the time dimension, which can be realized through the MPI [40]. The expression equation is as follows:

\[
\text{TFP}_{ch} = \text{Eff}_{ch} \times \text{TE}_{ch} = \text{PE}_{ch} \times \text{SE}_{ch} \times \text{TE}_{ch}
\] (2)

In Equation (2), \(\text{TFP}_{ch}\) represents the change in the MPI, \(\text{Eff}_{ch}\) represents the change in efficiency, and \(\text{TE}_{ch}\) represents the change in technology. \(\text{TFP}_{ch}\) greater than 1 indicates the improvement in total factor productivity, \(\text{Eff}_{ch}\) greater than 1 indicates the improvement in technical efficiency, \(\text{TE}_{ch}\) greater than 1 indicates technological progress, \(\text{PE}_{ch}\) greater than 1 indicates the improvement in the technology application level, and \(\text{SE}_{ch}\) greater than 1 indicates the optimization of scale.

3.1.3. Tobit Model

Since the efficiency of tourism development is in the interval (0, 1), the Tobit model is applicable here [41]. The model is as follows:

\[
\begin{align*}
Y_{it}^* &= \beta_0 + \beta_1 \ast \text{HSR}_{it} + \beta_2 \ast X_{it} + \mu_{it} \\
Y_{it} &= \begin{cases} 
1 & \text{if } Y_{it}^* > 1 \\
Y_{it}^* & \text{if } 0 < Y_{it}^* \leq 1 \\
0 & \text{if } Y_{it}^* \leq 0
\end{cases}
\end{align*}
\] (3)

In Equation (3), \(i\) and \(t\) represent province and year, respectively; \(Y_{it}\) is the actual measured value; and \(Y_{it}^*\) is the corresponding hidden variable. Random error term \(\mu_{it} \sim N(0, \sigma^2)\), and \(X_{it}\) represents other control variables.

3.2. Index Structure and Variable Design

3.2.1. Index Structure

In this study, the input indicators are capital, labor force, tourism resources, and HSRs and the output indicators are total tourism income and total number of tourists [42]. The selection of input indicators comes from the most basic production factors from the perspective of economics, namely land, capital, and labor force [43]. Among them, capital and labor force are calculated by the total investment in fixed assets and the number of tourism employees, respectively. The data are derived from the annual statistical bulletin of urban social development, EPS database, and statistical yearbook; and land is replaced by tourism resource indicators (because tourism production is not constrained by land area and is also endowed by nature) [44]. The data are from the official website of the local culture and tourism department. The HSR’s data also come from China Railway Administration.
3.2.2. Variable Design of the Tobit Model

To measure the development of efficiency, OE, PTE and SE are usually selected as simultaneously explanatory variables [45,46]. The high-speed rail was selected as the core explanatory variable. Control variables and intervening variables are determined according to relevant references [6,47]. The explained variables OE, PTE, and SE of tourism development data were obtained by DEAP software.

Core explanatory variable, expressed in HSR: First, sort out HSRs’ lines in 39 cities, count the number of annual HSR stations in each city, and then use the number of HSR stations to measure the HSRs in each city. The number of HSR stations is obtained by repeated calculation to compare the number of HSR lines opened in cities and enrich the information of this variable.

Control variables: Include the development level of the regional economy (Economy), the urbanization level (Urban), industrial structure (Structure), the resource attraction level (Resource), and service capacity (Service). The corresponding measurement standards are the proportion of provincial GDP, the proportion of urban population in the total population at the end of the period, the industrial structure index, the proportion of comprehensive scores of scenic spots above Grade 3A, and the proportion of employees in the tertiary industry.

Intervening variables: Include the income level of residents (Income) and the accessibility of mountain tourism (Accessibility). The income variable is calculated according to the GDP of each city, while accessibility has been measured by the average weighted travel time taking, as example, one city to make calculations related to other cities [48].

4. Analysis of Empirical Results

Guizhou Province stands out as having the highest proportion of mountainous areas in southwest China, and Guangxi and Yunnan provinces are areas adjacent with the same economic-level development. The starting of HSRs in these three mountainous provinces has been rapid: Since the first HSR was put into operation in December 2014, nine HSR lines were being operated by the end of 2019, representing 12.7% of the number total HSR lines in China.

As a consequence of the aforementioned, for this study, 39 cities from these three mountainous provinces have been selected as research areas, excluding the 2010–2014 stage. Consequently, for this study, the period between 2015 and 2019 has been considered as the initial stage of HSRs in this region.

Through longitudinal studies, related problems have been studied and three scenarios are presented below.

(1) The temporal characteristic: By using DEA with static analysis [49], the temporal and spatial characteristics are summarized.

(2) The spatial characteristic: By using the MPI with dynamic analysis [49], the temporal dynamic changes and spatial differences have been obtained.

(3) The temporal and spatial evolution and impact analysis of the efficiency of tourism development: The impact analysis of the efficiency of tourism development is based on the Tobit model, which extensively analyzes the impact of the core variable HSR on OE, PTE, and SE, respectively.

4.1. Temporal and Spatial Characteristics

4.1.1. Time Series Characteristics of OE

As per Table 1, the mean OE is 0.81, which means 81.0% of the optimal level; and from the perspective of time series change, OE is the lowest in 2014. With the sufficient input of production factors, the best DEA efficiency will be reached in 2019. Note that 2014, as an inflection point, may be affected by HSR because the improvement in OE occurs when a certain input factor increases and realizes rational use. From the perspective of PTE, its average value is higher than that of OE. On the whole, PTE is initially flat and then moves downward, and it drops to the lowest in 2018, which is a manifestation of the unreasonable
factor input and allocation, indicating that the overall level of tourism efficiency is affected
by the rationality of factor investment in this study area in 2018. From the perspective of
SE, its average value shows an upward trend as a whole and is slightly higher than that of
OE, as shown in Table 1.

Table 1. OE, PTE, and SE of tourism development.

| Years | OE  | PTE | SE  |
|-------|-----|-----|-----|
| 2010  | 0.83| 1.00| 0.83|
| 2011  | 0.81| 1.00| 0.81|
| 2012  | 0.81| 1.00| 0.81|
| 2013  | 0.80| 1.00| 0.80|
| 2014  | 0.78| 0.97| 0.82|
| 2015  | 0.80| 0.93| 0.86|
| 2016  | 0.82| 0.93| 0.88|
| 2017  | 0.81| 0.89| 0.91|
| 2018  | 0.79| 0.88| 0.91|
| 2019  | 0.84| 0.89| 0.94|
| Mean  | 0.81| 0.95| 0.86|

4.1.2. Characteristics of the Spatial Pattern of OE

The spatial correlation index can effectively reveal the spatial aggregation characteristics of development efficiency in regional tourism. To measure the spatial clustering characteristics, four types are identified in space, namely cold point, sub-cold point, sub-hot point, and hot point. A cold spot region means a cluster area with low efficiency of tourism development. A hot spot region means a cluster area with high efficiency of tourism development [50]. In addition, the spatial statistics module of ArcGIS is used to calculate the local spatial correlation index of OE in 2014 and 2019 and thus reveals the spatial characteristics of OE in tourism development (Figure 1).

Figure 1. Spatial hot spot evolution of OE in 2014 (a) and 2019 (b).

(1) OE Is Obviously Differentiated in Space

The spatial change of Yunnan province is obvious, and there is a trend of gradually turning to the complete high-value spatial agglomeration area. In particular, a total of six advanced cities are affected: Lijiang city has changed from a sub-hot to a hot area, Dali city and Kunming city from sub-cold to sub-hot areas, Chuxiong city from a sub-cold to a hot area, and Laibin city and Hezhou city from cold to sub-cold areas. The sub-cold regions
of Guangxi province occupy the vast majority, and there is a trend of gradually turning to completely low-value spatial agglomeration areas. Except for Liupanshui city and Qianxinan city, other areas in Guizhou province belong to high-value spatial agglomeration areas and do not change.

(2) The Whole Area Undergoes the Phenomenon of Agglomeration to a High-Value Space

From the hot spot area with the highest value and the cold spot area with the lowest value, the hot spot area increases by 2 and the cold spot area decreases by 2.

(3) There is the Characteristic of Regional Transformation, but the Number of High-Value and Low-Value Spatial Aggregation Areas is the Same

From low to high, the number of the four types changed from 10, 11, 13, and 5 to 12, 9, 15, and 3, respectively. There were nine cities involved in the transformation, accounting for 23.08%.

4.2. Temporal and Spatial Evolution

On the basis of the MPI, this study conducts a dynamic analysis of the temporal and spatial evolution of development efficiency in mountain tourism in this study area, as shown in Table 2.

| Years | $\text{Eff}_{ch}$ | $\text{TE}_{ch}$ | $\text{PE}_{ch}$ | $\text{SE}_{ch}$ | $\text{TFP}_{ch}$ |
|-------|-------------------|-----------------|-----------------|-----------------|-----------------|
| 2010–2011 | 0.97 | 1.07 | 1.00 | 0.97 | 1.04 |
| 2011–2012 | 0.99 | 0.96 | 1.00 | 0.99 | 0.95 |
| 2012–2013 | 0.99 | 1.04 | 1.00 | 0.99 | 1.03 |
| 2013–2014 | 0.98 | 1.15 | 0.95 | 1.03 | 1.13 |
| 2014–2015 | 1.02 | 0.94 | 0.96 | 1.06 | 0.97 |
| 2015–2016 | 1.03 | 1.07 | 0.99 | 1.03 | 1.09 |
| 2016–2017 | 0.99 | 1.00 | 0.96 | 1.03 | 0.99 |
| 2017–2018 | 0.98 | 1.13 | 0.97 | 1.00 | 1.11 |
| 2018–2019 | 1.06 | 1.01 | 1.00 | 1.05 | 1.07 |
| Mean | 1.01 | 1.04 | 0.98 | 1.02 | 1.04 |

Note: The above data indicate the change in index.

4.2.1. Dynamic Change of Time Sequence

The mean of $\text{TFP}_{ch}$ is 1.04, which means an average annual efficiency improvement of 4%. The mean of $\text{Eff}_{ch}$ is 1.01, with an average annual increase of 0.1%, of which $\text{PE}_{ch}$ decreases by 1.5% and $\text{SE}_{ch}$ increases by 1.8%. The mean of $\text{TE}_{ch}$ is 1.04, with an average annual increase of 4%. Therefore, $\text{PE}_{ch}$ has a negative impact on the efficiency of tourism development in the mountainous region, and the biggest internal driving force to improve the efficiency of tourism development is $\text{TE}_{ch}$, followed by $\text{SE}_{ch}$.

From an annual point of view, $\text{TE}_{ch}$ is less than 1 only in the two intervals, 2011–2012 and 2014–2015, and greater than 1 in other years. $\text{PE}_{ch}$ is less than or equal to 1, indicating that tourism management innovation is not helpful in the improvement of OE. The impact of $\text{SE}_{ch}$ on $\text{TFP}_{ch}$ is first negative and then positive, indicating that $\text{SE}_{ch}$ in this study area has been improving.

From the efficiency range, the efficiency improvement is the most obvious from 2013 to 2014: $\text{TFP}_{ch}$ is 1.13, and the efficiency increases by 13 percentage points, including $\text{TE}_{ch}$ by 15 percentage points, $\text{SE}_{ch}$ by 3 percentage points, and $\text{PE}_{ch}$ by 5 percentage points. From 2011 to 2012, $\text{TFP}_{ch}$ performed the worst, with a decrease of 5%, of which $\text{TE}_{ch}$ decreased by 4%, $\text{PE}_{ch}$ remained unchanged, and $\text{SE}_{ch}$ decreased by 0.3%.

4.2.2. Spatial Difference and Distribution

As can be seen from Table 3, the mean of Guangxi province is the largest, at 1.07, that is, the average annual efficiency increases by 7%. Although the static efficiency of Guangxi
province is not high, the efficiency increases rapidly. The second is Guizhou province, with a mean of 1.03 and a tourism development efficiency that has increased by 3% annually. The performance of Yunnan province is close to that of Guizhou, with an average annual increase of 3%, as shown in Table 3.

Table 3. MPI of tourism development by region.

| Years       | Guizhou | Guangxi | Yunnan | All |
|-------------|---------|---------|--------|-----|
| 2010–2011   | 1.09    | 1.05    | 1.01   | 1.04|
| 2011–2012   | 0.93    | 1.06    | 0.88   | 0.95|
| 2012–2013   | 0.91    | 1.07    | 1.08   | 1.03|
| 2013–2014   | 1.14    | 1.15    | 1.09   | 1.12|
| 2014–2015   | 0.98    | 1.04    | 0.90   | 0.97|
| 2015–2016   | 1.05    | 0.99    | 1.23   | 1.09|
| 2016–2017   | 1.03    | 1.07    | 0.91   | 0.99|
| 2017–2018   | 1.12    | 1.07    | 1.13   | 1.10|
| 2018–2019   | 1.03    | 1.09    | 1.07   | 1.07|
| Mean        | 1.03    | 1.07    | 1.03   | 1.04|

Yunnan province achieved efficiency improvement in 2010–2011, 2012–2014, 2015–2016, and 2017–2019. The best efficiency improvement was in 2017–2018, reaching 13 percentage points. Among the years of efficiency decline, 2011–2012 had the worst performance, and the efficiency decreased by 18 percentage points. In addition to the efficiency decline of 0.5 percentage point in 2015–2016, Guangxi province achieved efficiency improvement in other years, with the best efficiency improvement occurring in 2013–2014, reaching 15 percentage points. Guizhou province achieved efficiency improvement in 2010–2011, 2013–2014, and 2015–2019, with the most significant improvement, of 14 percentage points, occurring in 2013–2014. Efficiency declined in 2011–2013 and 2014–2015.

The spatial map is helpful to analyze the overall distribution in this study area and clearly shows the evolutionary law in space. Therefore, the TFP\textsubscript{ch} of 39 cities is classified according to the absolute scale. The darker the color is, the greater will be the MPI. The cross-sectional data of 2011, 2015, and 2019 are selected for analysis.

The topographic map of the study area is intended to represent the three periods used in the study and to carry out a complete comparison under a unified rule and thus show the evolutionary law in space by including a horizontal comparison, a vertical comparison, and a horizontal–vertical comparison.

As shown in Figure 2, The horizontal comparison has been used to observe the changes that occurred in the 39 cities under study, while the vertical comparison has been applied to observe the changes in the three different periods in each city and, finally, to observe the changes in the 39 cities in three different periods; at the same time, the horizontal–vertical comparison has been applied.

4.3. Impact Analysis of the Efficiency of Tourism Development

Using the Tobit model, this research deeply analyzes the impact of HSR on the efficiency of tourism development in this study area.

4.3.1. Analysis of OE

In Table 4, regressions (1,2) are the regression results of OE on HSR for 39 cities. The coefficients of HSR are found to be negative, and only the regression with control variables shows significance. A look at the control variable coefficient reveals that the two factors that contribute most to the improvement of OE are Economy and Service, which show that the key factor to improve OE in the study area in the early stage of the HSR is not HSR. Therefore, H1 is rejected.

Regressions (3–5) are the regional regression results. It can be seen that the coefficients of HSR are negative but not significant. Guangxi province has the largest coefficient of
HSR, followed by Guizhou and Yunnan provinces. In terms of $t$, the sequence is also the same, which is consistent with the time sequence of the opening of HSRs in these three provinces. By observing the regression coefficient and $p$, it is known that the regression coefficient will gradually become positive and significant as time goes on. HSR is shown to have a delayed effect on promoting the OE of tourism development in this study area. Therefore, $H_2$ is rejected.

**Table 3.** MPI of tourism development by region.

| Years         | Guizhou (3) | Guangxi (4) | Yunnan (5) |
|---------------|-------------|-------------|-------------|
| 2010–2011     | 1.09        | 1.05        | 1.01        |
| 2011–2012     | 0.93        | 1.06        | 0.88        |
| 2012–2013     | 0.91        | 1.07        | 1.08        |
| 2013–2014     | 1.14        | 1.15        | 1.09        |
| 2014–2015     | 0.98        | 1.04        | 0.90        |
| 2015–2016     | 1.05        | 0.99        | 1.23        |
| 2016–2017     | 1.03        | 1.07        | 0.91        |
| 2017–2018     | 1.12        | 1.07        | 1.13        |
| 2018–2019     | 1.03        | 1.09        | 1.07        |

The spatial map is helpful to analyze the overall distribution in this study area and clearly shows the evolutional law in space. Therefore, the TFP of 39 cities is classified according to the absolute scale. The darker the color is, the greater will be the MPI. The cross-sectional data of 2011, 2015, and 2019 are selected for analysis. The topographic map of the study area is intended to represent the three periods used in the study and to carry out a complete comparison under a unified rule and thus show the evolutionary law in space by including a horizontal comparison, a vertical comparison, and a horizontal–vertical comparison.

As shown in Figure 2, the horizontal comparison has been used to observe the changes that occurred in the 39 cities under study, while the vertical comparison has been applied to observe the changes in the three different periods in each city and, finally, to observe the changes in the 39 cities in three different periods; at the same time, the horizontal–vertical comparison has been applied.

**Figure 2.** Spatial variation in the MPI.

**Table 4.** Impact of HSR on OE.

| Variables          | Without Control Variables (1) | With Control Variables (2) | Guizhou (3) | Guangxi (4) | Yunnan (5) |
|--------------------|--------------------------------|-----------------------------|-------------|-------------|------------|
| HSR                | $-0.07$ ($-1.26$)              | $-0.19$ *** ($-2.79$)       | $-0.13$     | $-0.07$     | $-0.30$ *  |
| Economy            | $1.88$ *** ($6.39$)            | $0.90$ *** ($2.64$)         | $1.71$ **   | $1.15$ *    |            |
| Urban              | $-0.12$ ($-1.07$)              | $-0.12$ ($-1.07$)           | $1.48$ *    | $-0.68$ **  |            |
| Structure          | $-0.43$ *** ($-2.65$)          | $0.05$ ($0.38$)             | $1.14$ *    | $0.13$      |            |
| Resource           | $0.03$                         | $-0.43$ *** ($-2.65$)       | $0.55$ *    | $0.01$      |            |
| Service            | $0.53$ * ($0.62$)              | $0.25$ *** ($-2.95$)        | $1.96$ *    | $0.31$      |            |
| cons               | $0.82$ * ($10.88$)             | $0.71$ * ($3.54$)           | $1.26$ *    | $0.87$      | $0.91$ ***  |
| LR-Test            | $1.59$                         | $129.91$ *** ($21.73$)      | $18.02$ *** | $81.18$ *** | $35.38$ *** |

Note: The number enclosed in parentheses is $t$; *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. Source of data: Obtained by Stata (SE version) software.
4.3.2. Analysis of PTE

In Table 5, regressions (1,2) are the regression results of PTE on HSR for 39 cities. The coefficients of HSR are shown to be negative, and the regression is significant. In the early stage of an HSR, HSR does not promote PTE in this study area. The development of an HSR could have brought more customers, but because it is in the early stage, the management and technical levels have not yet matched the demand, which eventually leads to the fuller disclosure of the ineffectiveness of PTE.

Table 5. Impact of HSR on PTE.

| Variables | Without Control Variables (1) | With Control Variables (2) | Guizhou (3) | Guangxi (4) | Yunnan (5) |
|-----------|-------------------------------|----------------------------|-------------|-------------|------------|
| HSR       | −0.35 *** (−11.31)            | −0.37 *** (−8.98)          | −0.06       | −0.37 *** (−4.38) | −0.48 *** (−7.08) |
| Economy   | 0.68 ***                     | 0.41 **                    | 1.41        | 0.06        | 0.10       |
| Urban     | −0.17 *** (−2.59)            | −0.17 *** (−3.11)          | −0.04       | −0.14       | −0.14      |
| Structure | −0.08                        | 0.07                       | −0.34       | 0.07        | 0.07       |
| Resource  | 0.01                         | −0.09                     | 0.05        | 0.01        | 0.01       |
| Service   | 0.13 *** (4.27)              | 0.06                      | −0.08       | 0.04        |            |
| cons      | 1.01 *** (130.05)            | 1.02 *** (50.57)          | 0.99 ***    | 0.98 ***    | 1.07 ***   |
| LR-Test   | 110.71 ***                   | 145.24 ***                | 52.67 ***   | 69.20 ***   |            |

Note: The number enclosed in parentheses is t; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively. Source of data: Obtained by Stata (SE version) software.

4.3.3. Analysis of SE

In Table 6, regressions (1,2) are the regression results of SE on HSR for 39 cities. It can be seen that the coefficients of HSR are positive and the regression is significant, indicating that HSR has significantly promoted SE in this study area in the early stage of the HSR. In regressions (3–5), the regression coefficients of HSR in Guangxi and Yunnan provinces are positive. From the significance level, HSR can promote SE in Guangxi province (significant) and Yunnan province (insignificant), but it cannot hinder Guizhou province. Therefore, H4 is accepted.

Table 6. Impact of HSR on SE.

| Variables | Without Control Variables (1) | With Control Variables (2) | Guizhou (3) | Guangxi (4) | Yunnan (5) |
|-----------|-------------------------------|----------------------------|-------------|-------------|------------|
| HSR       | 0.26 *** (5.23)               | 0.17 *** (2.71)            | −0.07       | 0.28 *** (3.64) | 0.14       |
| Economy   | 1.28 *** (4.74)               | 0.49                       | 0.50        | 1.09 *      |            |
| Urban     | 0.04                         | 0.05                       | 1.54 ***    | −0.57 **    | (−2.23)    |
| cons      | 145.24 ***                   | 77.57                     | 16.12       | (41.78)     |            |
| LR-Test   | 110.71 ***                   | 52.67 ***                 | 69.20 ***   |            |            |
| Variables | Without Control Variables (1) | With Control Variables (2) Guizhou (3) Guangxi (4) Yunnan (5) |
|-----------|------------------------------|-------------------------------------------------|
| Structure | −0.375 **                     | −0.02                                           |
|           | (−2.49)                      | (−0.13)                                         |
| Resource  | 0.023                        | −0.34 **                                       |
|           | (0.50)                       | (−2.55)                                        |
| Service   | 0.42 *                      | 0.19 ***                                      |
|           | (9.37)                       | (3.02)                                         |
| cons      | 0.81 ***                     | 0.69 ***                                      |
|           | (64.70)                      | (23.00)                                        |
| LR-Test   | 26.43 ***                    | 121.57 ***                                    |

Note: The number enclosed in parentheses is t; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively. Source of data: Obtained by Stata (SE version) software.

5. Verification of the Mechanism of HSR Affecting the Efficiency of Tourism Development

Referring to the regression coefficient method by sequential test in the intermediary effect [51], this research further studies the indirect effect of HSR on the efficiency of tourism development. The metering model is as follows:

\[
Y_{it} = \beta_0 + \beta_1 \cdot HSR_{it} + \beta_2 \cdot X_{it-1} + \epsilon_{it} \\
M_{it} = \alpha_0 + \alpha_1 \cdot HSR_{it} + \alpha_2 \cdot X_{it-1} + \delta_{it} \\
Y_{it}^{**} = \gamma_0 + \gamma_1 \cdot HSR_{it} + \gamma_2 \cdot M_{it-1} + \gamma_3 \cdot X_{it-2} + \rho_{it}
\] (4)

In Equation (4), \(i\) and \(t\) represent city and year, respectively; \(HSR_{it}\) is the number of HSR stations; \(M_{it}\) is the intervening variable; and \(X_{it-1}\) is the control variable and the random error terms \(\epsilon_{it}\), \(\delta_{it}\), \(\rho_{it}\) ~ \(N(0, \sigma^2)\).

Therefore, to test H5 and H6, this study tests the mediating effect by using the Stata command statement combined with the sequential test of the regression coefficient method and the bootstrap method with a higher test power than the Sobel test [52,53]. The inspection results are shown in Table 7.

Table 7. Intermediary effect test.

| Variables | Income | Income+ | OE | OE+ | PTE | PTE+ | SE | SE+ |
|-----------|--------|---------|----|-----|-----|------|----|-----|
| HSR       | 0.52 *** | −0.02 | −0.22 *** | −0.17 *** | −0.36 *** | −0.37 *** | 0.13 ** | 0.18 *** |
|           | 0.34 *** | −0.06 | −0.19 *** | −0.09 | −0.33 *** | −0.31 *** | 0.12 ** | 0.21 *** |
| Income    | 0.31 *** | 0.67 *** | 0.13 ** | 0.31 *** | 0.18 *** | 0.38 *** | 0.26 *** | 0.55 *** |
| cons      | 0.27 *** | −0.13 *** | 0.75 ** | 0.79 * | 1.07 *** | 1.03 *** | 0.74 *** | 0.76 *** |
| Intermediary effect | — | — | — | — | 51.79% | — | — |
| Total effect | — | — | — | — | 36.36% | — | — |
Table 7. Cont.

| Variables | Income | Income+ | OE | OE+ | PTE | PTE+ | SE | SE+ |
|-----------|--------|---------|----|-----|-----|------|----|-----|
| Indirect effect | 67.15% # | | | | | | | |
| Direct effect | 54.08% # | 13.00% # | | | | | | |
| Variables | Accessibility | Accessibility+ | OE | OE+ | PTE | PTE+ | SE | SE+ |
| HSR | 0.47 *** | 0.42 *** | −0.08 | −0.17 * | −0.33 *** | −0.33 *** | 0.24 *** | 0.14 ** |
| | 0.49 *** | 0.43 *** | −0.09 | −0.12 | −0.22 *** | −0.25 *** | 0.13 *** | 0.13 ** |
| Accessibility | | | 0.01 | −0.04 | −0.05 ** | −0.10 *** | 0.05 | 0.05 |
| cons | 0.57 *** | 0.51 *** | 0.82 *** | 0.73 *** | 1.04 *** | 1.07 *** | 0.78 *** | 0.66 *** |
| | 0.56 *** | 0.520 *** | 0.84 *** | 0.73 *** | 1.04 *** | 1.06 *** | 0.80 *** | 0.66 *** |
| Intermediary effect | | | | | | | | |
| Total effect | | | 6.80% | 11.63% | — | — | — | — |
| Indirect effect | 5.58% # | | | | | | | |
| Direct effect | 2.27% # | | | | | | | |

Note: The figures in the first row are based on the data from 2010 to 2019 (the figures of HSR in this time interval are from nothing to existence), and the figures in the second row are based on the data from 2015 to 2019 (the figures of HSR in this time interval are from small to large); #, a masking effect; —, not significant; +, control variables involved; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively. Source of data: Obtained by Stata (SE version) software.

5.1. Intermediary Effect of Income

For the analysis without control variables: HSR has a significant role in promoting Income, and Income has a masking effect on the OE and PTE of HSR to improve tourism development [54], playing a significant intermediary role in SE.

For the analysis after adding control variables: HSR has no significant hindering effect on Income (the regression coefficients of HSR on Income in two periods are −0.02 and −0.06, respectively) and does not reflect the intermediary effect on OE, PTE, and SE after adding control variables but only on SE without control variables.

Overall, Income did not play an intermediary role in the efficiency of tourism development in the early stage of HSR in this study area. Therefore, H5 is rejected.

5.2. Intermediary Effect of Accessibility

Accessibility plays a significant intermediary role in HSR by promoting PTE and SE of regional tourism development but has no significant intermediary role in OE. With the gradual and comprehensive opening of an HSR, the mediating effect on PTE increases, the mediating effect on SE is from nothing to something, and there is no mediating effect on OE. The reason for this outcome is that the proportion of the mediating effect of PTE and SE in the total effect belongs to the low-level stage while OE is obtained by multiplying PTE and SE. Therefore, the mediating effect on OE is not significant.

From the perspective of OE’s regression coefficient on HSR and Accessibility, the two periods of 2010–2019 and 2015–2019 are compared: Although the regression coefficient is negative, the negative value changes from significant to insignificant and from small to large, even turning positive. The result indicates that with the increase in the proportion of the mediating effect of PTE and SE, the mediating effect of OE will also be significant.

Therefore, in the early stage of an HSR, Accessibility plays only a small intermediary role in HSR, improving the efficiency of tourism development in the study area. Therefore, H6 is accepted.

6. Conclusions and Implications

As a result of the research mentioned above, the hypotheses H3, H4, and H6 are accepted while the hypotheses H1, H2, and H5 are rejected. In the mountainous area of the southwest mountainous region of China in the early stage of an HSR, verification research on the efficiency of HSR on tourism development is as follows:
6.1. Conclusions

6.1.1. In Its Early Stage, HSR Is Not Yet a Key Factor in Improving the Efficiency of Tourism Development in the Mountainous Region

Although HSR has a positive impact on the accessibility of tourist destinations, the space–time compression effect, regional opening to the outside world, integration of the tourist market, regional cultural integration, and upgrading of tourism products, in the early stage of the opening of the HSR, the key factors to improve the efficiency of tourism development are still Economy and Services rather than HSR.

6.1.2. The Promotion Effect of an HSR on the Efficiency of Tourism Development Is Delayed

HSR does not have a significant effect on promoting the OE of tourism development in theory. However, due to the significant trend of tourism development in SE, which can promote the improvement of OE, it can be inferred that HSR will significantly promote OE in this study area when in the middle stage of an HSR’s life cycle.

6.1.3. In Its Early Stage, an HSR Breaks the Balance of Resources Invested and Wasted Resources

The PTE of tourism development is the worst in the early stage of HSR. Before the opening of an HSR, its management innovation and technology in tourism development have reached a relatively mature level. After investing in HSR resources, the original balance is broken and there is a phenomenon where the invested resources become invalid. In other words, there is a waste of resources. For the above cases, this may be because the management and technical levels of HSR have not yet matched the demand, resulting in a fuller disclosure of the ineffectiveness of PTE.

6.1.4. Taking an HSR Is Born out of the Rigid Demand of Residents in the Mountainous Region Rather Than of their Income Levels

The increase in residents’ income, good employment situation, and socioeconomic development in a mountainous region are conducive to improvement in residents’ disposable income. If people will increase their tourism consumption along with the improvement in their income levels, this means that tourism is a normal product rather than a low-grade product. Obviously, the improvement of tourism development efficiency is due to the expanded scale of the tourism market and the increasing tourism income. The increase in residents’ willingness and the ability to travel are rooted in the increase in their income and disposable income.

The above will only happen in theory, but in this study area, income was excluded. Taking an HSR is not a result of an improvement in income levels of residents in mountainous areas but of their rigid demand for travel. Therefore, Income does not appear as an intermediary between HSR and the efficiency of regional tourism development.

6.1.5. Accessibility in Mountain Tourism Plays a Positive Role between an HSR and the Efficiency of Tourism Development

As a fast and efficient means of transportation, HSRs can greatly shorten the travel time between cities. The convenience of tourism transportation is one of the important factors that tourists should consider when choosing a tourism destination. The accessibility of tourism transportation in various regions plays an important role in improving the efficiency of tourism development. HSR in this study area plays a role in the efficiency of overall tourism development by improving the Accessibility between tourism destinations.

6.2. Discussions and Implications

The construction and development of HSR lines have met the objectives of connecting developed areas with developing areas, promoting positive impacts for the sustainable development of the areas since they have managed to break down the barriers of geographic
space, promoting rapid acceleration flow of regional productive factors, and transforming resource advantages into economic advantages in developing areas.

Because the construction and commissioning of the HSR lines in this mountainous area are in their initial phase of development, their impact on the economy and society has not yet been fully reflected, but it is evident that when they enter a more mature stage, their action will gradually appear with the flow of productive factors and industrial spatial agglomeration.

The aforementioned situation requires great effort on the part of the government, with the revelation of the problems in the tourist efficiency of the mountainous area in the initial stage of the HRS, to find a solution to the problems as soon as possible so that sustainable investment can be made in the construction of HRSs as this is important in guiding the design and planning of HSRs in the middle or late stage.

The HRS lines have a potential market, the tourist market. The growth of the tourist destination in the less favored areas is intended to improve the intensity of the use of the HRSs since the HRSs can also promote the development of the tourist destination.

Therefore, the government should continue to improve the tourism industry system and marketing in these mountainous areas so that the tourism system with the HRS infrastructure achieves a balanced allocation and coordinated development to finally achieve sustainable development of the tourism economy in the entire mountainous region.

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