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Study on the Influencing Factors of TFP of Low-carbon Tourism Distribution

Xiaoyu Cheng*, Keshen Jiang**

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Abstract

Purpose - Performance appraisal has a significant influence on the development of low-carbon tourism distribution.
Research design, data, and methodology - Data of this study are collected from 27 provinces (cities) of China. SBM-Malmquist model is used to measure the TFP and its dynamic changes of low-carbon tourism distribution; TOBIT model is used to discuss the factors of TFP of low-carbon tourism distribution.
Results - The results show that, there are obvious differences among regional TFP of low-carbon tourism distribution, the average change tends to grow positively in general, and the western region grows fastest on average due to the improvement of technical efficiency and technical progress, while there are technical efficiency improvement but technical regresses in eastern and central regions. The economic scale, economic strength, structure of energy consumption, location quotient and government regulation have a significant positive effect on the TFP of low-carbon tourism; energy intensity, industrial structure and opening degree have a negative effect; investments in fixed assets, intensity of R&D fund and urbanization rate have no significant influence on the TFP of low-carbon tourism.
Conclusions - Improving the productivity of low-carbon tourism and reducing regional differences are effective ways to develop low-carbon tourism and enhance tourism competitiveness.

Keywords: Low-Carbon Tourism, Total Factor Productivity(TFP), Undesirable-SBM Model, Malmquist-Luenberger Index, TOBIT Model.

JEL Classifications: L83, Q56, R15.

1. Introduction

In 2016, the contribution of Chinese tourism to the domestic economy reached 11% as a whole, and the contribution to the employment reached over 10.26%, what's more, the overall competitiveness rankings of Chinese tourism in 2017 rose to 15, while the environmental sustainability only ranked 132. The environmental problems hinder the development of Chinese tourism. In fact, the tourism industry is no longer a "smokeless industry", a study of UNWTO found that tourism carbon emissions have accounted for 14% of global warming, as a response, China decide to reduce carbon emissions by 60%-65% during the year of 2005-2030 in the "Paris agreement" which will come into force in 2016, low-carbon tourism has become an important way to promote energy-saving and emission-reduction to improve the competitiveness of tourism. The performance research has an important significance to improve the competitiveness of tourism, some scholars studied the static efficiency of tourism vary between inter-city (Wang, Huang, Tao, & Fang, 2013), inter-provincial (Fang, Huang, Yu, & Tu, 2013), inter-area (Gong, Zhang, & Tang, 2016) and nation (Zhao, 2016); Wang (2014), Zhang (2014) respectively calculated total factor, productivity(TFP) of tourism in different regions and analyzed their dynamic changes. At present, the qualitative research relates to low-carbon tourism is far more than the quantitative research, only Zha (2016) and Han (2016) have taken carbon emissions into the research of tourism efficiency which expand the quantitative research of low-carbon tourism, however, it is a pity that the research neither

* First Author, Corresponding Author, College of Economics and Management, Nanjing University of Aeronautics and Astronautics, China. Tel: +86-156-5188-5207, E-mail: nuaacxy@163.com
** Second Author, College of Economics and Management, Nanjing University of Aeronautics and Astronautics, China.
Tel: +86-136-5517-5909, E-mail: jiangksh@126.com

expand the scope of objectivities nor further explore the influence factors of tourism efficiency. Study on influence factors plays an important role in improving efficiency and enhancing competitiveness which was not mentioned in the paper above, there are some relevant methods, Shi (2015) made an empirical analysis on the affecting factors of industrial production efficiency by Dynamic Spatial Panel Data Model; the influential factors of environmental performance were discussed by TOBIT Regression Analysis System (Bai, Zhang, He, & Song, 2013); Cao, Huang, Xu, and Wang (2015) studied on the influencing factors of tourism efficiency of scenic as by GMM Estimation (SYS-GMM) etc.

The quantitative analysis of low-carbon tourism are insufficient, especially the measurement of productivity, at the same time, the further researches of influence factors on the change of productivity are in lack. In view of the problems, this paper will take tourism carbon emissions into the estimation of TFP as a quantification analysis of low-carbon tourism, firstly, tourist consumption stripping coefficient will be required to measure the carbon emissions of tourism, secondly, the TFP of low-carbon tourism and its dynamic changes will be estimated by SBM-Malmquist model, finally, the study of influencing factors will be based on the TOBIT model. All of the studies above are aimed to put forward some effective suggestions to enhance the competitiveness of tourism.

2. Methodology and Summary Statistics

Productivity generally refers to total factor productivity (hereinafter referred to as TFP), it is a performance evaluation index(Timothy et al., 2005), from the perspective of quantitative analysis, the study will measure the TFP of low-carbon tourism by taking tourism carbon emissions as bad output into the measurement of tourism productivity. Considering the availability of data, the study selects 27 provinces (cities) of China (excluding Hebei, Henan, Guangxi, Tibet, Hongkong, Macao, and Taiwan) as objectives, which relates to the estimation of tourism carbon emissions, static estimation and dynamic analysis of TFP of low-carbon tourism, also a further regression analysis with its factors.

2.1. Estimation Method of Tourism Carbon Emission

Carbon emissions in this paper refer to emissions of CO2, which mainly originate from energy consumption, however, tourism is not included in the statistics, and tourist consumption stripping coefficient is introduced to solve the problem, namely "the proportion of added value of tourist consumption in service industry"(Li & Li, 1999). The way of estimation is to strip tourism energy consumption from the energy consumption of industries related to tourism by tourist consumption stripping coefficient, and then convert it into tourism carbon emissions through the energy conversion coefficient. Referring to the 'National Tourism and related industries statistical classification 2015 '(GB/T4754-2011) and the 'Energy Statistics Yearbook', industries related to tourism are decided as Transportation, Warehousing and Postal industry, Wholesale and Retail industry, Hotels and Catering Services industry. The formula of tourist consumption stripping coefficient is:

$$A_i = T_i / N_i \tag{1}$$

Ai refers to tourist consumption stripping coefficient of i industry, Ti refers to the added value of tourism from i industry, it is the product of value-added rate and tourism revenues of i industry, value-added rate of i industry is the ratio of added value in the total output value of i industry, tourism revenue of i industry is the product of tourism income and the ratio of tourist consumption related to i industry, Ni refers to added value of i industry.

The formula of tourism carbon emissions is:

$$C = \Sigma\Sigma_{i=1}^{n}(E_{ij}A_i r_j \beta) \ (n = 1, 2, \cdots) \tag{2}$$

C represents the total carbon emissions of tourism, E_{ij} says energy J which is consumed by i industry, A_i says the tourist consumption stripping coefficient of i industry, r_j says reference coefficient of standard coal for energy conversion of energy j, say emissions of CO_2 per unit of standard coal, =2.45(Chen & Zhu, 2009).

2.2. Estimation Method of TFP of Low-carbon Tourism

Data Envelopment Analysis (DEA) is commonly used to estimate TFP, it does not involve the quantitative estimation of parametric equations and the assumption of effective technology is not required, but it can only measure the relative effectiveness of efficiency which says a comparison the productivity of a fixed point of Decision Making Unit (DMU) and production frontier, Malmquist-Luenberger index will be used to analyze the dynamic changes of TFP.

2.2.1. Techniques and Model of Production

Suppose there are K DMUs using N inputs in year t, that is $X_n^t = (X_1, X_2, \cdots, X_n) \in R_N^+$, to obtain M expected outputs, that is $Y_m^t = (Y_1, Y_2, \cdots, Y_M) \in R_M^+$, and W bad outputs, that is $b_W^t = (b_1, b_2, \cdots, b_W) \in R_W^+$ for k=1,...,K, t=1, .., T, λ_k^t is the adjusting weight of actual observations of DMU at each technical level. Production techniques are constructed as follow:

$$P^t = \{(x^t, y^t, b^t): \textstyle\sum_{k=1}^{K}\lambda_k^t x_{kn}^t \le x_{kn}^t, \forall n; \ \sum_{k=1}^{K}\lambda_k^t y_{km}^t \ge y_{km}^t, \forall m;$$

$$\textstyle\sum_{k=1}^{K}\lambda_k^t b_{kw}^t \le b_{kw}^t, \forall w; \ \lambda_k^t \ge 0, \forall \lambda\} \tag{3}$$

In (3), $\Sigma_{k=1}^{K} \lambda_k^t = 1$ means variable returns to scale (VRS), whereas constant returns to scale (CRS). DEA is rooted in CCR model by Charnes, Cooper and Rhodes (1978), after that, a lot of extended researches were proposed, including directional distance function of SBM (Slacks-Based Measure) by Tone, which was set to solve problems of traditional DEA model with angle and radial who ignores the slackness during input and output, it can solve the problem with bad output.

$$\overrightarrow{S_V^t}(x^t, y^t, b^t, g^x, g^y, g^b) = \text{Max} \frac{\frac{1}{N}\sum_{n=1}^{N}\frac{s_n^x}{g_n^x} + \frac{1}{M+W}\left(\sum_{m=1}^{M}\frac{s_m^y}{g_m^y} + \sum_{w=1}^{W}\frac{s_w^b}{g_w^b}\right)}{2};$$

$$\text{s.t.} \sum_{k=1}^{K}\lambda_k^t x_{kn}^t + S_n^x = x_{kn}^t, \forall n; \quad \sum_{k=1}^{K}\lambda_k^t y_{km}^t - S_m^y = y_{km}^t, \forall m;$$

$$\sum_{k=1}^{K}\lambda_k^t b_{kw}^t + S_w^b = b_{kw}^t, \forall w; \ \sum_{k=1}^{K}\lambda_k^t = 1, \lambda_k^t \geq 0, \forall \lambda; \tag{4}$$

$$\lambda \geq 0, \ S_n^- \geq 0, \ S_m^g \geq 0, \ S_w^b \geq 0$$

In (4), (x_k^t, y_k^t, b_k^t) says the input, output, bad output vector of kth DMU in year t, (g^x, g^y, g^b) is a corresponding contraction vector, (S_n^X, S_m^y, S_w^b) is a slack variable vector which can be understood as the redundant input, insufficient output, and redundant bad output of DMUs.

2.2.2. Malmquist-Luenberger Index

The dynamic change of productivity can be measured by Malmquist-Luenberger(ML) index, it was developed from Malmquist (M) index by Caves, Christensen, and Diewert. M-index is constructed based on output distance function which can't be applied to bad output, in view of that, Chambers, Chung, and Fare proposed the ML index based on the directional distance function. According to the directional distance function of SBM, the ML index during t and t+1 can be presented as:

$$ML_t^{t+1} = \left\{\frac{[1+\vec{S}_0^t(x^t, y^t, b^t; g^t)]}{[1+\vec{S}_0^t(x^{t+1}, y^{t+1}, b^{t+1}; g^{t+1})]} \times \frac{[1+\vec{S}_0^{t+1}(x^t, y^t, b^t; g^t)]}{[1+\vec{S}_0^{t+1}(x^{t+1}, y^{t+1}, b^{t+1}; g^{t+1})]}\right\}^{\frac{1}{2}} \tag{5}$$

ML index can be decomposed into efficiency change (EFFCH) index and technology change (TECHCH) index:

$$ML = EFFCH \times TECH \tag{6}$$

$$EFFCH_t^{t+1} = \frac{[1+\vec{S}_0^t(x^t, y^t, b^t; g^t)]}{[1+\vec{S}_0^{t+1}(x^{t+1}, y^{t+1}, b^{t+1}; g^{t+1})]} \tag{7}$$

$$TECHCH_t^{t+1} = \left\{\frac{[1+\vec{S}_0^{t+1}(x^t, y^t, b^t; g^t)]}{[1+\vec{S}_0^t(x^t, y^t, b^t; g^t)]} \times \frac{[1+\vec{S}_0^{t+1}(x^{t+1}, y^{t+1}, b^{t+1}; g^{t+1})]}{[1+\vec{S}_0^t(x^{t+1}, y^{t+1}, b^{t+1}; g^{t+1})]}\right\}^{\frac{1}{2}} \tag{8}$$

If the results of ML, EFFCH, TECHCH are greater than 1, says TFP, technical efficiency and technological progress grows positively, not the other way.

2.2.3. TOBIT Model

The TOBIT model belongs to censored regression model which is applied to the study of limited dependent variables. Limited says the observations of explained variables who are compressed at a point to form a mixed distribution of discrete and continuous called censored data, where the maximum likelihood method can be better for the regression estimation in place of the ordinary least squares method.

$$y_i^* = x_i\beta + \mu_i \mu_i \sim N(0, \sigma^2)$$

$$y_i = \begin{cases} & y_i^* y_i^* > 0 \\ 0 & y_i^* \leq 0 \end{cases} \tag{9}$$

In (9), is a limited dependent variable, is an independent variable, is a regression coefficient, and is a stochastic disturbance term.

2.3. Indicator Selection and Data Sources

The estimation of tourism carbon emissions is based on “China Statistical Yearbook”, “China Tourism Statistical Yearbook”, “Tourism Sampling Survey”, “China Energy Statistical Yearbook” during year of 2006-2016, and “General Principles for Calculation of Total Production Energy Consumption" of GB/T 2589-2008.

The measurement of TFP of low-carbon tourism by ML index involves indicator selection of input and output. From the perspective of production, for input indicators, capital, labor and land can be respectively represented as original value of fixed assets of tourism enterprises, tourism employees, tourism resource endowment, where A-class tourist attractions will be weighted. Tourism gross income is selected to represent output, and tourism carbon emissions is selected to represent bad output, tourism energy consumption is a corresponding input indicator to tourism carbon emissions. Indicators are from "China Tourism Statistical Yearbook" during the year of 2006-2016.

The TFP of low-carbon tourism influenced by a series of factors, after an overview of various studies, energy intensity, structure of energy consumption and intensity of R&D fund are considered as technical factors; economics of scale, industrial structure and scale of investment in fixed assets are considered as scale effects; in addition, economic strength, location quotient, urbanization rate and government regulation can also be considered. The data of factors are derived from “China Statistical Yearbook” during the year of 2006-2016.

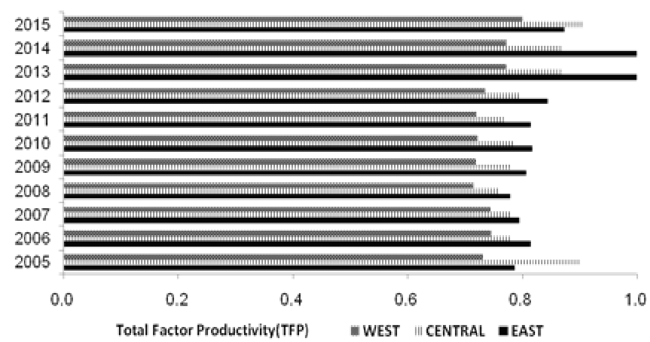
3. Estimation of TFP of Low-carbon Tourism3

Tourism carbon emissions is a bad output indicator of TFP of low-carbon tourism during the estimation process, the estimation method of tourism carbon emissions has been described in detail above and the result will not directly appeared in paper but only be reflected in the TFP of low-carbon tourism. The TFP of low-carbon tourism and ML index will be measured by MATLAB R2016a.

3.1. Static Analysis of TFP of Low-carbon Tourism

The result of TFP based on undesirable SBM model is static, says the different production frontiers resulted from the different technology in different years; in that case, the productivity can only be compared in the cross-section. Tianjin and Shanghai, who's TFP of low-carbon tourism are valid at any technical level during the year of 2005-2015, the other provinces (cities) are invalid to different degrees; there are some obvious differences of TFP of low-carbon tourism among provinces (cities), ranging between 0.7-1. Table I shows the value distribution of TFP of low-carbon tourism among 27 provinces (cities), the Figures in brackets indicate the frequency of TFP within the assumed range of 27 provinces (cities) during the year of 2005-2015. As it can be seen in table 1, provinces (cities) of higher TFP are concentrated in the East, while the lower are concentrated in the West.

<Figure 1> is a bar chart of three regions in China which shows the distribution of TFP of low-carbon tourism during the year of 2005-2015, there are some obvious differences of TFP among regions. Except in 2005 and 2015, the values of TFP of eastern region were greater than the central and Western regions, and achieved full effectiveness in 2013 and 2014; however, it was transcended by the central region in 2005 and 2015; the western region has always been "the most ineffective" among the three regions. TFP is an index estimated to measure the disparity between the effective production frontier and the best production frontier of input, output, bad output, in view of that, it can be found that the allocation of tourism resources are obviously better in the provinces (cities) and regions with higher TFP than the lower.



<Figure 1> The Regional Distribution of TFP of Low-carbon Tourism

3.2. Dynamic Analysis of TFP of Low-carbon Tourism

The dynamic change of TFP is measured by ML index, which can be divided into efficiency change index and technology change index (hereinafter referred to as EFFCH and TECHCH respectively). <Table 2> describes the average value of ML index and its decomposition index of 27 provinces (cities) during the year of 2005-2015.

<Table 1> Distribution of TFP of Low-carbon Tourism (2005-2015)

ρ	>0.9	<0.8
Provinces (Cities)	Shanghai (11), Tianjin (11), Anhui (11), Jiangsu (9), Zhejiang (8), Fujian (8), Guizhou 6), Beijing (4), Jiangxi (3), Hubei (3), Guangdong (2), Jilin (1), Yunnan (1) Shandong (1), Inner Mongolia (1), Liaoning (1),	Gansu (11), Qinghai (11), Ningxia (11), Xinjiang (11), Yunnan (10), Chongqing (9), Shaanxi (9), Heilongjiang (9), Sichuan (9), Inner Mongolia (8), Liaoning (8), Jilin (8), Shanxi (7) Hunan (7), Hainan (7), Hubei (5), Guangdong (5), Beijing (3) Shandong (2), Jiangxi (2)

Source: sort out from the result of TFP measured by MATLAB R2016a.

<Table 2> ML Index and Its Decomposition Index for TFP of Low-carbon Tourism

P/C	ML	EFFCH	TECHCH	P/C	ML	EFFCH	TECHCH
Beijing	0.955	0.965	0.989	Hubei	1.078	1.104	0.977
Tianjin	1.049	1.000	1.049	Hunan	0.981	0.987	0.993
Shanxi	1.117	1.069	1.045	Guangdong	1.111	1.099	1.011
Inner M	1.228	1.098	1.119	Hainan	1.006	0.997	1.009
Liaoning	1.198	1.078	1.112	Chongqing	1.003	0.997	1.006
Jilin	1.052	1.044	1.008	Sichuan	1.116	1.043	1.070
Heilongjiang	1.028	0.986	1.042	Guizhou	1.184	1.092	1.085
Shanghai	0.989	1.000	0.989	Yunnan	0.932	0.895	1.042
Jiangsu	1.031	1.000	1.031	Shaanxi	1.023	1.019	1.004
Zhejiang	1.094	1.082	1.011	Gansu	1.059	1.030	1.028
Anhui	1.002	1.000	1.002	Qinghai	0.945	0.965	0.979
Fujian	1.027	0.975	1.053	Ningxia	1.050	1.041	1.009
Jiangxi	1.026	0.975	1.053	Xinjiang	0.948	0.989	0.958
Shandong	1.013	1.013	1.001	Average	1.046	1.020	1.025

As it can be seen in <Table 2>, the average value of ML index of 27 provinces (cities) during the year of 2005-2015 is 1.0461, says a positive growth in TFP of low-carbon tourism. The provinces (cities), whose ML indexes are greater than 1, account for 77.8%, from the perspective of decomposition, some of them got a decline in technical efficiency, such as Heilongjiang, Fujian, Jiangxi, Hainan, Chongqing, while Tianjin, Jiangsu, Anhui stayed the same, the positive growth of TFP of provinces (cities) mentioned above originated from technical progress; there is a positive growth in TFP of Hubei originated from technical efficiency improvement even with a backwardness in technology; and the positive growth in TFP of other provinces (cities) originated from the joint action of technical efficiency improvement and technical progress. The value of ML index of Beijing, Shanghai, Hunan, Yunnan, Qinghai, Xinjiang is less than 1, says a negative growth in TFP of low-carbon tourism, and the negative growth in TFP of Beijing, Hunan, Qinghai, Xinjiang originated from the decline in technical efficiency and the backwardness in technology; the technical efficiency of Shanghai stayed unchanged and the negative growth in TFP originated from technical regress; the decline in technical efficiency of Yunnan lead to a negative growth in TFP even with a technical progress.

<Table 3> describes the ML index and its decomposition index for the TFP of low-carbon tourism of three major regions during the year of 2005-2015.In the eastern region, the ML index is less than 1 during the year of 2005-2006, 2006-2007, 2014-2015, says a negative growth in TFP of low-carbon tourism, the negative growth in 2005-2006 and 2014-2015 originated from technical regress, while a joint action of the decline in technical efficiency and technology in 2006-2007. In the remainder of the year, TFP showed positive growth even with problems of technical efficiency decline or technical regression. In the central region, the ML index is less than 1 during the year of 2005-2006, 2014-2015, says a negative growth in TFP of low-carbon tourism, there was a technical regress in both of them, and a decline of technical efficiency in 2005-2006. The positive growth in TFP of low-carbon tourism wasn't affected by the decline of technical efficiency in 2007-2008, 2013-2014 and the technical regress in 2008-2009, 2010-2011 and 2012-2013. In the western region, the ML index is less than 1 during the year of 2005-2006, 2007-2008 and 2014-2015, says a negative growth in TFP of low-carbon tourism, the negative growth originated from the technical regress in 2005-2006, 2014-2015 and the decline of technical efficiency in 2007-2008. The TFP grew positively in the remainder of the year.

The average value of ML index of the three regions are 1.0425, 1.0252, 1.1034, says a positive growth in TFP of low-carbon tourism in general, the average annual growth in the western region is greater than the eastern region, followed by the central region. From the perspective of decomposition, the positive growth in TFP of low-carbon Tourism in the eastern and central regions originated from the improvement of technical efficiency, and the western region originated from the joint action of technical efficiency improvement and technical progress.

4. Study on the Influencing Factors of TFP of Low-carbon Tourism

4.1. Variable Selection and Model Setting

The study on the influencing factors of low-carbon tourism is in a lack, the result of TFP above based on the dynamic analysis of ML index got rid of the constraints of cross-section, which is applicable to the panel data regression. The factors mentioned above are as follow:

(1) Economics of scale is measured by the ratio of the GDP of provinces (cities) to the GDP of China, presented as x1. (2) The economic strength is measured by GDP per capita, presented as x2. (3) Industrial structure is measured by the ratio of the added value of the tertiary industry to the GDP of provinces (cities), presented as x3. (4) Investment in fixed assets is measured by the fixed investments in the tertiary industry, presented as x4. (5) Energy intensity is measured by the ratio of the total energy consumption to the GDP of provinces (cities), presented as x5. (6) Structure of energy consumption is measured by the

<Table 3> ML Index and Its Decomposition of TFP of Low-carbon Tourism (2005-2015)

YEAR	EAST			CENTRAL			WEST		
	ML	EFFCH	TECHCH	ML	EFFCH	TECHCH	ML	EFFCH	TECHCH
2005-2006	0.6723	1.183	0.5683	0.3204	0.6401	0.5005	0.7413	1.0899	0.6802
2006-2007	0.9718	0.9778	0.9938	1.24	1.2318	1.0066	1.0435	1.0175	1.0255
2007-2008	1.1132	0.6145	1.8116	1.1959	0.6663	1.7948	0.9739	0.5478	1.778
2008-2009	1.1012	1.0916	1.0088	1.1063	1.1093	0.9973	1.1494	1.0743	1.0699
2009-2010	1.3973	1.1752	1.189	1.7085	1.3301	1.2844	1.8974	1.4219	1.3344
2010-2011	1.0595	1.0631	0.9966	1.077	1.0973	0.9815	1.0628	1.101	0.9653
2011-2012	1.0967	1.116	0.9827	1.1894	1.1787	1.009	1.2693	1.2292	1.0326
2012-2013	1.2078	1.3671	0.8835	1.1459	1.1686	0.9805	1.1179	1.0848	1.0306
2013-2014	1.1155	1.0067	1.1081	1.113	0.9991	1.1141	1.1543	1.0389	1.1111
2014-2015	0.8651	1.0873	0.7957	0.874	1.1221	0.7789	0.9351	1.1158	0.8381

ratio of the consumption of raw coal to the total energy consumption of provinces (cities), presented as x6. (7) Intensity of R&D fund is measured by the ratio of the R&D fund to the GDP of provinces (cities), presented as x7. (8) Location quotient, especially the location quotient of tourism, is measured by the ratio of tourism revenue to the GDP of provinces (cities) accounting for the ratio of tourism revenue to the GDP of China, presented as x8. (9) Urbanization rate is measured by the ratio of the urban population of provinces (cities) to the total population of China, presented as x9. (10) Government regulation is measured by the ratio of the financial expenditure of provinces (cities) to the GDP of China, presented as x10. (11) Opening degree is measured by the ratio of foreign direct investment of provinces (cities) to the GDP of China, presented as x11.

The TOBIT model of TFP of low-carbon tourism is shown as follow:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \beta_{11} x_{11} + \varepsilon \tag{10}$$

In (10), y is a dependent variable represented by the TFP of low-carbon tourism, x1-x11 represent independent variables of influencing factors mentioned above, $\beta_0 - \beta_{11}$ represent regression coefficients of independent variables, ε represents random error term, I represents province(city), t represents year. <Table 4> shows the regression results of the random effect model of TOBIT with the help of STATA/MP 14.0.

<Table 4> Regression Results of the Influencing Factors of TFP of Low-Carbon Tourism

Independent variable	Symbol	Coefficient	P>|z|
Economics of Scale	x1	2.6502**	0.027
Economic Strength	x2	0.00000534**	0.012
Industrial Structure	x3	-0.7343*	0.054
Investment in Fixed Assets	x4	-0.00000785	0.17
Energy Intensity	x5	-0.1232***	0.007
Structure of Energy Consumption	x6	0.3138**	0.046
Intensity of R&D Fund	x7	-0.0288	0.447
Location Quotient	x8	0.0842***	0
Urbanization Rate	x9	0.3579	0.329
Government Regulation	x10	0.8047***	0.006
Opening Degree	x11	-0.0167*	0.091

Note: ***, **, * indicate the significance at 1%, 5% and 10% level respectively

4.2. Analysis of Regression Results

As it can be seen in <Table 4>, economics of scale, economic strength, structure of energy consumption, location quotient and government regulation have a significant positive impact on the TFP of low-carbon tourism, among which the location quotient and government regulation are significant at 1% level while the other factors are significant at 5 % level. The promotion of economics of scale and economic strength will help optimize the allocation of tourism resources and increase productivity, the coefficient of economics of scale is much larger than economic strength, which says a significant scale effect. The positive effect of the structure of energy consumption indicates a dependence on coal consumption of tourism development; it can be considered that the benefits of coal consumption have a positive effect on the TFP of low-carbon tourism which is larger than the negative effect caused by carbon emissions, and the situation is in accordance with the situation of coal consumption in China. A higher location quotient shows a better degree of tourism specialization and a reasonable allocation of tourism resources, the promotion of tourism specialization is conducive to maximize output and minimize input, bad output of the development of low-carbon tourism. The promotion of macroeconomic regulation plays a positive role in promoting the development low-carbon tourism, in which the affairs expenditure of government create opportunities for the development of low-carbon tourism, at the same time, the special expenditure on environmental protection is conducive to improve the problem of carbon emissions.

Energy intensity, industrial structure and opening degree have a significant negative impact on the TFP of low-carbon tourism, among which the energy intensity is significant at 1% level while the other factors are significant at 10% level. The improvement of energy intensity reflects the decline in efficiency of energy utilization, thus inhibiting the improvement of the TFP of low-carbon tourism. The negative effect of industrial structure is contrary to the existing general assumptions, for a long time, the increase of the proportion of tertiary industry was considered as optimization of industrial structure, however, in recent years, the "optimization" converts into "change", which indicates that the continue rise of proportion of the tertiary industry led to a change of rationality of industrial structure, thereby inhibiting the promotion of the TFP low-carbon tourism. The promotion of the ratio of FDI to GDP means an inflow of more factors, such as capital and technology, but also means a deepen of dependence of economic growth on FDI, with a possibility of adverse inflow of capital and technology, which is not conducive to the healthy development of local economy and have an inhibitory effect on the promotion of the TFP of low-carbon tourism.

Investments in fixed assets, intensity of R&D fund and urbanization rate have not passed the significant test. Firstly, Investments in fixed assets is the reproduction of fixed assets, its earnings will take some time to complete, while the tourism is an instant activity and its return completed during the activity, there is hysteresis between the investment and the tourism, in that case, investments in fixed assets did not appear to be significant. Secondly, the

R&D fund in China is limited and only accounts for limited proportion of GDP, the limited R&D fund also have a limited contribution to the development of low-carbon tourism, that's why there is no significant correlation. Finally, the reason for the failed result of significance test of urbanization rate is complicated; it may be attributed to the expansion of scope of tourism development which is not limited to towns any more, especially the prevalence of rural tourism.

5. Conclusion and Suggestion

5.1. Conclusion

In this paper, firstly, undesirable SBM model is used to estimate the TFP of low-carbon tourism of 27 provinces (cities) of China during the year of 2005-2015, and the SBM-Malmquist model is used to analysis the TFP of low-carbon tourism and its dynamic changes, finally, the TOBIT model is used to study the influencing factors.

(1) There is an obvious difference of the TFP of low-carbon tourism among regions, the eastern region is better than the central and western regions, and the upside of the west region is huge. For provinces (cities), the provinces (cities) with higher productivity are concentrated in the East, while the lower are concentrated in the West.

(2) The average change of the TFP of low-carbon tourism during the year of 2005-2015 tend to grow positively in general, from the regional perspective, the average change of productivity in eastern, central and western regions grow positively, and the positive growth of the western region stems from the improvement of technical efficiency and technical progress, the eastern and central regions stems from the improvement of technical efficiency even with technical regression, the average annual growth rate of the western region is higher than the eastern and central regions.

(3) As it can be seen in the results of influencing factors of the TFP of low-carbon tourism, economic scale, economic strength, structure of energy consumption location quotient and, government regulation have a significant positive impact on the TFP of low-carbon tourism; energy intensity, industrial structure, opening degree have a significant negative impact on the TFP; urbanization rate, investment in fixed assets and intensity of R&D funds do not pass the test.

5.2. Suggestion

Improving the productivity of low-carbon tourism and reducing regional differences are effective ways to develop low-carbon tourism and enhance tourism competitiveness. The suggestions below are based on the analysis and conclusions above:

(1) Under the premise of following the law of economic development, we should rationally expand the economic scale and enhance the economic strength effectively, thus creating a sound economic foundation for the development of low-carbon tourism. We should promote the specialization of low carbon tourism effectively by realizing the organic integration of existing resources, the industrial integration and the creation of "Travel+" mode. The development of low-carbon tourism can't rely on the expansion of the tertiary industry and the promotion of opening degree, we should rationally adjust the ratio of tertiary industry during the optimization of industrial structure and the introduction of capital and technology during the process of opening to the outside world. In addition, we should give full play to the positive guiding role of the government, and develop the low-carbon tourism from the perspective of overall planning of resources, management system, policies and regulations.

(2) We should rationally control the proportion of coal consumption, develop new energy sources and optimize the structure of energy consumption. What's more, we should increase the fund of R&D and provide technical support for low-carbon tourism accordingly to improve the utilization of energy and reduce the dependence of low-carbon tourism on energy.

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