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# Inclusive green growth and development of the high-quality tourism industry in China: The dependence on imports

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ABSTRACT

Inclusive green growth and dependence on import trade are domestic and international issues that need to be considered in the process of high-quality development of China's tourism industry. Under the complex international environment, it is necessary to explore the regulating effect of import dependence on the impact of inclusive green growth on the high-quality development of the tourism industry. From the perspective of import dependence, this study uses the panel data of 30 Chinese provinces (excluding the Tibet Autonomous Region, Hong Kong, Macao, and Taiwan) from 2010 to 2019, and constructs the mechanism of inclusive green growth on the high-quality development of the tourism industry based on the theory of spatial production. The purpose of this study is to examine the moderating effect of import dependence on the mechanism of the inclusive green growth index on the high-quality development of the tourism industry. It is found that inclusive green growth can significantly promote the high quality of the tourism industry. The threshold test results show that import dependence has a significant negative threshold effect in the mechanism of inclusive green growth on the high-quality development of the tourism industry. When import dependence exceeds a single threshold (38.65), the contribution of inclusive green growth to the improvement of high-quality development level of the tourism industry first decreases and then increases. The results show that even if there are favourable conditions such as inclusive green growth, if there is dependence on imported goods, it will have a negative impact on the high-quality development of the tourism industry. This paper enriches the research on the evaluation of high-quality development level of the tourism industry and the interaction between international trade and tourism industry. Moreover, it provides a reference for developing countries such as China under the impact of COVID-19 and the anti-globalisation.



## 1. Introduction

### 1.1. The origin of this study

COVID-19 is spreading worldwide. It not only poses a serious threat to the health and life of the whole world, but also negatively affects the global labour market and economic development, especially in international trade and the tourism industry. As many as 120 million tourism jobs are at risk. In 2020 alone, the economic loss may have exceeded US $1 trillion, according to a report released by the Secretary General of the United Nations, Antonio Guterres. Therefore, it is crucial to re-examine the importance of import dependence and ecological environment protection in the development of the regional tourism industry. Uğur et al. (2019) tested the relationship between inbound tourists and the import and export volume of Turkey and 13 Silk Road countries through autoregressive distributed lag model (ARDL), and pre-

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**Nomenclature**

| | |
|---|---|
| $THD$ | The high-quality development index of the tourism industry |
| $GEP$ | Inclusive green growth index |
| $PATG$ | The proportion of added value of the tertiary industry in GDP |
| $PFAIT$ | The proportion of fixed assets investment in the tertiary industry (excluding farmers) |
| $PFEG$ | The proportion of fiscal expenditure in GDP |
| $NPA$ | The number of patent applications |
| $PCEUR$ | The per capita consumption expenditure of urban residents |
| $\ln THD$ | The logarithmic form of the dependent variable |
| $\ln GEP$ | The logarithmic form of the core independent variable |
| $\ln NPA$ | The logarithmic form of the number of patent applications |
| $\ln PCEUR$ | The logarithmic form of the per capita consumption expenditure of urban residents |
| $i$ | The i-th province |
| $t$ | Years |
| $\alpha_0$ | The constant term$i$ |
| $\alpha_{1\sim2}$,$\beta_{1\sim5}$ | The value of the parameter to be estimated |
| $u$ | Time fixed effect |
| $v$ | Regional fixed effect |
| $\varepsilon$ | The random error term |
| $ID$ | Import dependence |
| $\ln ID$ | The logarithmic form of import dependence |
| $\gamma$ | The threshold value to be estimated |
| $I(X)$ | The index function |
| $S$ | The standardized data |
| $x$ | The original data |
| $m$ | Number of provinces |
| $j$ | The $j$th indicator |
| $n$ | Number of indicators |
| $+$ | Indicator attributes are positive |
| $-$ | The indicator attribute is negative |
| $R$ | The information entropy of index |
| $d$ | Proportion of an indicator in all samples |
| $W$ | The weight of the index |
| SE-DEA | Super efficiency data envelopment analysis model |
| $L$ | Number of input indicators |
| $K$ | Number of output indicators |
| $g$ | The input indicator |
| $f$ | The output indicator |
| $\theta$ | The comprehensive technical efficiency |
| $\lambda$ | The weight coefficient |
| $s^+$ | The residual variable |
| $s^-$ | The relaxation variable |
| $e_1^T$ | L-dimensional unit vectors |
| $e_{2_k^T}$ | K-dimensional unit vectors |
| $\chi^2$ | Chi-square statistics |
| $p$ | Significance coefficient |
| $F$ | Variance homogeneity test |
| $R^2$ | Coefficient of determination |
| $\ln THD_{it-1}$ | The logarithmic form of the lagging first-order term of the tourism industry high-quality development index |
| $t$-value | Statistical value of $t$-test |

liminarily proved that tourism is related to international trade, and that international trade is very important for the development of tourism. Simultaneously, in order to curb and avoid the loss of the global economy and community health caused by the spread of viruses, it is necessary to promote the coordinated development of ecological environment protection, social equity, and tourism economic growth. From the perspective of import dependence, this paper discusses the impact of ecological environment protection and social equity on the development of the tourism industry. Its purpose is to try to link international trade, inclusive green growth and development of the high-quality tourism industry organically. Then provide suggestions for operation and management of tourism industry under the impact of COVID-19 by exploring the interaction mechanism among international trade, inclusive green growth and development of the high-quality tourism industry.

### *1.2. Research issues and objects*

In order to explore the impact mechanism of ecological environmental protection and social equity on the high-quality development of the tourism industry under the condition of import dependence, this paper introduces three concepts: import dependence, inclusive green growth, and the high-quality development of the tourism industry. Import dependence is expressed by the ratio of regional trade imports to total imports and exports. Under the impact of COVID-19 and the trend of anti-globalisation, the Chinese government is establishing a new development pattern which takes domestic big cycle as main body, domestic and international double cycle promote each other. This concept provides a method for solving the problem of import dependence. The concept of the inclusive green growth was proposed at the 2012 United Nations Conference on Sustainable Development (Rio + 20). It opens a sustainable development path that takes into account both green development and social equity. Inclusive green growth combines the development vision of ecological environment protection, social equity, and sustainable growth, and is an important tool to promote the construction and sustainable development of eco-civilisation. High-quality development of the tourism industry is a new concept proposed by the Chinese government based on the theory of high-quality development, which is an important way to improve the construction of a tourism governance system. Xi Jinping, President of the People's Republic of China, pointed out that the development of the new era and new stage must remain committed to the new development philosophy and must be of high quality. This means that the development mode of the tourism industry in the new era must be of high quality, and to achieve the high-quality development of the tourism industry, the new development philosophy must be remain committed. Inclusive green growth advocates economic growth, social equity and green production, which has great similarity with the new development philosophy of innovative, coordinated, green, open and shared. It can be said that the inclusive green growth index is a way to measure the implementation of new development philosophy. Therefore, this study explores the impact mechanism of the inclusive green growth on the high-quality development of the tourism industry from the perspective of import dependence. This provides ideas and references for global tourism industry governance under COVID-19.

Before discussing the above issues, this study needs to elaborate the meanings of inclusive green growth and import dependence. The high-quality development of the tourism industry needs the support of the overall environment of a region. Therefore, the inclusive green growth index obtained in this paper is a comprehensive index to measure the overall development environment of a region, not just limited to regional tourism. The import dependence proposed in this paper refers to the dependence of regional overall development environment on import trade, rather than the dependence of regional tourism development on import trade. In-

bound and outbound tourism and the import and export of other commodities or goods will have an impact on the development of regional tourism. The import dependence of inbound and outbound tourism means that the development of regional tourism depends too much on inbound tourism market. The import dependence of import and export trade of other commodities indicates that the overall development of the region is too dependent on the import of commodities. The import dependence discussed in this paper is the second case.

Because the statistical data of Hong Kong, Macao, Taiwan, and the Tibet Autonomous Region are not easy to obtain, in order to ensure the continuity of panel data and the consistency of acquisition calibre, this study selected 30 provinces in China as the research object. Through the entropy weight method and the data envelopment analysis method, this paper calculates the inclusive green growth index, the high-quality development index of the tourism industry, and the import dependence index of 30 provinces in China. This paper from the perspective of import dependence, discusses the influencing mechanism of inclusive green growth on the high-quality development of the tourism industry further.

The import dependence has both the positive effect of expanding opening up and the negative effect of reducing the ability of independent innovation. Therefore, the impact of import dependence on the relationship between inclusive green growth and high-quality development of the tourism industry may be nonlinear. The threshold model proposed by Hansen (1999) can be used to explain the dynamic and non-linear influence of threshold variables on the other two variables. Threshold effect model breaks the assumption of linear relationship between variables and is suitable for testing the characteristics of nonlinear variation between variables (Dai and Cheng, 2013). Thus, this paper uses the threshold model to explore the dynamic and non-linear impact of import dependence on the relationship between inclusive green growth and high-quality development of the tourism industry.

### *1.3. Theoretical explanation*

Based on the 'spatial production theory' put forward by French scholar Henri Lefebvre in 1974, this paper expounds the mechanism for inclusive green growth to influence the high-quality development of the tourism industry based on import dependencey. Spatial production theory explains the emergence and development of urban society by using spatial thinking, and the theoretical core of 'society space' is constructed. It becomes the premise for the introduction of the spatial production theory from philosophy and sociology to geography and tourism. The dialectical framework of 'three elements in one' is an important content to the theory of space production, which is embodied in the the "practice of space", the "representation of space" and the "space of representation". The dialectical framework of "three elements in one" can be used to explain any social form and mode of production. The "practice of space" is a material and perceptive space, including the nodes, paths, and environment of social production and reproduction. The "practice of space" in this paper represents a productive investment in tourism development. The "representation of space" is conceptual and symbolic space, acquired through the adjustment and modification of the real space texture by the various roles of space using their own thinking consciousness and power of knowledge. It can be introduced into this study as a representation of the impact of the conception of inclusive green growth, import dependence on the development of the regional tourism industry. The "space of representation" is the real space of human life, which is a combination of the produced space and the regression of space practice. Introducing it into this study can represent the output end of the development process of the regional tourism industry.

At present, the high-quality construction of China's tourism industry has just started, and there is a certain distance from the state of high-quality development, so a evaluation of the high-quality development of China's tourism industry in various provinces can't be directly conducted. The key performance of high-quality development is to achieve industrial quality change, efficiency change, and dynamic change. Therefore, based on China's national conditions, this paper evaluates the development quality of the tourism industry in China's provinces from the perspective of production efficiency. High-quality development is the form of promoting the comprehensive development of economic, political, cultural, social and ecological dimensions, and tourism activities are related to many aspects within the region. Therefore, the high-quality development of regional tourism is the high-quality development of various aspects related to tourism in the region.

The following points should be paid attention to construct the impact mechanism of inclusive green growth on high-quality tourism development from the perspective of production efficiency: The factors of production in the input side of regional tourism industry come from economic, political, cultural, social and eco-civilisation dimensions. The benefits of the tourism industry's output side can feed back to the dimensions of economy, culture, society, and eco-civilisation. The economic, political, cultural, social and eco-civilisation space after the benefit feedback can be affected by a variety of factors, and then become the basic condition to promote the quality of tourism development to a higher level.

This paper combines with the theory of spatial production, and construction the mechanism of tourism industry high-quality development based on production efficiency (Fig. 1).

In this paper, it is reasonable and necessary to consider import dependence as a threshold variable of the impact of inclusive green growth on high-quality development of the tourism industry. The relationship between international trade and tourism development exists objectively. Some Chinese scholars have proposed that the development of international tourism can accelerate the growth of international trade, there is a positive correlation between the two. Huang (2019) recognized the relationship between import trade and tourism development. Taking Pingxiang Port of Guangxi Zhuang Autonomous Region as an example, cultivating a new format of 'cross-border tourism industry + import fruit trade' was proposed. However, the effect of international trade on the development of the tourism industry can not always be positive. When the import volume is greater than the export volume, the development of the tourism industry may be negatively affected. Too much import means too much dependence on high-tech products such as integrated circuits, instruments, meters, display panels, especially for China and other developing countries, which is not conducive to the development of smart tourism. At the same time, over-reliance on imports is not conducive to the publicity of national image. It can make the country less attractive to potential inbound tourists and lead to the shrinkage of the inbound tourism market.

This paper preliminarily tested the correlation between import dependence, total tourism income, and total number of tourists in China. The results show that the import dependence of China's provinces is related to the total tourism income and the total number of tourists. From the perspective of data: the import dependence degree is negatively correlated with the total tourism income at the significance level of 5%, and the correlation coefficient is -0.14. There is a negative correlation between import dependence and total number of tourists when the significance level is 1%, and the correlation coefficient is -0.25. Based on this conclusion, if import dependence is taken as a threshold variable, whether it have a threshold adjustment effect on the impact of

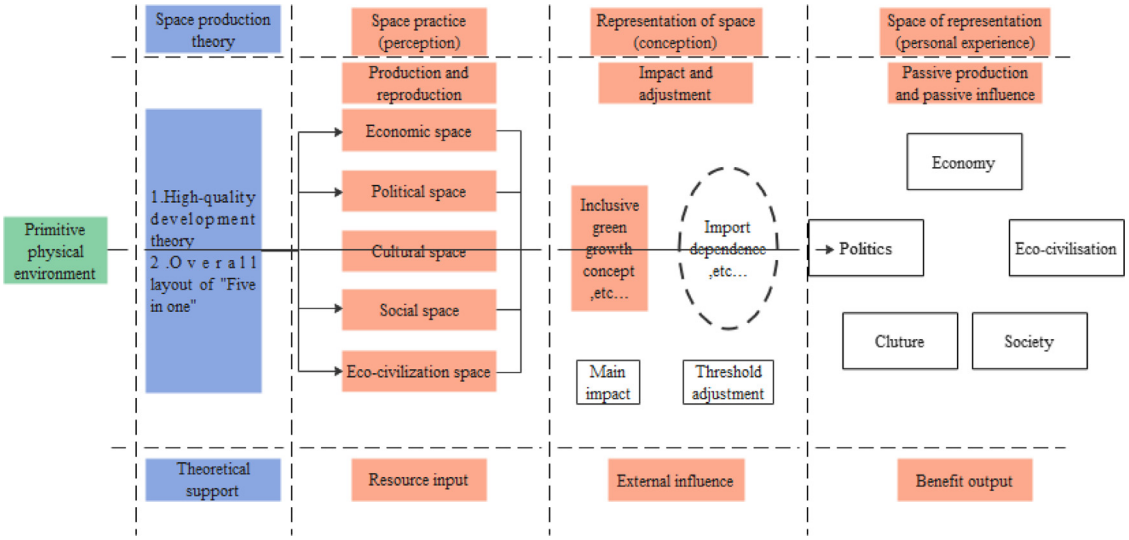


**Fig. 1.** The mechanism of tourism industry high-quality development based on production efficiency.

inclusive green growth on the high-quality development of the tourism industry. This problem is worth considering.

### *1.4. Theoretical contribution and practical significance*

Some scholars have made rich research achievements in the evaluation of high-quality development of the tourism industry, the evaluation of inclusive green growth, and the relationship between international trade and the tourism industry. In terms of the evaluation of high-quality development level of the tourism industry, scholars comprehensively measure the development of the tourism industry in the whole region (Tang et al., 2021), or measure the quality level of a tourism sector or a tourism activity link (PAI et al., 2019). Data measurement and experimental interview have been used frequently(Liu et al., 2019). In addition, when the existing literature evaluates the high-quality development of the tourism industry, the index variables mostly come from the five development requirements of the new development philosophy. The new development philosophy is scientific, detailed and reasonable, which has important reference significance for the construction of high-quality development index system of tourism industry (Liu et al., 2020). In terms of inclusive green growth of the tourism industry, the spatial and temporal patterns and spillover effects of inclusive green growth efficiency, the construction of international tourism destinations and the poverty alleviation of tourism industry have been widely studied (Zhao et al., 2021; He et al., 2019; Shen et al., 2016). Scholars' research on the relationship between international trade and the tourism industry has gone through the stages from bilateral relations to multilateral relations, from one-way role to two-way role of trade and tourism, from single positive influence to comprehensive consideration of positive and negative effects(Jordan and Ken, 2001; Zhao et al., 2012; Christian et al., 2009; Richard et al., 2011).

This paper contributes theoretically to has contributed to the construction of high-quality development mechanism of tourism industry and the discussion of the relationship between international trade and the development of tourism industry.

First of all, based on the "three in one" framework of the spatial production theory, this paper constructs a high-quality development mechanism of tourism industry from the perspective of production efficiency. It points out that the production factors of high-quality development of the tourism industry comes from the five dimensions of economic, political, cultural, social, and eco-civilisation. The output benefit of high-quality development of the tourism industry is conducive to the development of the above five dimensions. The high-quality development mechanism of tourism industry can be influenced and adjusted by external factors in the process of operation. The development mechanism provides a reference for other research on measuring the high-quality development index of the tourism industry in the aspect of index source.

The second, using the threshold regression model, this paper discusses the threshold effect of import dependence on the relationship between an inclusive green growth and high-quality development of the tourism industry. Threshold regression analysis is an effective method to study the nonlinear relationship. Threshold regression model can judge whether import dependence has a threshold regulating effect on the relationship between inclusive green growth and high-quality development of the tourism industry, and how to adjust the relationship between them.

The third, this paper constructs an inclusive green growth index to explore the relationship between it and the high-quality development of the tourism industry. It provides a theoretical reference for dealing with the problems of economic growth, ecological protection and social equity in the process of high-quality of tourism development.

The practical significance of this paper is mainly reflected through the discussion of the impact mechanism of an inclusive green growth on the high-quality development of the tourism industry from the perspective of import dependence, which organically connects international trade, sustainable development, and tourism industry development. It provides a reference for China and other developing countries to adjust their tourism development strategies under the impact of COVID-19.

In addition, this paper puts forward three research hypotheses:

**Hypothesis 1.** With other conditions unchanged, inclusive green growth has a positive relationship with the high-quality development of the tourism industry.

**Hypothesis 2.** Import dependence has a negative effect on the relationship between inclusive green growth and the industrial high-quality development of the tourism industry.

**Hypothesis 3.** Import dependence has a threshold regulation effect on the relationship between inclusive green growth and the industrial high-quality development of the tourism industry.

### 1.5. Thesis proposal

This paper aims to calculate China's inclusive green growth index and the index for tourism's industrial high-quality development, and verify the correlation between them using regression analysis. Then, by setting import dependence as the threshold variable, this paper constructs a panel threshold model. In the end, the paper discusses whether import dependence plays a threshold regulating role in the relationship between inclusive green growth and high-quality tourism development. In addition to this section, Section 2 is literature review. Section 3 panel regression model, threshold regression model and index evaluation system are constructed, and data sources and research methods are clarified. Section 4 include empirical process and result analysis. The last part of the paper is the research results and conclusions.

## 2. Literature review

### 2.1. Construction of high-quality development index evaluation system of tourism industry

The high-quality development of the tourism industry is put forward based on the high-quality development theory. The report of the 19th National Congress of the Communist Party of China puts forward that "China's economy has changed from a stage of high-speed growth to a stage of high-quality development, and is in a critical period of transforming the mode of development, optimising the economic structure, and transforming the driving force of growth". Currently, there are two understandings of the meaning of high-quality development of the tourism industry in academic circles. One takes the high-quality development as the evaluation standard to measure the development of tourism industry in the whole region, and pay more attention to comprehensiveness (He and Hu, 2020; Tang et al., 2021). The other is the quality evaluation of a sector of the tourism industry or a link of tourism activities, and it focuses more on the micro perspective and diversification (Pai et al., 2019; Hatamifar et al., 2018). The former is mainly based on domestic research in China. The research idea is to collect and sort out the panel data for comprehensive calculation, and then use econometric statistics and spatial statistics to calculate the comprehensive score and distribution characteristics. (Shi et al., 2021; Wang et al., 2020; Liu et al., 2019). The latter is mainly based on the research of other countries, and frequently using the methods of interview and experimental comparison (Fam et al, 2021). This paper aims to use the first research idea to study the high-quality development of the tourism industry.

The construction of the high-quality development of China's tourism industry has just started, thus the academic research on this aspect is still relatively primary. The existing literature mainly discusses how to build the index system and measure the high-quality development index. However, the existing literature does not define high-quality development of the tourism industry, nor does it elaborate the high-quality development mechanism of tourism. The five new development philosophy of innovation, coordination, green, openness and sharing have become the source of indicators for many scholars to build a high-quality development evaluation system of tourism. Liu et al. (2020) considered that the 'new development vision' to be scientific, detailed, and reasonable, which had important reference significance to build a high-quality economic development index system. Lv and Cui (2020) pointed out that high-quality development highly integrates new development visions, defined the connotation of high-quality development from the aspects of the economy, innovation, coordination, greenness, openness, and inclusivity, and selected the index variables of a high-quality evaluation system according to the abovementioned six dimensions. Zhang et al. (2020) combined with the new development visionand defined the high-quality development of the tourism industry as a complex process of innovation, coordination, greenness, opennees, inclusivity, and cultural tourism resources, and constructs the evaluation system of high-quality development of the tourism industry from the abovementioned six aspects. In addition, some scholars evaluate the high-quality development level of the regional tourism industry from the perspective of production efficiency of regional tourism industry. The index variables are divided into input and output, which are mostly obtained from tourism resource endowment, scenic spots, hotels, travel agencies, total tourism income, and total number of tourists (He and Hu, 2020; Wang et al., 2020; Zhang and Tong, 2021).

This study points that it is unreasonable to take the five new development philosophy as the index source of the evaluation system of high-quality development of the tourism industry. One of the connotation of high-quality development is the fundamental embodiment of the new development philosophy; that is to say, to achieve high-quality development, innovation, coordination, greenness, openness, and inclusivity must be achieved. From this point of view, the new development philosophyis more like the influencing factor of high-quality development. The correct selection range of a high-quality development evaluation index of the tourism industry comes from the Five-sphere Integrated Plan. According to the input-output mechanism of production efficiency, input indications and output indicators are selected from five dimensions of civilization: economy, politics, culture, society and eco-civilisation. Then, the data envelopment analysis method is used to measure the realistic level of high-quality development of the tourism industry. This research idea of combining production efficiency with the Five-sphere Integrated Plan can more accurately describe the high-quality development of the tourism industry.

### 2.2. Inclusive green growth and high-quality development of the tourism industry

The research on inclusive green growth is very mature. It is mainly used in the fields of carbon emission reduction, carbon tax, resource development and utilisation, social equity, and social inclusion (Ojha et al., 2020; Wang et al., 2020; McCartney et al., 2020; Soma et al., 2018; Brand et al., 2017; Spash, 2020). Significant progress has also been made in the study of inclusive green growth in tourism and related industries. Zhao et al. (2021) measured the spatial-temporal pattern and spatial spillover effect of inclusive green efficiency in China and provides a reference for the development of the tourism industry in each province. He (2019) pointed out that inclusive growth is a new mechanism for the construction of international tourism destinations in western provinces of China, and explored the basic path of the construction of international tourism destinations in Western China under the condition of inclusive growth. Shen et al. (2016) regarded the inclusive green growth development mode as a path of tourism poverty alleviation in frontier ethnic areas, which is conducive to dealing with the relationship between economy, equity, and ecological environment protection. Zhang and Chen (2020) empirically studied the impact of tourism development on inclusive growth in poor areas. The results show that tourism development can promote the inclusive growth of poor areas. In addition, inclusive growth and ethnic tourism, religious tourism, and rural tourism are also involved.

Many papers discussing the inclusive green growth of tourism have been published. However, the focus of this paper is not the inclusive green growth of tourism itself, but the impact of the inclusive green growth of the whole society on the high-quality development of the regional tourism industry. This paper regards the inclusive green growth index as a quantitative form of the new development philosophy, discusses its impact on the mechanism

of the high-quality development of the regional tourism industry. This paper enriches the relevant research on green, inclusive, fair, and sustainable growth and the high-quality development of the tourism industry.

### 2.3. Import dependence and the high-quality development of the tourism industry

The relationship between international trade and the development of the tourism industry has been discussed by many scholars. As early as 2001, Jordan and Ken (2001) took China as an example to discuss the causal relationship between trade and tourism. The results show that there is a two-way Granger causality between international tourism and international trade, which means that international trade is indeed related to the development of China's tourism industry. Zhao et al. (2012) further discussed the relationship between China-EU tourism and import and export trade. The conclusion is that the differences between countries in the relationship between tourism and trade are closely related to the inflow of passengers, the degree of dependence on trade, bilateral relations and other factors. Christian et al. (2009) discussed the impact of inbound tourism development on the wine export trade. The correlation between international people flow and goods flow causes positive interdependence between tourism inflow and manufactured goods export. Richard et al. (2011) were aware of the negative impact of international trade. By studying the relationship between bilateral trade and medical tourism, the authors discussed the advantages and disadvantages of international trade. Fang et al. (2020) studied the relationship between China-South Pacific island countries tourism and trade, and the results show a positive long-term equilibrium relationship between tourism flow and import and export trade between China and South Pacific island countries. The above literature shows that scholars' research on the relationship between international trade and the tourism industry has gone through the stages: from bilateral relations to multilateral relations, from one-way role to two-way role of trade and tourism, from single positive influence to comprehensive consideration of positive and negative effects.

However, the high-quality development of the tourism industry should be innovative and open. It should not only strengthen international exchanges, but also not rely too much on the import of technical products. Therefore, this paper studies the threshold moderating effect of import dependence on the relationship between inclusive green growth and high-quality tourism development. This paper is a supplement to the research on the relationship between international trade and the tourism industry. The research results of this paper provides a reference for China and other developing countries to adjust their tourism industry development strategies according to the international environment.

## 3. Methods

### 3.1. Model building

Based on the panel data of 30 Chinese provinces from 2010 to 2019 (Hong Kong, Macao, Taiwan, and the Tibet Autonomous Region were not included because of the lack of data), this paper studied the threshold moderating effect of import dependence on the relationship between inclusive green growth and high-quality development of the tourism industry. The panel regression model of the impact of inclusive green growth on the high-quality development of the tourism industry is constructed.

In the panel regression model of the impact of inclusive green growth on the high-quality development of the tourism industry, the high-quality development index of the tourism industry is the dependent variable and is referred to as "*THD*" for short. Inclusive green growth index is the core independent variable and is referred to as "*GEP*" for short. The proportion of added value of the tertiary industry in GDP is a control variable and is called "*PATG*" for short. The proportion of fixed assets investment in the tertiary industry (excluding farmers) is a control variable and is called "*PFAIT*" for short. The proportion of fiscal expenditure in GDP is a control variable and is called "*PFEG*" for short. The number of patent applications is a control variable and is called "*NPA*" for short. The per capita consumption expenditure of urban residents is a control variable and is called "*PCEUR*" for short. $\ln THD$is the logarithmic form of the dependent variable. $\ln GEP$is the logarithmic form of the core independent variable. $\ln NPA$is the logarithmic form of the number of patent applications. $\ln PCEUR$is the logarithmic form of the per capita consumption expenditure of urban residents. The reason for taking logarithms of variables is to weaken the collinearity and heteroscedasticity of the model. In addition, the subscripts $i$ indicates the $i$ province, the subscripts $t$ indicates the $t$ year. $\alpha_0$ is the constant term, $\alpha_1$, $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$, $\beta_5$are the value of the parameter to be estimated. $u$ is time fixed effect, $v$ is regional fixed effect, and $\varepsilon$ is the random error term.

The panel regression model is shown as follows (1).

$$\ln THD_{it} = \alpha_0 + \alpha_1 \ln GEP_{it} + \beta_1 PATG_{it} + \beta_2 PFAIT_{it} + \beta_3 PFEG_{it} + \beta_4 \ln NPA_{it} + \beta_5 \ln PCEUR_{it} + u_t + v_i + \varepsilon_{it} \quad (1)$$

This paper establishes the regression equation of threshold model with import dependence as threshold variable. Import dependence is expressed by the ratio of trade import amount to total trade import and export amount.

In the regression equation of threshold model, the meanings of variables $THD$, $GEP$, $PATG$, $PFAIT$, $PFEG$, $NPA$, $PCEUR$, $\ln THD$, $\ln GEP$, $\ln NPA$, $\ln PCEUR$, $i$, $t$, $\alpha_0$, $\beta_1 \sim \beta_5$, $\varepsilon$ are the same as those in panel regression model (1). $\alpha_1$ and $\alpha_2$ are the value of the parameter to be estimated.$ID$indicates import dependence, and$\ln ID$represents the logarithmic form of import dependence. $\gamma$ is the threshold value to be estimated. $I(X)$ is the index function,

The regression equation of the threshold model is shown as follows:

$$\ln THD_{it} = \alpha_0 + \alpha_1 \ln GEP_{it} \times I(\ln ID_{it} \le \gamma) + \alpha_2 \ln GEP_{it} \times I(\ln ID_{it} > \gamma) + \beta_1 PATG_{it} + \beta_2 PFAIT_{it} + \beta_3 PFEG_{it} + \beta_4 \ln NPA_{it} + \beta_5 \ln PCEUR_{it} + \varepsilon_{it} \quad (2)$$

The above model is only for the simple case of a single threshold. From an econometric point of view, there may be two or more thresholds, so it is necessary to set up a double threshold model. The symbols in the double threshold regression model have the same meaning as those in the single threshold regression model.

The double threshold regression model is shown as follows:

$$\ln THD_{it} = \alpha_0 + \alpha_1 \ln GEP_{it} \times I(\ln ID_{it} \le \gamma_1) + \alpha_2 \ln GEP_{it} \times I(\gamma_1 < \ln ID_{it} \le \gamma_2) + \alpha_3 \ln GEP_{it} \times I(\ln ID_{it} > \gamma_2) + \beta_1 PATG_{it} + \beta_2 PFAIT_{it} + \beta_3 PFEG_{it} + \beta_4 \ln NPA_{it} + \beta_5 \ln PCEUR_{it} + \varepsilon_{it} \quad (3)$$

### 3.2. Variable selection

Based on the above discussion on the high-quality development mechanism of the tourism industry, this section determines each index variable. Among them, the inclusive green development index is the independent variable. The high-quality development of the tourism industry is the dependent variable. The proportion of the added value of the tertiary industry in GDP, the proportion of fixed asset investment in the tertiary industry (excluding farmers). The proportion of fiscal expenditure in GDP. The number of patent applications, and per capita consumption expenditure of urban residents are the control variables. The import dependence index is the threshold variable.

**Table 1**
China's inclusive green growth index system.

| Dimension | Secondary indicators (Unit) | Nature |
|---|---|---|
| Material footprint per capita (Ming et al., 2021) | Per capita GDP per square kilometre of built-up area (Yuan) | Positive |
| | Forest volume per 10,000 cubic metres per capital GDP (Yuan) | Positive |
| | Per capita GDP per thousand hectares of wetland area (Yuan) | Positive |
| Air pollution (Li and Yin, 2020) | Proportion of days when the air quality of provincial capital cities reaches or is better than grade II (%) | Positive |
| Protected areas (Wu et al., 2019) | Green covered area as % of completed area (%) | Positive |
| | Area of soil erosion under control (1000 hectares) | Positive |
| | Number of National Nature Reserves (Number) | Positive |
| Energy use (Zhao et al., 2021) | Electricity consumption (100 million kW•h) | Positive |
| | Total natural gas supply (10,000 cu.m) | Positive |
| | Total annual water supply (10,000 cu.m) | Positive |
| Environmental Patents (Li and Yin, 2020) | Expenditure on R&D (10,000 yuan) | Positive |
| | Number of inventions in force (Piece) | Positive |
| Renewable energy supply (Li and Yin, 2020) | Hydro power generation (100 million kW•h) | Positive |
| Palma ratio (Zhao et al., 2021) | Proportion of per capita income of urban and rural residents (rural per capita disposable income = 100) (%) | Negative |
| Gender inequality (Li and Yin, 2020; Wu et al., 2019) | Sex ratio (female = 100) (%) | Negative |
| | Sex ratio of high school education and above (female = 100) (%) | Negative |
| | Illiteracy sex ratio (female = 100) (%) | Positive |
| Access to basic services (Ming et al., 2021; Li and Yin, 2020) | Public transportation vehicles per 10,000 population (Unit) | Positive |
| | Broadband subscribers port of internet (10,000 ports) | Positive |
| | Coverage rate of urban population with access to tap water (%) | positive |
| | Coverage rate of urban population with access to gas (%) | Positive |
| | Treatment rate of consumption wastes (%) | Positive |
| Mean years of schooling(Wu et al., 2019) | Average years of education for people aged 6 and over (year) | Positive |
| Pension coverage (Li and Yin, 2020; Wang, 2021; Wu et al., 2019) | Urban employee basic pension insurance contributors at year end (10,000 persons) | Positive |
| | Persons covered by urban basic medical care insurance at year end (10,000 persons) | Positive |
| | Total dependency ratio of population (%) | Positive |
| Life expectancy (Li and Yin, 2020) | Proportion of population aged 65 and above (‰) | Positive |
| | Death rate (‰) | Negative |

*3.2.1. The index of inclusive green growth*

In 2012, the United Nations Environmental Programme put forward a preliminary evaluation method on how to evaluate inclusive green economy. In 2013, the green growth knowledge platform proposed a method of exploring green growth indicators. Inclusive green growth, as a way of development, embodies the characteristics of social equity, environmental ecology, market openness, and sustainable economic growth. It advocates people-centred and harmonious development between humankind and nature. China put forward the development thought of 'inclusive green growth' in the 12th Five-Year plan. On 29 October 2015, the President Xi Jinping put forward the development philosophy of innovative, coordinated, green, open, and share. Inclusive green growth and the new development philosophy showed great similarity. The implementation of the new development philosophy is the driving force promoting high-quality development. The high similarity between the inclusive green growth index and the new development philosophy determines that it maybe also have an impact on high-quality development. This section takes the inclusive green development index as the independent variable of the regression model to explore its impact mechanism on the high-quality development of the tourism industry.

The indicators of the inclusive green growth evaluation system constructed in this paper come from the report "the green economy progress measurement framework application" issued by the United Nations Environment Programme in 2017. The purpose of the report was to evaluate the progress made by various countries in poverty eradication and common prosperity. The report proposed a green economy development index covering 13 variables. These indicators are primarily aimed at the including poverty, environmental and prosperity sharing issues, etc of an Inclusive green growth economy. Considering the availability of indicator data and the actual adaptability to China's national conditions, this study adjusts the number of United Nations green economy development indicators. Among them, "green trade" refers to the production and trade competitiveness of environmental goods. However, because of the lack of data statistics on environmental protection products in China's provinces, it is excluded, and the remaining 12 primary indicators are retained (Li and Yin, 2020). This study initially selected 29 secondary indicators, but the SPSSAU Pearson correlation test results showed that the "actual road area at the end of the year" had a large correlation, and there was information redundancy, so it was eliminated. Finally, 28 secondary indicators were determined. The specific rules of the index evaluation system are shown in Table 1.

The index of material footprint per capita and its data sources. Material footprint is the total amount of raw materials used to meet the final demand of an economic entity(Xie et al., 2018). It is a indicator to measure the utilisation of resources at the national(Meng et al 2019). This study the ratio of per capita GDP to the consumption of various material resources is used to measure the utilisation of material resources in various regions. This indicator is a positive indicator, and a larger value indicates a better utilization of resources. It can effectively reflect the harmonious degree of human economic development and material resources environment in various regions. In this study, indicators "per capita GDP per square kilometre of built-up area", "forest volume per 10000 cubic metres per capital GDP", "per capita GDP per thousand hectares of wetland area" were used to as the secondary indicators of per capita material footprint. The selected built-up area

is used to represent the utilization of land resources by economic development. Forest volume and wetland area are selected to represent the utilization of ecological resources by economic development. As the data is not available, so as far as possible to reflect the economic development of natural resources. The three secondary indicators were obtained by dividing the ratio of local GDP and the total number of local people by the total built-up area, forest volume, and wetland area, respectively. Relevant data have been obtained from *China Statistical Yearbook (2011-2020)*.

The index of air pollution and its data sources. This index reflects the relationship between economic construction and air environmental protection. Air pollution directly affects environmental quality and human health, and has a negative impact on the high-quality development of the tourism industry. Due to the lack of statistical data on air quality in some provinces in China from 2010 to 2019, it is expressed by the air quality of provincial capitals. This study uses "the proportion of days that the air quality of the capital of each province" reaches or is better than the second level to reflect the air quality. The index is positive. The larger the value, the better the air quality. The statistical data of air quality of provincial capital cities have been obtained from *China Statistical Yearbook (2011–2020)*.

The index of protected areas and its data sources. This indicator is an important aspect to measure the potential of resources and environment to promote sustained economic growth and green growth. Only when the natural environment and resources are effectively protected can the high-quality development of the tourism industry have a solid foundation. In this study, "the green coverage rate of the built-up area", "the area of soil erosion control", and "the number of national nature reserves" are used to reflect the indicators of "protected areas". The greening area of the built-up area, the control area of soil erosion and the number of national nature reserves all reflect the efforts made by various provinces in protecting the environment and improving ecological conditions. All data have been obtained from *China Statistical Yearbook (2011-2020)*.

The index of energy use and its data sources. This index reflects the energy use of each province. In this study, "total electricity consumption", "total natural gas supply", "total annual water supply" are used to represent the energy use of each province. Electricity, water and natural gas are the most commonly used energy for life and production. In this paper, it is reasonable to select the total annual supply or consumption of three kinds of energy to reflect the energy use. The higher the value, the safer the energy security. The statistical data of each sub-index have been obtained from *China Statistical Yearbook (2011-2020)*.

The index of environmental patents and its data sources. Environmental patent is an important index to reflect the innovation ability of environmental protection science and technology in each province. Technological innovation helps improve the efficiency of environmental protection and optimise the effect of environmental protection. Because this paper aims to study the impact of provincial inclusive green growth on the high-quality development of the tourism industry, inclusive green growth measures the development of the whole society, not just tourism. Therefore, it is not necessary to select the environmental patent of tourism industry when collecting data. This paper uses the R&D funds and effective invention patents of Industrial Enterprises above Designated Size to reflect this index. Industrial Enterprises above Designated Size in China refer to industrial enterprises with an annual main business income of more than 20 million yuan. Such enterprises are highly representative in reflecting the research and development funds and effective invention patents of various provinces. Therefore, the selection of this index is reasonable and feasible. The required data have been obtained from *China Statistical Yearbook (2011-2020)*.

The index of renewable energy supply and its data sources. Renewable energy supply is an important performance of saves energy and promotes environmental protection. This study used the hydropower generation of each province to express its renewable energy supply. Hydropower is one of the most common renewable energy supply modes. China has made remarkable achievements in hydropower engineering construction. Increasing hydropower investment and accelerating hydropower infrastructure construction can help to promote the promotion of regional inclusive green growth index. Therefore, it is reasonable to select this index. The data of hydropower generation in each province have been obtained from *China Energy Statistical Yearbook (2011–2020)*.

The index of Palma ratio and its data sources. The Palma ratio index was developed by Cambridge University economist José Gabriel Palma and proposed in 2011 to compare the respective shares of the top 10% of the population with the lowest 40% of the population in order to reflect the level of income inequality of different social strata. Because of the lack of income statistics on the above two groups in China's provinces, "the proportion of per capita income of urban and rural residents (rural per capita disposable income = 100)" was used to reflect their income inequality(Zhao et al., 2021; Wang, 2021; Li and Dong, 2021). The index was obtained by multiplying the ratio of urban per capita disposable income and rural per capita disposable income by 100. The data have been obtained from *China Statistical Yearbook (2011-2020)*.

The index of gender inequality and its data sources. The indicator reflects the potential development losses caused by gender inequality and highlights gender inclusiveness and equity. The unequal rights of men and women to survival and development are not conducive to the stable development of society. This study used "the population sex ratio (female = 100)", "high school education sex ratio (female = 100)", and "illiteracy sex ratio (female = 100)" to express gender inequality. The population sex ratio was obtained by multiplying the ratio of male and female populations in each province by 100. The indicator is negative. The more unequal the right of men and women to live. The gender ratio with high school education or above was obtained by multiplying the ratio of male and female populations with high school education or above in each province by 100. The index is negative. The greater the value, the greater the proportion of men and women with high school education and above, and the more unequal the right of men and women to enjoy education. The illiteracy sex ratio was obtained by multiplying the ratio of male illiteracy and female illiteracy in each province by 100. The indicator is positive. The greater the data value, the smaller the proportion of illiterate men and women, and the more equal the right of men and women to get rid of illiteracy. The three indicators reflect the fairness of men and women in survival and development from the perspective of survival and education. The selection of indicators is reasonable. The data used to calculate the indicators have been obtained from *China Statistical Yearbook (2011–2020)*.

The index of access to basic services and its data sources. This indicator aims to describe residents' access to basic services and the improvement of residents' living conditions by inclusive green growth initiative. Sound infrastructure is an indispensable condition for promoting inclusive green growth in all provinces. Referring to the existing literature(Ming et al., 2021; Li and Yin, 2020), index variables such as "public transportation vehicles per 10,000 population", "coverage rate of urban population with access to tap water", "coverage rate of urban population with access to gas" are selected to represent the availability of basic services. In addition, the "number of Internet broadband ports per 10,000 people" is innovatively taken as one of the indicators of "access to basic services" to reflect the possibility of residents' access to Internet services. The above indicators comprehensively describe the opportu-

nities for access to basic services from different aspects such as domestic water, natural gas, public transport system and Internet. The selection of this index is reasonable. Relevant data have been obtained from *China Statistical Yearbook (2011–2020)*.

The index of mean years of schooling and its data sources. The average length of schooling is used to measure the educational level of residents in the region. Good educational conditions are an important embodiment of the effect of inclusive green growth of the whole society in the region. In order to obtain the index of "average years of education", it needs to be calculated according to the following steps: First of all, we need to multiply the number of primary school education by 6 years, the number of junior middle school education by 9 years, the number of high school or middle school vocational education by 12 years, and the number of junior college and undergraduate education by 16 years. Second, Sum the four values calculated above and divide by the number of people aged 6 and over. The required number of years for Chinese residents to have primary school, junior high school, senior high school or secondary vocational school, and junior college or university education is 6, 9, 12, and 16, respectively. Statistical data have been obtained from *China Statistical Yearbook (2011–2020)*.

The index of pension coverage and its data sources. The original intention of the index was to use pension coverage to evaluate the basic life of employees after retirement, aiming to reflect the degree of social welfare. Referring to the existing literature (Li and Yin, 2020; Wang, 2021; Wu et al., 2019), this study expands the selection range of indicators. Use "urban employee basic pension insurance contributors at year end", "persons covered by urban basic medical care insurance at year end", "total dependency ratio of population" to reflect the social welfare status of each province. The first two indicators indicate the number of people who can enjoy social security benefits, which is the embodiment of the results of regional inclusive green growth. "total dependency ratio of population" means the ratio of non working age population to working age population. The non working age population includes people under the age of 15 and people over the age of 65. The three indicators reflect the reality of protected persons and social welfare beneficiaries, and are reasonable for reflecting inclusive green growth. All the relevant data have been obtained from *China Statistical Yearbook (2011–2020)*.

The index of life expectancy and it data sources. This index reflects the health level of residents in the region. Life expectancy is a well-being of people of all ages and is crucial to measuring sustainable development. In this study, "proportion of population aged 65 and above" and "death rate" are used to reflect "life expectancy" (Li and Yin, 2020). A healthy and beautiful living environment is an effective proof of the achievements of regional inclusive green growth. Relevant data have been obtained from *China Statistical Yearbook (2011-2020)*.

*3.2.2. The index of high-quality development of the tourism industry*

Because this study aims to explore the mechanism of inclusive green growth on the high-quality development of the tourism industry and the threshold effect of import dependence on the mechanism. The high-quality development index of the tourism industry change with changes in the inclusive green growth index. Hence, the high-quality development index of the tourism industry is taken as the dependent variable.

The high-quality development index of the tourism industry is a comprehensive evaluation index including both input index and output index. It evaluates the high-quality development of regional tourism industry by calculating the production efficiency formed by factor input and benefit output. According to the theory of high-quality development, and combined with China's national conditions, the high-quality development of the tourism industry is closely associated with the Five-sphere Integrated Plan. On the one hand, in order to promote the high-quality development of the tourism industry, the input of production factors need to be obtained in the dimensions of economy, politics, culture, society and ecological civilization. On the other hand, the output benefits of the high-quality development of the tourism industry also spill over to the abovementioned five dimensions. Therefore, this study followed the requirements of the Five-sphere Integrated Plan, and selected input indicators and output indicators from the four dimensions of economy, politics, culture and education, and the human settlement environment. Among them, the space of science and education is the embodiment of the level of culture and education, and the human settlement environment represents social undertakings and eco-civilisation. Economic, political, cultural, social and ecological civilization are the five aspects of the Five-sphere Integrated Plan and the strategic goal of promoting the cause of socialism with Chinese characteristics in the new era. Promoting the high-quality development of the tourism industry is inseparable with these five aspects. The tourism elements must be promoted in these five aspects to achieve high-quality development

Five secondary indicators of the output side and ten secondary indicators of the input side were preliminarily determined in this study. Francisco et al. (2016) calculated that when all indicators were positively correlated, the abnormally high positive correlation between the input and output sides indicates that they were linear, which would lead to a high efficiency score and deviation from the normal value. Therefore, it is necessary to eliminate indicators with high correlation. The correlation between input indicators or output indicators has no significant effect on the efficiency score, so the correlation measurement of the two data sets is not very important. After the SPSSAU Pearson correlation test results showed that the "total number of tourists" had a large correlation, it was eliminated. Finally, 14 secondary indicators were determined.

The traditional data envelopment analysis (DEA) and super-efficiency DEA models have restriction in the number of decision making unit (DMU) and the number of indicators. The restriction requires two times the sum of input indicators and output indicators must not exceed the number of decision-making units. Liu et al. (2005) considered the shortcomings of traditional DEA and super-efficiency DEA models, and modified them based on fuzzy set theory and AHP. Specifically, the weight range of each index variable was determined by the analytic hierarchy process, and the original data was then standardised using the homogenisation method. Finally, the weight range and standardised index data were brought into DEA and super-efficiency DEA models to form a modified model that could measure a small number of DMU. In this study, 30 provinces in China were taken as DMU, and 14 indicators were finally determined, realising, which meets the measurement standard of traditional DEA and super-efficiency DEA models.

In addition, it can not be operated when data envelopment analysis (DEA) has the problem that the original data of input variables and output variables are zero. In order to solve this problem, Ali (1990) discussed the problem of translation invariance in DEA, and the conclusion that the additive model is translation invariant was put forward. Hence, a very small positive number (0.1) was added to each original data of variable. The high-quality development index system of China's tourism industry is shown in Table 2.

Based on the Five-sphere Integrated Plan, the high-quality development evaluation system of tourism industry sets 10 input indicators and 4 output indicators. The indicators come from the four dimensions of economy, politics, culture and education, and human settlement environment. Because the current tourism statistics system is not perfect, the statistical technology needs to be upgraded and the tourism activities involve a wide range of industries, it is difficult to separate the tourism statistics from the

**Table 2**
High-quality development index system of China's tourism industry.

| Index direction | Dimension | Secondary indicators (Unit) |
|---|---|---|
| Output | Economic space | Total tourism revenue (100 million yuan) (Shao et al., 2021) |
| | Political space | General public budget revenue (100 million yuan)(Wang et al., 2021) |
| | Cultural and educational space | The number of annual projects of the National Social Science Fund of China (economic theory + applied economy + sociology + ethnic issues + sports + Management) (Number) |
| | Human settlement environment | Employment proportion of tourism practitioners % (Shao et al., 2021) |
| Input | Economic space | Total number of tourist attractions (Number) (Sun et al., 2021; Zhang et al., 2021; Zhang et al., 2021) |
| | | Total fixed assets of accommodation enterprises above quota (100 million yuan) (Wang et al., 2021) |
| | | Total fixed assets of catering enterprises above quota (100 million yuan) (Wang et al., 2021) |
| | | Investment in fixed assets of health and social service (100 million yuan)(Pan et al., 2021) |
| | Political space | Fiscal expenditure for environment or energy conservation protection (100 million yuan) (Wang., 2020) |
| | Cultural and educational space | Total number of tourism universities and colleges (Number) (Wang., 2021) |
| | | Number of books in public libraries per capita (Number) (Shi et al., 2021) |
| | | Number of performances in art performance venues(10 000 shows) (Shi et al., 2021) |
| | Human settlement environment | Per capita park green space area (square meter)(Sun et al., 2021) |
| | | Number of public lavatories per 10 000 population (Number)(Lei et al., 2021) |

Note: The national social science fund projects are subject to the province where the institution is located, and the projects declared by military academies are not included.

above four dimensions. When determining the index variables, we have to use some proxy variables, which will indeed reduce the accuracy of the calculation results, which is also the limitation of this study. At present, tourism activities involve a wide range of fields. Tourists' tourism behaviors such as diet, get accommodation, transportation, tourism, shopping and entertainment need the support from the economic, political, cultural, social and ecological civilization of the tourism destination. At the same time, the benefits brought by tourism activities benefit the above five aspects. In other words, the development of tourism requires the development of all aspects of tourism destinations; Promoting the development of all aspects of tourism destinations will help to promote the development of regional tourism. Therefore, it is not feasible to separate the statistical data of tourism industry in the process of tourism research. Especially under the requirements of high-quality development, the development of tourism industry should drive the overall development of the region. Therefore, it is reasonable to use some proxy variables when calculating the high-quality development index of the tourism industry.

When determining the input and output indicators of high-quality development of the tourism industry, this paper lists references to prove the rationality of the selection of indicators. In addition, because the development of tourism is not only inseparable from the support of a good ecological environment, but also can improve the ecological environment. More often, the ecological environment is regarded as the basic condition for the development of tourism. Therefore, when determining the output indicators of the high-quality development evaluation system of tourism industry, this study does not select indicators from the dimension of ecological civilization.

*3.2.2.1. Determination of input index and its data source.* Reference to existing literature, this paper determines four indicators in the economic dimension, such as "total number of tourist attractions" (Sun et al., 2021; Zhang et al., 2021; Zhang et al., 2021), "total fixed assets of accommodation enterprises above quota" (Wang et al., 2021), "total fixed assets of catering enterprises above quota" (Wang et al., 2021) and "investment in fixed assets of health and social service" (Pan et al., 2021). Scenic spots are the core elements of regional tourism industry. This paper takes the "Total number of tourist attractions" as one of the investment indicators of the economic dimension, and reveals the direct investment of each province to promote the development of tourism. The selection of indicators is reasonable. The data have been obtained from *The Yearbook of China Tourism Statistics (2011-2018)* and *ZhongGuo WenHua WenWu He LvYou TongJi NianJian (2019–2020)*. Catering and accommodation are two elements of tourism activities. Catering and accommodation are two important links of tourist activities and an important part of regional tourism industry. In this paper, "total fixed assets of accommodation enterprises above quota" and "total fixed assets of catering enterprises above quota" are selected as the two input indicators of the economic dimension, reflecting the investment intensity of each province in the construction of tourist reception facilities. It is worth noting that the accommodation enterprises and catering enterprises above the limit point to those whose main business income exceeds 2 million yuan to limit the standard to accommodation enterprises and catering enterprises of more than 2 million yuan, on the one hand, can ensure the integrity of statistical data, on the other hand, can provide tourists with higher quality services. It is reasonable to select the above two indexes. The data have been obtained from *China Statistical Yearbook (2011–2020)*. Taking "investment in fixed assets of health and social service" as one of the input indicators of the economic dimension can effectively reflect the medical conditions and social security level of high-quality development of regional tourism. Although it can not fully represent tourism capital investment, it can reflect the high correlation of regional tourism industry. A harmonious and stable social environment is the fundamental guarantee

to provide high-quality tourism services for tourists and residents. The data have been obtained from *China Statistical Yearbook (2011–2020)*.

Reference to existing literature, this paper determines one indicator in the political dimension, such as "fiscal expenditure for environment or energy conservation protection" (Wang, 2020). At present, there is no statistical data on the tourism financial expenditure of all provinces in China, so it can not directly reflect the investment of political space in tourism. In this paper, "fiscal expenditure for environment or energy conservation protection" is selected as the input index of the political dimension. Although the calculation results have deviation, it tries to reduce the deviation as much as possible. Strengthening financial support for environmental protection and energy conservation is conducive to creating a good ecological environment for the high-quality development of the tourism industry. At the same time, improving the level of environmental protection and energy conservation is also a part of the high-quality development of the tourism industry. Therefore, the index selection is reasonable.The data have been obtained from *China Statistical Yearbook (2011–2020)*.

Reference to existing literature, this paper determines three indicators in the cultural and educational space, such as "total number of tourism universities and colleges" (Wang, 2021), "number of books in public libraries per capita" (Shi et al., 2021), "number of performances in art performance venues" (Shi et al., 2021). This paper takes "total number of tourism universities and colleges" as an investment index in culture and education, which reflects the knowledge support and talent reserve for the high-quality development of regional tourism industry. The more tourism universities in the region, the more investment in talent training and scientific research. The existence of tourism colleges and universities is conducive to promoting the transformation of tourism scientific research achievements to the economic benefits of tourism industry. Therefore, the selection of this index is reasonable. The data have been obtained from *The Yearbook of China Tourism Statistics (2011–2018)*. Since the data of tourism colleges in 2018 and 2019 have not been included, this study uses the trend function of Excel to predict and supplement. With the implementation of the integrated development strategy of culture and tourism industry, cultural facilities such as public libraries, museums, memorials and art performance venues have become an important part of tourism supply. To realize the high-quality development of regional tourism industry, we must strengthen the support for cultural undertakings and enrich the content of tourism supply. This paper selects "number of books in public libraries per capita" (Shi et al., 2021), "number of performances in art performance venues" (Shi et al., 2021) as the investment indicators of cultural undertakings, and is of great significance to deepen the integration of culture and tourism and promote the high-quality development of the tourism industry. Therefore, the selection of the above two indicators is reasonable. Both data have been obtained from *ZhongGuo WenHua WenWu TongJi NianJian (2011–2018)* and *ZhongGuo WenHua WenWu He LvYou TongJi NianJian (2019-2020)*.

Because human survival and development are inseparable from social environment and the ecological environment, this study combines social space and ecological civilization into the dimension of "human settlement environment". Reference to existing literature, this paper determines two indicators in the human settlement environmental dimension, such as "per capita park green space area" (Sun et al., 2021) and "number of public lavatories per 10,000 population" (Lei et al., 2021). Building and maintaining the park environment and increasing the per capita park green space area is an important embodiment of improving the regional ecological environment. To realize the high-quality development of the tourism industry, we must increase the investment in park green space construction. Tourism toilet is a weak link in the development of China's tourism industry. In recent years, in order to solve the problems of small number of toilets and poor sanitary conditions, all provinces have vigorously promoted the "toilet revolution". This paper takes "number of public lavatories per 10 000 population"as the investment index of social dimension, which reflects the investment of various provinces in improving human settlements. The above two indicators are closely related to the high-quality development of the tourism industry, so the selection of indicators is reasonable. The data have been obtained from *China Statistical Yearbook (2011–2020)*.

*3.2.2.2. Determination of output index and its data source.* Reference to existing literature, this paper determines one indicators in the economic dimension, such as "total tourism revenue" (Shao et al., 2021). The total tourism income includes domestic and inbound tourism income. The total tourism revenue directly reflects the economic benefits brought by the high-quality development of the tourism industry. Thus, the selection of this index is reasonable. The data are from the statistical bureau, statistical yearbook, and statistical bulletin of each province. This study takes "general public budget revenue" as the output index of the political dimension, which reflects the impact of the high-quality development of the tourism industry on the general public budget revenue of the local government. Although this proxy variable bias the calculation results, the financial benefits brought by tourism can be taken into account to the greatest extent. Tourism activities are widely involved in catering, accommodation, transportation, entertainment, leasing, finance, real estate and other industries. Therefore, the financial revenue brought by the development of tourism is not easy to be stripped out. Thus, limited by the current statistical technology, it is reasonable to use the general public budget revenue instead of the budget revenue of the tourism industry as the output index of the political space. The data are obtained from *China Statistical Yearbook (2011–2020)*.

This study regards the number of annual projects of the National Social Science Fund of China as the output index of the cultural and educational dimension. The selection of this index is innovative. Based on the territorial principle, the greater the number of annual projects of the National Social Science Fund of China in each province, the greater the potential of the transformation of scientific research achievements to local economic benefits. Since the annual projects of the National Social Science Fund of China do not summarise the research topics of tourism specialty separately, but are distributed among other research fields closely related to tourism specialty. This study summarises the number of research topics in the fields of economic theory, applied economy, society, ethical issues, sports, and management to reflect the benefit output of the tourism industry in cultural and educational space. The index exaggerates the output benefit of tourism in the dimension of culture and education to a certain extent, which is also the difficulty encountered in constructing the index system under the current conditions. The statistical data of annual projects of the National Social Science Fund of China are from the annual project list of *NSFC (2010–2019)*.

The high-quality development achievements of tourism should fully benefit local residents and tourists. Referring to the existing literature, this study takes "the total number of tourism" and "employment proportion of tourism practitioners" (Shao et al., 2021) as the output indicators of the dimension of "human settlement environment". The total number of tourists is the welfare brought by the development of the tourism industry. Only by providing high-quality tourism products and services can the total number of tourists be increased. The employment proportion of tourism practitioners reflects the employment benefits brought to local residents by promoting the development of the tourism industry. Both "the total number of tourism" and "employment proportion of

tourism practitioners" are the data formed because of the development of tourism. They are the direct embodiment of the output benefits of the high-quality development of the tourism industry in the dimension of "human settlement environment" . Therefore, the selection of the two indicators is reasonable. However, the total number of tourists failed to pass the Pearson correlation test, so it was excluded. The data are obtained from *The Yearbook of China Tourism Statistics (2011–2018)* and *ZhongGuo WenHua WenWu He LvYou TongJi NianJian (2019-2020)*.

*3.2.3. The index of import dependence*

As an important growth point of economic development, international tourism and international trade have been highly valued by countries and regions in the world. Trade is closely related to tourism. Import and export trade is the international "tourism" of goods, and international tourism is the import and export "trade" of personnel and capital. However, with the change of world economic and political situation, the relationship between international tourism and international trade may not always be positive. In particular, whether the excessive dependence on the import market hinder the upgrading of the core technology of China's tourism industry and have a negative impact on the mechanism of inclusive green growth and high-quality development of the tourism industry is worth researching. Hence, this study discusses the moderating effect of import dependence index on the relationship between inclusive green growth and high-quality development of the tourism industry. This study uses the ratio of trade import amount to total import and export amount of each province to express the import dependence. The larger the ratio, the greater the import dependence of the province. The data of import and export volume of goods comes from *China Statistical Yearbook (2011–2020)*, and is divided and counted according to the location of the consignor and the consignee.

*3.2.4. Determination of control variables*

The high-quality development of the tourism industry may be affected by other factors, so this study selects five control variables from the industrial environment, capital environment, political environment, innovation environment and living environment. The proportion of added value of the tertiary industry in GDP reflects the industrial structure environment and is called "*PATG*" for short. The proportion of fixed assets investment in the tertiary industry (excluding farmers) shows the capital support environment and is called "*PFAIT*" for short. The proportion of fiscal expenditure in GDP shows the actual use and control scale of GDP by government departments and is called "*PFEG*" for short. The number of patent applications reflects the innovation environment and is called "*NPA*" for short. The per capita consumption expenditure of urban residents reflects the living environment and is called "*PCEUR*" for short. The statistical data of control variables are from *China Statistical Yearbook (2011-2020)*.

*3.3. Methodology*

*3.3.1. Min-max standardisation and entropy weight method*

This study used the entropy weight method to evaluate the inclusive green development index of provinces in China. The evaluation process included determining the index weight and calculating the comprehensive index. In this paper, the min-max standardization was used to process the original data dimensionless, and the entropy weight method was used to determine the index weight. Finally, the index weight and dimensionless index data were weighted to obtain the inclusive green growth index.

In this paper, the min-max standardization was used to process the original data dimensionless, which can ensure that the performance of the same index in different periods or different regions can be compared. In the formula, $S_{ij}^t$is the standardized data of the $j$ variable in the $i$ province in year $t$. $x_{ij}^t$refers to the original data of year $t$ of the $j$ indicator in the $i$ province. There are $m$ provinces and $n$ indicators, and meet the requirements of $S_{ij}^t \geq 0$, $0 < i < n$,$0 < j \leq m$. When the indicator attribute is "+", the positive min-max standardization formula is applicable to data processing; when the indicator attribute is "−", the negative min-max standardization formula is applicable to data processing.

The formulas of positive min-max method and reverse min-max method are as follows:

$$S_{ij}^t = \frac{x_{ij}^t - \min\left\{x_{1j}^t, x_{2j}^t, \cdots, x_{mn}^t\right\}}{\max\left\{x_{1j}^t, x_{2j}^t, \cdots, x_{mn}^t\right\} - \min\left\{x_{1j}^t, x_{2j}^t, \cdots, x_{mn}^t\right\}} \tag{4}$$

$$S_{ij}^t = \frac{\max\left\{x_{1j}^t, x_{2j}^t, \cdots, x_{mn}^t\right\} - x_{ij}^t}{\max\left\{x_{1j}^t, x_{2j}^t, \cdots, x_{mn}^t\right\} - \min\left\{x_{1j}^t, x_{2j}^t, \cdots, x_{mn}^t\right\}} \tag{5}$$

Based on the results of data standardisation, the entropy value was calculated using the entropy weight method. $R_j^t$ is the information entropy of index $j$ in year $t$. $d_{ij}^t$is the proportion of the $j$index of the $i$sample in year $t$in the $j$index of all samples. $W_j^t$is the weight of the $j$index. The greater the weight is, the greater is the contribution of the index to the measurement results.

The relevant formula is as follows:

$$R_j^t = -\frac{1}{\ln(m)} \sum_{i=1}^{m} d_{ij}^t \times \ln d_{ij}^t, i = 1, 2, \cdots, m; j = 1, 2, \cdots, n \tag{6}$$

$$d_{ij}^t = \frac{E_{ij}^t + 1}{\sum_{i=1}^{m} (E_{ij}^t + 1)} \tag{7}$$

$$W_j^t = \frac{1 - R_j^t}{\sum_{j=1}^{n} (1 - R_j^t)} \tag{8}$$

The index weight determined by the entropy weight method and the dimensionless index value processed by the min-max standardisation were weighted to obtain the inclusive green growth index. $GEP_i^t$ is the inclusive green growth index of province $i$ in year $t$. The inclusive green growth index ranges from 0 to 1. The larger the index value is, the better is the situation.

The inclusive green growth index is calculated as follows:

$$GEP_i^t = \sum_{j=1}^{n} W_j^t S_{ij}^t \tag{9}$$

*3.3.2. Super-efficiency data envelopment analysis*

Arabmaldar et al. (2021) proposed a new robust wpf-DEA a model in the presence of interval data uncertainty and non arbitrary factors. They thought that it was very important to identify the worst performing DMU. The wpf-DEA was actually more useful than the traditional DEA model focusing on the best performing DMU, especially for companies that need to conduct risk assessment. At present, the existing SBM-DEA model of unexpected output discusses the problem of identifying bad performance in the optimal situation, while the new robust wpf-DEA model discusses the topic of identifying bad performance in the worst situation. The high-quality development of the tourism industry discussed in this study is a problem of determining the best performance under the optimal situation, rather than pursuing the unexpected output and the worst boundary analysis. Therefore, the traditional super-efficiency DEA model was used to calculate the high-quality development index of the tourism industry.

**Table 3**
Average value and growth rate of inclusive green growth index in all regions from 2010 to 2019.

| Region | Value | Growth rate% | Region | Value | Growth rate% |
|---|---|---|---|---|---|
| Beijing | 0.39 | -1.20 | Hubei | 0.27 | -9.21 |
| Tianjin | 0.30 | -14.00 | Hu'nan | 0.23 | 2.18 |
| Hebei | 0.23 | 3.56 | Central China | 0.24 | 1.02 |
| Shanxi | 0.19 | 10.30 | Guangdong | 0.44 | 1.64 |
| Inner Mongolia | 0.21 | 19.69 | Guangxi | 0.18 | 15.34 |
| North China | 0.26 | 1.47 | Hainan | 0.15 | 41.23 |
| Liaoning | 0.22 | -8.63 | South China | 0.26 | 11.88 |
| Jilin | 0.16 | -11.21 | Chongqing | 0.20 | -17.75 |
| Heilongjiang | 0.19 | 11.39 | Sichuan | 0.32 | 11.68 |
| Northeast China | 0.19 | -2.88 | Guizhou | 0.15 | 35.99 |
| Shanghai | 0.40 | -13.23 | Yunnan | 0.23 | 30.02 |
| Jiangsu | 0.36 | 14.38 | Southwest China | 0.22 | 12.26 |
| Zhejiang | 0.29 | 6.65 | Shaanxi | 0.21 | -3.48 |
| An'hui | 0.20 | 41.43 | Gansu | 0.15 | 19.88 |
| Fujian | 0.23 | 7.41 | Qinghai | 0.18 | -8.41 |
| Jiangxi | 0.18 | 24.22 | Ningxia | 0.18 | 12.31 |
| Shandong | 0.32 | -2.28 | Xinjiang | 0.19 | 28.39 |
| East China | 0.28 | 6.78 | Northwest China | 0.18 | 8.39 |
| He'nan | 0.22 | 13.02 | national average | 0.24 | 5.79 |

Note: Tibet Tibetan Autonomous Region and Hong Kong, Macao and Taiwan regions are not included.

The traditional model of CCR-DEA and BCC-DEA effectively solves the problem of measuring the production efficiency of multiple decision-making units under the condition of multiple input indicators and output indicators. They preliminarily determines whether each decision-making unit is effective. However, when multiple decision-making units are effective, the traditional DEA model loses its effectiveness, because it cannot further analyse multiple effective units. Therefore, Andersen and Petersen (1993) proposed the super-efficiency DEA model (SE-DEA for short), which made up for the defect of $\alpha \neq 1$based on the traditional DEA model. In other words, when measuring and evaluating the efficiency of decision-making unit $\alpha = 1$, only the linear combination of this decision-making unit and all other decision-making units in sample are compared; decision-making unit$\alpha = 1$itself is not considered. In the SE-DEA model, the larger the $\theta$ is, the better is the evaluation effect; the smaller the $\theta$ is, the worse is the evaluation effect. When$\theta^0 < 1$, the efficiency value of the SE-DEA model is consistent with the results of the traditional DEA model. When$\theta^0 \geq 1$, the effective DMU can be sorted according to the efficiency score.

Suppose there are$n$decision-making units, and each decision-making unit has the same number of$L(X = 1, 2, \cdots, l)$input indexes and$K(Y = 1, 2, \cdots, k)$output indexes. $g_{\alpha l}$represents $l$ input indicators of decision-making unit $\alpha$, and $f_{\alpha k}$ represents $k$ output indicators of decision-making unit$\alpha$. After adding a limiting condition $\sum \varepsilon_\alpha = 1$, the formula is presented for the $\alpha(\alpha = 1, 2, \cdots, n)$ province. In the equation, $\theta(0 < \theta \leq 1)$represents the comprehensive technical efficiency and $\lambda$is the weight coefficient. $s^+(s^+ \geq 0)$is the residual variable; $s^-(s^- \geq 0)$is the relaxation variable. $\varepsilon$is the non-Archimedean infinitesimal.$e_1^T = (1, 1, \cdots, 1) \in E_l$and $e_2^T = (1, 1, \cdots, 1) \in E_k$are L-dimensional and K-dimensional unit vectors, respectively.

This paper build the SE-DEA model is based on BCC-DEA, and the equation for SE-SBM is as follows:

$$\begin{cases} \min\left(\theta - \varepsilon(e_1^T s^- + e_2^T s^+)\right) \\ s.t. \sum\limits_{\substack{\alpha=1 \\ \alpha\neq 1}}^{n} g_{\alpha l}\lambda_\alpha + s^- = \theta g_l^n, l = 1, 2, \cdots, L \\ \sum\limits_{\substack{\alpha=1 \\ \alpha\neq 1}}^{n} f_{\alpha k}\lambda_\alpha - s^+ = f_k^n, k = 1, 2, \cdots, K \\ \sum \varepsilon_\alpha = 1, \varepsilon_\alpha \geq 0, (\alpha = 1, 2, \cdots, n) \\ \lambda \geq 0, s^+ \geq 0, s^- \geq 0 \end{cases} \tag{10}$$

## 4. Results

### 4.1. Index measurement results

#### 4.1.1. Inclusive green growth index

First, the original panel data was imported into formulas (4) and (5), and the dimensionless data was obtained using the min-max standardisation method. Second, the standardised panel data was imported into formulas (6)–(8), and the weight coefficient of each index was obtained using the entropy weight method. Finally, the standardized data and weight coefficient were weighted according to formula (9), and the inclusive green growth index of 30 provinces (excluding Hong Kong, Macao, Taiwan, and Tibet) in China from 2010 to 2019 was obtained. The calculation results of inclusive green growth index are shown in Table 3.

This paper analyzes the development of regional inclusive green growth index from 2010 to 2019 from three levels: the national average, the average of China's seven administrative geographical divisions and the average of each province.

China's seven administrative geographical divisions are carried out in consideration of various dimensions such as history, nationality and culture, and follow the principle of combining zonality and non zonality, the principle of main factors and comprehensive analysis, as well as the principle of regional conjugation, which has a solid scientific foundation. The specific division of each province is: North China: Beijing, Tianjin, Hebei, Shanxi and Inner Mongolia; Northeast China: Heilongjaing, Jilin and Liaoning; East China: Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Shandong, Fujian and Taiwan; Central China: Henan, Hubei and Hunan; South China: Guangdong, Guangxi, Hainan, Hong Kong and Macao; Southwest China: Chongqing, Sichuan, Guizhou, Yunnan and Tibet; Northwest China: Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang and Western Inner Mongolia. Among them, because there are many missing statistical data in Tibet Tibetan Autonomous Region, Hong Kong Special Administrative Region, Macao Special Administrative Region and Taiwan Province, they are not included in the statistics. In addition, in view of the integrity of the decision-making unit and the fact that Inner Mongolia Autonomous Region belongs to two administrative geographical divisions, the inclusive green growth index of its tourism industry is included in North China for analysis.

First, nationally, the average value of inclusive green growth index is 0.24, with a growth rate of 5.79%. It reflects that inclusive green growth shows a slow upward trend, but the absolute value

**Table 4**
Average value and growth rate of tourism industry high quality development index and its decomposition efficiency in various regions from 2010 to 2019.

| Region | Value | growth rate% | PTE Score | growth rate% | SE Score | growth rate% |
|---|---|---|---|---|---|---|
| Beijing | 1.97 | -10.10 | 1 | 0 | 1 | 0 |
| Tianjin | 1.24 | -13.18 | 1 | 0 | 1 | 0 |
| Hebei | 1.06 | -2.64 | 1 | 0 | 1 | 0 |
| Shanxi | 1.10 | 25.25 | 1 | 0 | 1 | 0 |
| Inner Mongolia | 0.92 | -1.70 | 0.97 | 0 | 0.90 | 0 |
| North China | 1.26 | -2.65 | 0.99 | 0 | 0.98 | 0 |
| Liaoning | 1.17 | 0.94 | 1 | 0 | 1 | 0 |
| Jilin | 0.73 | 72.33 | 0.87 | 27.03 | 0.82 | 28.96 |
| Heilongjiang | 0.98 | 58.78 | 1 | 0 | 0.91 | 37.25 |
| Northeast China | 0.96 | 34.98 | 0.96 | 7.64 | 0.91 | 19.81 |
| Shanghai | 1.68 | 26.12 | 1 | 0 | 1 | 0 |
| Jiangsu | 1.13 | -3.04 | 1 | 0 | 1 | 0 |
| Zhejiang | 1.05 | 1.81 | 1 | 0 | 1 | 0 |
| Anhui | 0.93 | -2.47 | 1 | 0 | 0.92 | 0 |
| Fujian | 0.93 | 20.99 | 0.95 | 0 | 0.98 | 20.15 |
| Jiangxi | 1.12 | 7.03 | 1 | 0 | 1 | 0 |
| Shandong | 1.23 | 3.90 | 1 | 0 | 1 | 0 |
| East China | 1.15 | 8.54 | 0.99 | 0 | 0.99 | 2.45 |
| Henan | 1.10 | -1.62 | 1 | 0 | 1 | 0 |
| Hubei | 1.15 | 17.62 | 1 | 0 | 1 | 0 |
| Hunan | 1.03 | 76.37 | 0.97 | 38.72 | 0.97 | 9.91 |
| Central China | 1.10 | 23.32 | 0.99 | 10.26 | 0.99 | 3.10 |
| Guangdong | 1.74 | 6.37 | 1 | 0 | 1 | 0 |
| Guangxi | 1.07 | 5.17 | 1 | 0 | 1 | 0 |
| Hainan | 2.00 | -35.16 | 1 | 0 | 1 | 0 |
| South China | 1.61 | -14.14 | 1 | 0 | 1 | 0 |
| Chongqing | 1.26 | 1.49 | 1 | 0 | 1 | 0 |
| Sichuan | 1.06 | -1.30 | 0.98 | 0 | 1 | 0 |
| Guizhou | 2.52 | 13.79 | 1 | 0 | 1 | 0 |
| Yunnan | 1.00 | 12.70 | 1 | 0 | 0.94 | 0 |
| Southwest China | 1.46 | 8.08 | 0.99 | 0 | 0.99 | 0 |
| Shaanxi | 1.35 | -13.97 | 0.98 | 0 | 0.93 | 0 |
| Gansu | 0.81 | -13.34 | 1 | 0 | 0.77 | 0 |
| Qinghai | 1.42 | -5.76 | 1 | 0 | 1 | 0 |
| Ningxia | 1.74 | 100.20 | 1 | 0 | 1 | 0 |
| Xinjiang | 1.14 | -6.35 | 1 | 0 | 1 | 0 |
| Northwest China | 1.29 | 12.12 | 1 | 0 | 0.94 | 0 |
| national average | 1.25 | 6.63 | 0.99 | 1.67 | 0.97 | 2.58 |

Note: Tibet Tibetan Autonomous Region and Hong Kong, Macao and Taiwan regions are not included.

is still low. Secondly, from the perspective of China's seven administrative geographical divisions, the order of the average value of inclusive green growth index is: East China, North China, South China, Central China, southwest China, northeast China and northwest China. Among them, the average value of inclusive green growth index in southwest China, northeast China and northwest China is lower than the national average. The growth rate ranking of inclusive green growth index is: southwest China, South China, northwest China, East China, North China, Central China and northeast China. The growth rates of North China, Central China and Northeast China are lower than the national average. Therefore, East China and South China have the highest level of inclusive green growth. Driven by developed provinces (municipalities directly under the central government) such as Shanghai, Guangdong, Shandong, Jiangsu and Zhejiang, it has achieved high-quality results. One belt, one road, is a fast growing trend in southwest and northwest China. The inclusive green growth in northeast China is the worst, the basic value is low and the growth rate is negative.

Finally, from the analysis of each province, the average value and growth rate of inclusive green growth index in Jiangsu, Zhejiang and Sichuan are better than the national average. The three provinces are strongly driven by the new first tier cities, the service industry is relatively developed, and the awareness of ecological environment protection has a long history. In recent years, driven by the Internet and big data, it has formed a strong ability of sustainable development. Guangdong's inclusive green growth index is the highest in China, and the growth rate remains positive. Through the analysis of the original data, it is found that Guangdong Province has made outstanding achievements in scientific research investment, Internet penetration, energy supply and social medical security. The average value of inclusive green growth index in Beijing, Tianjin, Shanghai, Shandong and Hubei provinces (municipalities directly under the central government) is significantly higher than that in other provinces, but the growth rate is negative. It shows that driven by strong urban strength, superior location conditions and strong economic foundation, these regions maintain the inclusive green growth index at a high level. The analysis of statistical data shows that the reasons for the reduction of inclusive green growth index in these regions include: the decline of air quality, the reduction of greening rate in built-up areas, the reduction of energy supply, the reduction of scientific research investment, the imbalance of gender rights and interests between men and women, and the problems of education security and social welfare security. The average value of inclusive green growth index of Shanxi, Inner Mongolia, Heilongjiang, Anhui, Fujian, Jiangxi, Henan, Guangxi, Hainan, Guizhou, Yunnan, Gansu, Ningxia and Xinjiang is low, but the growth rate exceeds the national average level. Among them, the growth rate of Anhui, Hainan, Guizhou and Yunnan exceeded 30%. By analyzing the original data, it is found that the reasons for the growth trend of inclusive green growth index in these regions include: the improvement of forest resource utilization level, the increase of water resource supply, the increase of the number of effective in-

vention patents, the improvement of public transport facilities, and the great improvement of education security conditions and social medical security conditions. It can be seen that greening projects, energy supply, scientific research and innovation, medical care, and pension security are the main factors affecting the inclusive green growth index. The inclusive green growth index and growth rate of Hebei, Liaoning, Jilin, Hunan, Shaanxi, Qinghai and other provinces are lower than the national average. In particular, the growth rates of Liaoning, Jilin, Shaanxi and Qinghai are negative. Compared with the original data, it is found that the problems of the four provinces with negative growth rate of inclusive green growth index mainly appear in: the decline of air quality, insufficient ecological protection, the reduction of scientific research funds, the imbalance of gender rights, the decline of urban water penetration, etc.

*4.1.2. High-quality development index of the tourism industry*

In this study, the sample data of 30 Chinese provinces from 2010 to 2019 are included in Eq. (10), with a total sample size of 300. The SE-DEA model of MaxDea8 software was used to calculate the high-quality development index of the tourism industry of 30 decision-making units. The calculation results are shown in Table 4. In Table 4, "PTE score" represents the score of pure technical efficiency and "SE score" represents the score of scale efficiency.

This paper analyzes the high-quality development index of the tourism industry in each region from 2010 to 2019 from three levels: the national average, the average of seven administrative geographical divisions in China and the average of each province.

First of all, from a national perspective, the average value of the high-quality development index of the tourism industry is 1.25, with a growth rate of 6.63%. According to the standard analysis of tourism industry production efficiency, the current average level of national tourism industry high-quality development index is effective. Although pure technical efficiency and scale efficiency are not effective, they show an upward trend.

Secondly, from the seven administrative geographical divisions of China, the high-quality development index of the tourism industry is as follows: South China, southwest China, northwest China, North China, Central China, East China and northeast China. Among them, the index values of Central China, East China and northeast China are lower than the national average. In particular, the high-quality development of the tourism industry in northeast China has not been effective. The growth rate of high-quality development index of the tourism industry is ranked as follows: northeast China, Central China, northwest China, East China, southwest, North China and South China. Among them, the growth rates of North China and South China are lower than the national average and negative. The southwest China and northwest China have maintained a high growth rate on the basis of achieving high-quality and effective development of the tourism industry. Due to the advantages of high tourism resource endowments, strong ethnic customs and prominent natural environment characteristics in the provinces of southwest China and northwest China, there is an endless stream of tourists, the input of production factors reaps benefits and improves the production efficiency of tourism. The high-quality development of the tourism industry in Central China is effective, and has maintained a high growth rate. The region is located in the inland center, with superior traffic conditions and rich tourism resources, which has laid the foundation for the high-quality development of the tourism industry. In recent years, the high-quality development index of Hunan tourism has increased significantly, driving the overall development of the region. The high-quality development of the tourism industry in northeast China is invalid, but it shows a good growth trend. Due to the low starting point and small volume, the growth effect is more significant. The region should continue to follow the development experience and promote the high-quality development of the tourism industry to achieve effective development as soon as possible. Due to the ineffective high-quality development of the tourism industry in Anhui and Fujian, the overall level of East China has been lowered. The growth rate of high-quality development of the tourism industry in Beijing, Tianjin, Hebei and Inner Mongolia is negative, resulting in the decline of high-quality development index of the tourism industry in North China.

Finally, the calculation results of each province are analyzed. Shanghai, Guizhou and Ningxia have the highest level of high-quality tourism industry development. The high-quality development index and growth rate of tourism industry in the three provinces have exceeded the national average. Among them, the high-quality development index of the tourism industry in Guizhou has reached the highest, and the high-quality development growth rate of tourism industry in Ningxia has reached the highest. According to the analysis of the original data, Guizhou has less investment in production factors, but has obtained considerable total tourism income, which means that the resource utilization rate is high. Ningxia has significantly increased its total tourism revenue, fiscal revenue, project approval and other outputs, and significantly reduced its investment in resources such as art performances and public toilets, resulting in a significant increase in the growth rate. Such provinces (municipalities) should continue to maintain the current development trend and maintain a good state of tourism industry development. Ningxia should increase investment in art performances and public toilets, and constantly improve the quality of life of residents, so as to promote the development of tourism industry to a higher quality

The high-quality development index of the tourism industry in Guangdong and Chongqing is higher than the national average, the growth rate is lower than the national average, and the development power is insufficient. The tourism industry of such provinces (municipalities directly under the central government) is of high quality and has a good foundation for development, but the growth power is insufficient. Guangdong should increase the number of research projects and the number of jobs in the tourism industry, and speed up the improvement of cultural undertakings and social basic services. Chongqing should speed up the improvement of cultural undertakings and increase the input of production factors in order to stimulate the improvement of output efficiency. The high-quality development index of the tourism industry in Beijing, Hainan, Shaanxi and Qinghai is greater than the national average, but it shows a negative growth trend. Compared with the original data, it is found that the number of tourism practitioners and project approval in Beijing are declining, which reduces the production efficiency. Hainan has invested a lot of energy in infrastructure construction and capital, but the number of tourism practitioners has shown a downward trend, reducing the level of development. Shaanxi and Qinghai failed to obtain the expected benefits due to the input of production factors, which reduced the high-quality development index of the tourism industry. Therefore, Beijing and Hainan should improve the efficiency of resource utilization and enhance the ability of tourism to drive employment. Shaanxi and Qinghai should improve management level and technology and improve resource utilization to more resource investment can be transformed into benefits.

The high-quality development index of the tourism industry in Shanxi, Jiangxi, Hubei, Hunan and Yunnan is lower than the national average. However, it is effective and the growth rate is higher than the national average level, which has good development prospects. Such provinces need to continue to maintain the current pace of development. As the growth rate exceeds the national average, the high-quality development index of the tourism industry in such provinces has a good development prospect. The high-quality development of the tourism industry in Liaoning, Zhe-

**Table 5**
White heteroscedasticity test on the high-quality development of the tourism industry.

| Variables | $\chi^2$ | *p*-value | Heteroscedasticity |
|---|---|---|---|
| *LnGEP* | 61.37*** | 0.00 | existence |
| *+PATG* | 50.42*** | 0.00 | existence |
| *+PATG+PFAIT* | 43.16*** | 0.00 | existence |
| *+PATG+PFAIT+PFEG* | 57.28*** | 0.00 | existence |
| *+PATG+PFAIT+PFEG+LnNPA* | 71.53*** | 0.00 | existence |
| *+PATG+PFAIT+PFEG+LnNPA+LnPCEUR* | 65.66*** | 0.00 | existence |

Note: *, **, and *** indicate the significance levels of 0.1, 0.05, and 0.01, respectively; the sample size involved in the analysis is 300.

**Table 6**
D-W-H endogeneity test of independent variables and control variables.

| Variables | Test | Original hypothesis | Test results | Test conclusion |
|---|---|---|---|---|
| independent variables | Durbin Test | exogenous | $\chi^2(1)$=0.35,$p = 0.55$ | Accept |
| | Wu-Hausman Test | exogenous | F (1,297)=0.35,$p = 0.56$ | Accept |
| Control variables | Durbin Test | exogenous | $\chi^2(1)$=0.9,$p = 0.34$ | Accept |
| | Wu-Hausman Test | exogenous | F (1,292)=0.88,$p = 0.35$ | Accept |

jiang, Shandong and Guangxi is effective, and the growth rate is positive. However, both indicators are lower than the national average. The high-quality development of the tourism industry in such provinces remains stable, not too bad, but it is easy to stagnate. It shows that the high-quality development of the tourism industry in the above regions is relatively stable, but lack of power. Such provinces need to find new growth points and obtain the driving force for the high-quality development of the tourism industry by increasing the input of production factors in a certain dimension.

The high-quality development of the tourism industry in Tianjin, Hebei, Jiangsu, Henan, Sichuan and Xinjiang is effective, but it is lower than the national average level, and the growth rate is negative. The Such provinces need to find out the problems in time and adjust development strategies to avoid further deterioration of the situation. The high-quality development index of the tourism industry in Inner Mongolia, Jilin, Heilongjiang, Anhui, Fujian and Gansu has not reached an effective state. Among them, the main reason for the ineffective high-quality development of the tourism industry in Inner Mongolia, Jilin and Fujian is the low scores of pure technical efficiency and scale efficiency. It means that the above provinces need to enhance management capacity, improve technical level and resource utilization efficiency, and adjust the industrial development scale. The main reason why the high-quality development of the tourism industry in Heilongjiang, Anhui and Gansu is ineffective is the low score of scale efficiency, which means that they need to adjust the development scale of tourism industry. Avoid diminishing returns to scale caused by too large or insufficient scale.

### *4.2. The test of the impact of inclusive green growth on the high-quality development of the tourism industry*

#### *4.2.1. Correlation test*

In order to eliminate the possible heteroscedasticity of the indicator variables, this study needs to calculate the logarithm of the independent variables, the dependent variables, “the number of patent applications”, and “the per capita consumption expenditure of urban residents”. The SPSSAU automatic data science analysis platform was used to test the correlation between independent variables and dependent variables, and between control variables and dependent variables through the Pearson Correlation coefficient matrix. The results showed that inclusive green growth was positively correlated with the high-quality development of the tourism industry, with a Pearson Correlation coefficient of 0.15 ($p < 0.01$). Among the control variables, “the number of patent applications” had a significant negative correlation with the high-quality development of the tourism industry, and the Pearson Correlation coefficient was -0.12 ($p < 0.05$). The other four control variables were positively correlated with the high-quality development of the tourism industry. The Pearson correlation coefficient between “the proportion of the added value of the tertiary industry in GDP” and the high-quality development index of the tourism industry was 0.41. The Pearson correlation coefficient between “the proportion of fixed assets investment of the tertiary industry (excluding farmers)” and the high-quality development index of the tourism industry was 0.5. The Pearson correlation coefficient between “the proportion of fiscal expenditure in GDP ” and the high-quality development index of the tourism industry was 0.15. The Pearson correlation coefficient between “the per capita consumption expenditure of urban residents ” and the high-quality development index of the tourism industry was 0.19.

#### *4.2.2. Panel data regression analysis*

When estimating the panel data model, which model estimation method to use and check whether the regression model has heteroscedasticity should be firstly considered. In order to eliminate the effect of heteroscedasticity, Hausman test was used the to determine whether the model chooses fixed or random effect. Then, we used the White test to check for heteroscedasticity between groups. If there is heteroscedasticity, the robust standard error method is used to correct the heteroscedasticity of panel data to obtain effective parameter estimation results of the model. The Hausman test showed significant chi-square (6) value = 24.67 at 5% level, $p = 0.00 < 0.05$, which means a Fixed effect (FE) model is better than an Random Effect (RE) model.

The original hypothesis of the White test is that there is no heteroscedasticity in the model. If the original hypothesis is rejected, it indicates that the model has heteroscedasticity. If the original hypothesis is accepted, it indicates that there is no heteroscedasticity problem in the model. The white test results are shown in Table 5. When the core explanatory variables or control variables are taken into account, the$p < 0.05$, indicating that the original hypothesis is rejected and there is heteroscedasticity in the model. Therefore, the robust standard error method was used for regression analysis.

The fixed effect estimation method can mitigate the endogenous bias caused by missing variables to a certain extent. However, the more significant endogenous bias may come from the reverse causality. In order to avoid the result error caused by the endogenous problem due to the reciprocal causation between inclusive

**Table 7**
Robust standard error regression analysis of the impact of inclusive green growth on the high-quality development of the tourism industry.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| ln *GEP* | 0.26*** (6.54) | 0.02 (0.46) | -0.01 (-0.24) | 0.14*** (2.6) | 0.23*** (3.76) | 0.21*** (3.47) |
| *PATG* | | 0.01*** (9.15) | 0.01*** (3.53) | 0.005*** (2.67) | 0.01*** (3.1) | 0.01*** (4.39) |
| *PFAIT* | | | 0.008*** (5.99) | 0.007*** (5.71) | 0.01*** (4.82) | 0.01*** (5.43) |
| *PFEG* | | | | 0.01*** (4.08) | 0.00 (0.71) | 0.00* (1.85) |
| ln *NPA* | | | | | -0.05*** (-2.85) | -0.02 (-0.91) |
| ln *PCEUR* | | | | | | -0.20*** (-3.33) |
| Constant term | 0.53*** (8.64) | -0.43*** (-3.95) | -0.63*** (-5.49) | -0.43*** (-2.49) | 0.41 (1.33) | 1.73*** (3.44) |
| *F*-value | 8.61 | 28.76*** | 32.38*** | 25.98*** | 20.52*** | 19.14*** |
| $R^2$ | 0.01 | 0.16 | 0.25 | 0.26 | 0.26 | 0.28 |
| Sample size | 300 | 300 | 300 | 300 | 300 | 300 |

Note: *t* values are in brackets; *, **, and *** indicate the significance levels of 0.1, 0.05, and 0.01, respectively.

green growth and tourism's industrial high-quality development, this paper took the lag term of inclusive green growth as an instrumental variable, and used the Durbin Wu Hausman (D-W-H) test to check for endogeneity. The results showed that al lwere$p > 0.1$, indicating that there was no endogenous problem in the model. The endogeneity test results are shown in Table 6.

After the correlation test, the Hausman test, the heteroscedasticity test, and the endogeneity test, the robust standard error method was used for regression analysis of model (1). The regression results are shown in Table 7.

Table 7 shows the regression results of the impact of inclusive green growth on the high-quality development of the tourism industry. The first column shows the estimation results without considering the control variables, and the second, third, fourth, fifth, and sixth columns show the estimation results after adding the control variables, such as*PATG*,*PFAIT*,*PFEG*,*NPA*, and*PCEUR*, in turn. In general, robust regression does not analyse $R^2$ or the *F*-value, and these two indicators have lost their original significance. The results showed that the impact coefficient of inclusive green growth on the high-quality development of the tourism industry was significant at the level of 0.01. The significant regression coefficients were 0.26, 0.14, 0.23, and 0.21. Therefore, inclusive green growth has a significant positive role in promoting the high-quality development of the tourism industry (H1). Inclusive green growth provides ecological, inclusive, and sustainable conditions for the high-quality development of the tourism industry. Moreover, the high-quality development of the tourism industry follows the new development philosophy of innovation, coordination, greenness, openness, and sharing, and promotes economic construction, political construction, cultural construction, social construction, and ecological civilisation construction to embody the characteristics of inclusiveness, fairness, greenness, and sustainability.

In Table 5, columns (2) and (3) show that the regression coefficients of the first control variable (*PATG*) and the second control variable (*PFAIT*) are positive, and $p < 0.01$, which has a significant promoting effect on the explained variable. The results show that increasing the Positive regression coefficients and $p < 0.01$ have a significant promoting effect on the explained variable. The results show that increasing the proportion of added value of the tertiary industry and expanding the proportion of fixed investment in the tertiary industry will be conducive to the high-quality development of the tourism industry. This is due to the enhancement of the strength of the tertiary industry, especially the development of the modern service industry, which has become an effective means to stimulate consumption, boost domestic demand. The development of the tertiary industry helps to increase employment and provides a sustainable driving force for promoting the development of tourism industry and changing the development model.

From columns (4) - (6), the regression coefficient of the third control variable (*PFEG*) is positive, and it is significant. The reason *PFEG* has a significant promoting effect may be that the increase of the proportion of government fiscal expenditure in GDP stimulates social consumption to a certain extent, improve public service facilities and infrastructure, and provide convenient basic conditions and market resources for the high-quality development of the tourism industry. However, excessive government intervention curbs the flexible development of the tourism market, so the significance of *PFEG* is not stable, and the regression coefficient is relatively small.

Columns (5) and (6) show that the regression coefficients of the fourth control variable (ln *NPA*) and the fifth control variable (ln *PCEUR*) are negative, and have certain significance. This shows that the number of patent applications and per capita consumption expenditure of urban residents hinders the high-quality development of the tourism industry. China is the country with the largest number of patents, but there are some problems, such as a low threshold of patent application, high quantity and low quality, low conversion rate of patent achievements, and short patent duration. These problems may have a negative impact on China's tourism enterprises to enhance their strength and promote structural transformation and upgrading. The per capita consumption expenditure of urban households is the total expenditure for goods and services in daily life. This index is negatively correlated with the high-quality development of the tourism industry. The reason may be that the consumption of urban residents is mainly concentrated on goods and services to maintain the daily life of families, while the proportion of consumption in tourism is small.

This study needs to test the robustness of the constructed panel model to ensure that the calculation results are reliable. In this paper, the first-order lag term of the dependent variable was used to replace the original dependent variable, and was incorporated into model (1). Then, A new dynamic panel data model is constructed for robustness test, such as formula (11). In formula (11), $\ln THD_{it-1}$ is the logarithmic form of the lagging first-order term of the tourism industry high-quality development index. Other for-

**Table 8**
The robustness check of the impact of inclusive green growth on the high-quality development of the tourism industry.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| ln *GEP* | 0.25*** | 0.03 | -0.01 | 0.15*** | 0.24*** | 0.21*** |
| | (6.56) | (0.6) | (-0.22) | (2.69) | (3.51) | (3.37) |
| *PATG* | | 0.01*** | 0.01*** | 0.00** | 0.00** | 0.01*** |
| | | (9.17) | (2.97) | (2.04) | (2.32) | (3.83) |
| *PFAIT* | | | 0.01*** | 0.01*** | 0.01*** | 0.01*** |
| | | | 6.13) | (5.86) | (4.83) | (5.36) |
| *PFEG* | | | | 0.01*** | 0.00 | 0.01** |
| | | | | (4.21) | (1.00) | (2.2) |
| ln *NPA* | | | | | -0.05** | -0.01 |
| | | | | | (-2.45) | (-0.43) |
| ln *PCEUR* | | | | | | -0.24*** |
| | | | | | | (-3.45) |
| Constant term | 0.53*** | -0.4*** | -0.63*** | -0.41*** | 0.38 | 1.92*** |
| | (8.55) | (-3.57) | (-5.23) | (-3.35) | (1.12) | (3.37) |
| *F*-value | 1.53 | 24.91*** | 29.81*** | 24.38*** | 19.32*** | 19.00*** |
| Hausman test | 4.11** | 24.33*** | 30.89*** | 34.44*** | 22.44*** | 28.77*** |
| White test | 57.63*** | 53.41*** | 42.81*** | 57.91*** | 70.92** | 67.72*** |

Note: *t* values are in brackets; *, **, and *** indicate the significance levels of 0.1, 0.05, and 0.01, respectively; White test is used to test for heteroscedasticity; Hausman test is used to check whether to choose a fixed effect model or a random effect model; the sample size involved in the analysis is 300.

**Table 9**
Threshold effect test.

| Threshold model type | Threshold value | *F*value | *p*value | 10% critical value | 5% critical value | 1% critical value | BS times |
|---|---|---|---|---|---|---|---|
| Single threshold | 38.65 | 17.23** | 0.04 | 12.84 | 16.12 | 22.02 | 300 |
| Double thresholds | 64.84 | 6.81 | 0.51 | 17.49 | 22.57 | 32.66 | 300 |
| Three thresholds | 76.08 | 5.61 | 0.71 | 16.06 | 19.43 | 28.76 | 300 |

Note: Both the *p*value and the critical value were obtained by repeated sampling 300 times using the Bootstrap method; *p* values are in brackets; *, **, and *** respectively indicate the significance levels of 0.1, 0.05, and 0.01.

mula symbols have the same meaning as in formula (1).

$$\ln THD_{it-1} = \alpha_0 + \alpha_1 \ln GEP_{it} + \beta_1 PATG_{it} + \beta_2 PFAIT_{it} + \beta_3 PFEG_{it} + \beta_4 \ln NPA_{it} + \beta_5 \ln PCEUR_{it} + u_t + v_i + \varepsilon_{it} \quad (11)$$

Therefore, the Hausman test, the heteroscedasticity test, and the endogeneity test were conducted again. Robust regression was then used, and the regression results are shown in Table 8.

The newly constructed panel regression model was tested by Hausmann test. As shown in Table 8, the$p < 0.05$, so the fixed effect model was selected. Then, the White test was used to determine whether there was heteroscedasticity between the core explanatory variables and the control variables. The test results of Table 8 shows that$p < 0.05$, that is, there is heteroscedasticity, so the robust method need to be used for regression analysis. Then, the White test was used to determine whether there was heteroscedasticity between the core explanatory variables and the control variables. By comparing the results of the robust regression test in Tables 8 and 7, it was found that the estimated results of the core explanatory variables and the control variables did not fundamentally change, and the sign and significance are consistent. This shows that the model and empirical results constructed in this paper are robust.

### 4.3. Threshold effect

#### 4.3.1. Threshold effect test

Based on formulas (2) and (3), this paper used Stata16 software and the panel data of 30 Chinese provinces (excluding Hong Kong, Macao, Taiwan, and Tibet) from 2010 to 2019 to conduct threshold effect regression. Then, the Bootstrap self-help method was used to sample 300 times, and the threshold value and correlation statistics were estimated.

The results as shown in Table 9, the first column shows the types of threshold models: single threshold, double threshold, and triple threshold. The second column shows the threshold. The third and fourth columns show the *F*value and*p*value, respectively, which are used to test whether the threshold effect is significant. When the *F*value is greater than the critical value and the *p*value is less than the significance level, the test is passed. Columns five to seven show the critical values of *F* at 10%, 5%, and 1%, respectively. The eighth column shows the simulation frequency of the bootstrap method.

The*F*values of the double threshold model and the triple threshold model are less than their respective 10% critical values, and the*p*values are greater than the significance level of 0.1, indicating that they have not passed the double threshold test and the triple threshold test. The*F*value of the single threshold model is 17.23, which is greater than the critical value of 5%, and its*p*value is 0.04, which is significant at the significance level of 0.05. Therefore, this paper chooses the single threshold model. The single threshold value (38.65) based on import dependence is divided into two value ranges, and the nonlinear relationship between inclusive green growth and the high-quality development of the tourism industry is analysed in $[0, 38.65)$ and $[38.65, +\infty)$.

#### 4.3.2. Regression results and analysis of threshold effect

Table 10 shows the final regression result of the threshold effect. The first column shows the variable type, the second column shows the regression coefficient, and the T value is in brackets. Lines 1 to 5 are the regression results of the threshold effect of the control variables, and lines 6 and 7 are the changes of the regression coefficient of the inclusive green growth index under the effect of the threshold variables. The rest are the constant term, *F*value, and$R^2$.

It has been concluded from Tables 7 and 8 that the inclusive green growth index has a significant postive impact on the tourism industry when there is no threshold variable (import dependence).

**Table 10**
Regression results of the single threshold model.

| Variable | Regression coefficient (*t*-value) |
|---|---|
| *PATG* | -0.01*(-1.66) |
| *PFAIT* | -0.00 (-0.08) |
| *PFEG* | -0.01(-0.79) |
| ln *NPA* | -0.08(-1.55) |
| ln *PCEUR* | 0.28**(2.31) |
| ln *GEP*(*ID* ≤ 38.65) | -0.32*(-1.85) |
| ln *GEP*(*ID* > 38.65) | -0.24(-1.4) |
| Constant term | -1.89**(-2.26) |
| *F*value | 3.48*** |
| $R^2$ | 0.12 |

Note: *t* values are in brackets; *, **, and *** indicate the significance levels of 0.1, 0.05, and 0.01, respectively; $R^2$is for reference only; the sample size involved in the analysis is 300.

When the threshold variable (import dependence) is added, as shown in Table 10, the impact of inclusive green growth on the high-quality development of the tourism industry becomes negative. By observing the regression coefficients of the control variables, it was found that the regression coefficients of "the proportion of the added value of the tertiary industry in GDP" change from positive to negative, and decrease significantly. The regression coefficients of "the proportion of fixed assets investment in the tertiary industry" change from positive to negative, and decrease significantly. The regression coefficients of "the proportion of fiscal expenditure in GDP" change from positive to negative, and decrease significantly. The regression coefficient of "the number of patent applications" does not change, but it decreases significantly. The regression coefficient of "the per capita consumption of urban residents" has changed from negative to positive, and still has high significance.

From the threshold effect of import dependence, When *ID* ≤38.65, the degree of import dependence is less than or equal to the threshold value, and inclusive green growth has a significant negative impact on the high-quality development of the tourism industry. The regression coefficient is -0.32. When *ID* >38.65, the import dependence is greater than the threshold value. The negative impact of inclusive green growth on the quality development of the tourism industry is weakened, and the regression coefficient is -0.24. Import dependence will have a threshold moderating effect on the relationship between inclusive green growth and the high-quality development of the tourism industry, which means (H3) has been confirmed. The regression results show that in general, inclusive green growth plays a positive role in promoting the high-quality development of the tourism industry. However, if the import volume of intra-regional trade accounts for a large proportion of the total import and export volume, it means that regional economic development depends too much on import trade. In this case, the high-tech advanced equipment production of the tourism industry and its related industries will be easily restricted. Even if the ecological inclusive development model be adhered, the core technology of the industry should be firmly grasped. Only by adhering to the principle of independent industrial development can countries achieve sustainable and high-quality development.

Similar to the new development philosophy, the coordinated development of the economy, society, and environment brought by inclusive green growth creates the development conditions of ecological environment protection, social inclusion, and sustainable economic growth for the high-quality development of the tourism industry. Without considering import dependence, inclusive green growth can promote the high-quality development of the tourism industry. When import dependence is taken as a moderating variable, the influence of inclusive green growth on the high-quality development of the tourism industry becomes negative. As a moderating variable, import dependence has a negative nonlinear effect on inclusive green growth and the high-quality development of the tourism industry. This result highlights two key points; one is the negative effect, the other is the nonlinear characteristics.

There may be two reasons for the negative effect. First, China's imported industrial products are mainly high-tech products, such as integrated circuits, instruments and meters, primary shape materials, display panels, computers and their parts, aircrafts, and electronic components. The promotion of the quality of the tourism industry is inseparable from intelligent and digital upgrading. If the dependence on imports is too high and the dependence on high-tech products is too strong, it weaken the local tourism industry's independent innovation ability in terms of facilities and equipment, which is not conducive to high-quality development of the tourism industry. Strengthening China's trade export virtually drives cultural export, shape a good international image and enhance the attraction of domestic tourism industry to international tourists. On the contrary, if the degree of dependence on import is too strong, the intensity of foreign cultural input exceed the intensity of domestic cultural output, which stimulates the increase of outbound tourists. Finally, it is not conducive to the high-quality development of the domestic tourism industry.

When the import dependence is less than the threshold, the regression coefficient of inclusive green growth to the high-quality development of the tourism industry is negative and significant. When the import dependence is greater than the threshold, the negative effect of the regression coefficient decreases. The reason for the existence of non-linear characteristics may be: when the import volume of goods is large, it means that the opening-up is enhanced, the products that residents can consume are enriched, the basic living needs of residents are met, and the desire to travel is enhanced. From the above effect of import dependence, the effect of per capita consumption expenditure of urban residents on the high-quality development of the tourism industry has changed from negative to positive. Even if the negative impact is improved, due to excessive dependence on import trade, the opening level still is low, which is not conducive to the positive role of inclusive green growth in the high-quality development of the tourism industry.

### *4.4. Analysis of results in the context of covid-19*

There are two main reasons why this paper does not include the statistical data of 2020 into the panel data: first, due to the influence of COVID-19, the tourism revenue and tourist arrivals of all provinces generally decreased in 2020. This is very different from the development trend of tourism industry from 2010 to 2019. If the statistical data of 2020 are rashly included in the panel data from 2010 to 2019, it will make a wrong judgment on the development trend of tourism industry in China and all provinces. Second, many index data in 2020 have not been counted, and there are many missing values, which makes it impossible to obtain the high-quality development index and inclusive green growth index of the tourism industry. In order to improve the timeliness of this study and highlight the significance of this study in promoting the development of tourism industry under the influence of COVID-19, this study selects the indicators such as "tourism revenue", "tourism person times" and "import dependence" of each province in 2020 for analysis. The percentage of decline in tourism Industry data of each province in 2020 compared with 2019 is shown in Table 11.

It is found in Table 11 that under the influence of COVID-19, the inbound tourism revenue and the number of inbound tourists of all provinces have decreased seriously, with a decrease range of 84.4% ~ 96.59%, which reflects the very bad impact of COVID-19 on inbound tourism. Specifically, the total tourism revenue and

**Table 11**
The percentage of decline in tourism industry data of each province in 2020 compared with 2019 (%).

| Region | Total tourism revenue | Total tourist trips | Domestic tourism revenue | Inbound tourism income | Domestic tourists | Number of inbound tourists |
|---|---|---|---|---|---|---|
| Beijing | 42.9 | 53.2 | 50.8 | 90.7 | 42.3 | 91 |
| Tianjin | 66.15 | 40.21 | – | – | – | – |
| Hebei | 60.5 | 51.39 | 60.3 | 96.6 | 51.4 | 95.8 |
| Shanxi | 63.6 | 60.28 | 63.5 | 98.5 | 60.1 | 97.8 |
| Inner Mongolia | 48.27 | 35.95 | – | – | – | – |
| Liaoning | 56.28 | 52.98 | 55.56 | 93.1 | 52.8 | 93.27 |
| Jilin | 48.49 | 89.79 | – | – | – | – |
| Heilongjiang | 38.6 | 34.1 | – | – | – | – |
| Shanghai | 42.79 | 35.92 | 41.3 | 55 | 34.7 | 85.7 |
| Jiangsu | 42.4 | 46.3 | 41.5 | 65.1 | 46.2 | 80.7 |
| Zhejiang | 24.2 | 21.5 | – | – | – | 91.8 |
| Anhui | 50.3 | 43.05 | 49.1 | 91.9 | 42.6 | 89.4 |
| Fujian | 37.4 | 30.65 | 33.3 | 79.8 | 29.8 | 76 |
| Jiangxi | 43.85 | 29.75 | 43.5 | 95.7 | 29.6 | 93.4 |
| Shandong | 45.7 | 38.5 | – | – | – | – |
| Henan | 37.97 | 40.93 | – | – | – | – |
| Hubei | 36.8 | 27.8 | – | – | – | – |
| Hunan | 15.4 | 19.73 | 15.4 | 97.7 | 16.2 | 96.4 |
| Guangdong | 67.33 | 79.13 | 66.97 | 88.55 | 54.25 | 88.81 |
| Guangxi | 29 | 24.54 | 27.4 | 97.8 | 24 | 96 |
| Hainan | 17.5 | 22.3 | – | – | 21.2 | 84.4 |
| Chongqing | – | 35.5 | – | 95.7 | – | 96.4 |
| Sichuan | 38.1 | 40.3 | 37.4 | 97.7 | 39.9 | 94.1 |
| Guizhou | 53 | 45.6 | – | – | – | – |
| Yunnan | 41.3 | 35.01 | 39.6 | 92.2 | 33.9 | 92.2 |
| Shannxi | 61.7 | 49.5 | 60.4 | 98.6 | 49.2 | 98.2 |
| Gansu | 45.72 | 42.46 | 45.7 | 88.2 | 43.1 | 87.2 |
| Qinghai | 48.4 | 34.8 | 48.2 | 94.5 | 34.7 | 92.6 |
| Ningxia | – | – | – | – | – | – |
| Xinjiang | 72.7 | 25.9 | 72.45 | 99.63 | 25.17 | 96.59 |

Note: Tibet Tibetan Autonomous Region and Hong Kong, Macao and Taiwan regions are not included; The data comes from the 2020 national economic and social development statistical bulletin of each province; "–" indicates missing data.

the total number of tourists in each province are more affected by the domestic tourism market. In Hunan, Guangxi, Sichuan, Yunnan, Beijing and Jiangxi provinces (municipalities directly under the central government), the inbound tourism revenue and the number of inbound tourists all decreased by more than 90%, but the total tourism revenue decreased by less than 45%. This shows that the shrinking of inbound tourism market has little impact on the development of tourism industry in these provinces. The decline of inbound tourism revenue and number of inbound tourists in Shanghai, Guangdong, Jiangsu and other provinces (municipalities directly under the central government) was less than 90%, but the decline of total tourism revenue exceeded 40%. This shows that the shrinking of inbound tourism market has a great impact on the development of tourism industry in these provinces. Comparing the decline of total tourism income between the first category provinces (Hunan, Guangxi, Sichuan, Yunnan, Beijing and Jiangxi) and the second category provinces (Shanghai, Guangdong and Jiangsu) and its main reasons, it is found that the higher the dependence on the inbound tourism market, the stronger the decline of total tourism income. Therefore, under the influence of COVID-19, all provinces need to adjust the development strategy of tourism industry, return the market focus to China and reduce their dependence on the import market.

Based on the tourism industry data of each province in 2020, this study uses the least square regression analysis to calculate the impact mechanism of import dependence on the total tourism revenue and the total number of tourists. The heteroscedasticity problem has been solved using the Robust standard error method. The results of least squares regression analysis are shown in Table 12. It can be seen that the regression coefficient of the impact of import dependence on the total number of tourists is -572.56. The regression coefficient of the impact of import dependence on total tourism income is -86.25. The table shows that import dependence has a significant negative impact on total tourism income and total tourist output. The results of regression analysis reflect that under the influence of COVID-19, excessive dependence on import trade have a negative impact on the total tourism revenue and the total number of tourists, which is not conducive to the high-quality development of the tourism industry. Therefore, China's provinces need to understand and grasp the new development pattern with the domestic big cycle as the main body and the domestic and international double cycles promoting each other. Under the new development pattern, all provinces should reduce import dependence and realize self-reliance, so as to promote the high-quality development of the tourism industry.

## 5. Discussion

### 5.1. Scientific value

The scientific value of this paper is mainly reflected in the following points.

First of all, this paper creatively constructs the evaluation system of high-quality development index of tourism industry based on spatial production theory. Most of the existing literatures used five new development philosophy as indicators when calculating the high quality development index (Liu et al., 2020; Lv and Cui, 2020; Wang, 2020; Tang et al., 2021; Yang et al., 2021). This study did not follow this method. Instead, the index sources are economic, political, cultural, social and ecological civilization. Moreover, the production efficiency of tourism industry represents the high quality development level of the tourism industry and more accurately reflects the comprehensiveness and efficiency of the high quality development of the tourism industry. Secondly,

**Table 12**
Analysis on the influence mechanism of import dependence of China's provinces on total tourism revenue and total tourist arrivals in 2020.

| | Regression coefficient | |
|---|---|---|
| Constant | 59562.34***(5.00) | 8328.79*** (7.59) |
| Import dependence | -572.56*** (-2.87) | -86.25*** (-3.96) |
| Number of samples | 29 | 29 |
| $R^2$ | 0.232 | 0.367 |
| Adjustment $R^2$ | 0.203 | 0.344 |
| F-value | F (1,27)=8.24*** | F (1,27)=15.661*** |
| Dependent variable | Total tourist trips (10000 person times) | Total tourism revenue (100 million yuan) |
| D-W-value | 2.024 | 1.391 |

Note: $^{**}p < 0.05$, $^{***}p < 0.01$, $t$ value in brackets; Ningxia Hui Autonomous Region was excluded from the sample set because of more missing data, and the number of samples was 29.

most of the existing literatures draw conclusions based on bilateral or multilateral trade relations, and the impact of international trade on the development of tourism has both advantages and disadvantages. However, there are few studies on how import dependence affects the relationship between other factors and tourism development (Jordan and Ken, 2001; Shi et al., 2015; Christian et al., 2009; Richard et al., 2011).On this basis, the threshold effect regression model is used to verify the nonlinear moderating effect of import dependence on the relationship between inclusive green growth and high-quality development of the tourism industry. The research content of the relationship between international trade and tourism industry is deepened and expanded. Finally, the literature has studied inclusive green growth from the aspects of ecological and environmental protection, resource protection and social equity (Ojha et al., 2020; Wang et al., 2020; McCartney et al., 2020; Spash, 2020). In addition, inclusive green growth is often seen as a way to alleviate poverty through tourism (Zhang and Chen, 2020). This paper constructs the measurement system of inclusive green growth index and discusses the influence mechanism of inclusive green growth index on the high-quality development of the tourism industry. In this paper, inclusive green growth, tourism industry and high-quality development are organically combined, reflecting the inclusive, ecological and sustainable high-quality development of the tourism industry, and in line with the direction of high-quality development of the industry guided by the new development concept.

### 5.2. Study limitations

There are some limitations in the theoretical exploration and data accuracy of the high-quality development of the tourism industry in this paper: At present, the high-quality development of the tourism industry in China has just started, and relevant research can only build the evaluation system of the high-quality development of the tourism industry from a certain Angle. What level of development qualifies as high-quality development is still uncertain. This problem needs to be further discussed in practice. In the aspect of index system construction, many proxy variables are used in this paper because it is difficult to obtain data from tourism industry. Therefore, there is a gap between the calculated results and the real results to some extent in this paper. In Sections 3.2.1 and 3.2.2, this paper elaborates the rationality of index selection. However, due to the imperfection of China's tourism statistics system, some statistical data still exist problems.

## 6. Conclusions

This paper selects panel data of 30 provinces in China from 2010 to 2019, and calculates inclusive green growth index and high-quality development index of tourism industry by using entropy weight method and data envelopment analysis method. Then, robustness test and single threshold model are used to verify the nonlinear threshold effect of import dependence on the relationship between inclusive green growth and high-quality tourism development. The results showed that: The average inclusive green growth index across the country shows a slow upward trend, but the average level is still low. According to the calculation results of each province, greening projects, energy supply, scientific research and innovation, medical care and old-age security are the main factors influencing the inclusive green Growth index. The average value of the high quality development index of the national tourism industry is valid, and there is a big gap in the high quality development level of the tourism industry in various provinces. The hindrance factors mainly include insufficient power, low utilization rate of resources, and industrial scale not adapting to the pace of development. The high-quality development of the tourism industry can be promoted by investing new production factors, improving management level, improving resource utilization efficiency and benefit conversion rate, adjusting development strategy and industrial development scale, etc. Without considering import dependence, inclusive green growth has a positive effect on the high-quality development of the tourism industry. When import dependence is taken into account, inclusive green growth has a negative impact on the high-quality development of the tourism industry. When import dependence exceeds the threshold, the negative effect of inclusive green growth on the high-quality development of the tourism industry is eased. Through data calculation and testing, it is found that in the context of COVID-19, import dependence has a negative impact on the development of China's tourism industry.

The research results of this paper provide theoretical reference for China and other developing countries to promote poverty reduction and high-quality development of the tourism industry. COVID-19 will not end for some time to come. Therefore, future research, based on more comprehensive tourism data in the context of COVID-19, can explore the impact of COVID-19 on the high-quality development of the tourism industry.

## Author contributions

Conceptualization, Z.X.; methodology, Z.X.; investigation, Z.X.; data curation, Z.X.; writing—original draft preparation, Z.X.; writing—review and editing, B.B.M.; supervision, G.W.; funding acquisition, G.W. All authors have read and agreed to the published version of the manuscript. All authors have read and agreed to the published version of the manuscript.

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## Declaration of Competing Interest

The authors declare no conflict of interest.

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