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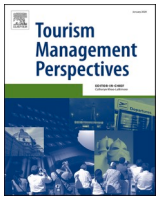

Trade facilitation promoted the inbound tourism efficiency in Japan☆

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ABSTRACT

This study explores the intrinsic correlation between trade facilitation and the inbound tourism efficiency in Japan based on the data from 2011 to 2019. According to the data from JNTO, Japan's inbound tourism showed a strong dependence on the Asian market, the growth rate of inbound tourists in Europe, America and Oceania increased in recent years. The COVID-19 seriously hindered the Japan's inbound tourism development. The fixed-effect regression indicates that trade facilitation promoted inbound tourism efficiency in markets of different types. The positive effect of trade facilitation on sightseeing market was most significant in Asia. While in Europe, America and Oceania, the inbound business market benefited most from trade facilitation. Trade facilitation amplified the positive effect of Japan's air transportation capacity, international tourism income and visa-free policy on the inbound tourism efficiency, and effectively buffered the negative impact of natural disasters. With regard to the estimated results of sub-indicators of trade facilitation, the improvement of infrastructure, government efficiency, customs environment and technological level all contributed to the increase in Japan's inbound tourism efficiency.

1. Introduction

Trade facilitation can effectively reduce the cost of international trade, promote trade between countries around the world and bring benefits to trade participant. As a key area in service trade, inbound tourism is of great significance to the improvement of the overall strength of the tourism industry and the speeding up of the opening up of the service trade in one country. In order to cope with the shrinking domestic consumption demand caused by declining birthrate and build a good international image, Japan began to implement the plan of "Visit Japan Campaign" (welcome to visit Japan) program in 2003, formulated the "Tourism Nation Promotion Basic Law" in 2006 which introduced the "Basic Plan for Tourism Nation Promotion" and formally established inbound tourism as a pillar industry to promote the country's economic development. Since the implementation of the plan, Japan's inbound tourism has achieved fruitful development, the number of Japan's inbound tourists has increased from more than 6 million in 2011 to more than 30 million in 2019 (An increase of nearly about four times).[1] The increase in the number of inbound tourists benefited from the improvement of the inbound tourism efficiency in Japan, the enhancement of the operational efficiency of tourism administration departments, enterprises and other entities could effectively improve the tourism development environment, create good tour experience and continuous attraction to tourists. Meanwhile, the tourism revenue from inbound tourists could provide financial guarantee for various tourism industry entities to promote their own operational efficiency, which made a huge contribution to Japan becoming a world-renowned tourism industry power.

Inbound tourism is an important part of service trade, which is closely related to trade facilitation level of a country and its inbound tourist source countries (regions). This means that trade facilitation plays a key role in improving inbound tourism in a country (region). I conducted statistics on the number of literature with the topic of trade facilitation and inbound tourism in Web of Science, it is found that this topic first appeared in 2005, and the number of literature has been increasing since then. There were a total of 156 articles as of 2019 (Fig. 1.). The increase in the number of literature showed that trade facilitation and inbound tourism have attracted more attention from scholars, but the small number of literature indicated that there was a large room for in-depth exploration. With regard to the research content,

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[1] The data was collected and calculated by the author. The data comes from the official website of the Japan Government Tourism Organization: https://www.jnto.go.jp/jpn/.

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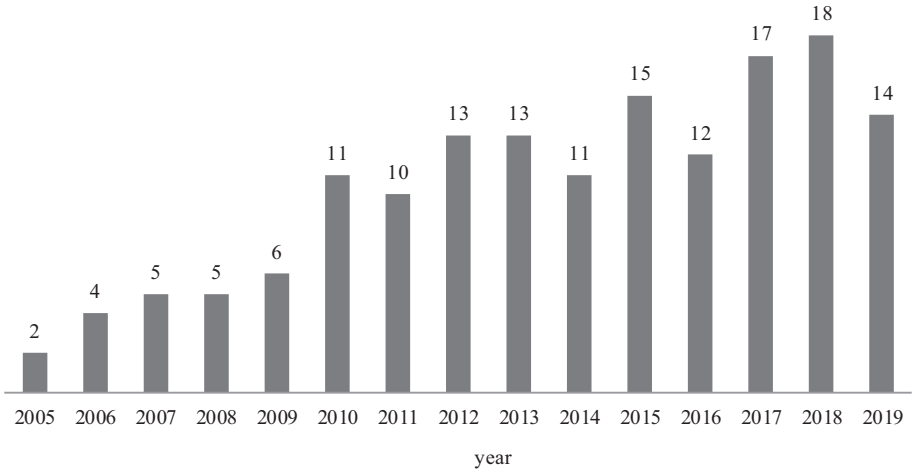

Fig. 1. The number of literature with the topic of trade facilitation and inbound tourism in Web of Science.

further discussions on the optimization of trade facilitation measurement methods and its influence on inbound tourism are particularly necessary. Therefore, this study takes Japan as research object, explores the influence of the trade facilitation of its different inbound tourist source countries (regions) on the Japan's inbound tourism efficiency to clarify their inherent relationship. Meanwhile, taking into account the impact of the COVID-19 on the efficiency of inbound tourism in Japan , the purpose of this study is to make innovative attempts and breakthroughs in related research fields. Based on the data released by The Japan National Tourism Organization (JNTO) from 2011 to 2019, it is found that Asian has become the largest inbound tourist source continent for Japan, followed by America and Oceania, Europe. The number of inbound tourist from Asia continued to increase from 2011 to 2015. The number of tourists in Europe, America and Oceania has rebounded in recent years. The COVID-19 has a huge negative impact on inbound tourism development in Japan and the number of inbound tourists from different continents to Japan has experienced a sharp decline (all more than 70%) from 2019 to 2020. According to the fixed-effect regression, trade facilitation has widely promoted the efficiency of inbound tourism in Japan. The promoting effect of trade facilitation on inbound tourism efficiency of sightseeing market was most significant in Asia. In Europe, America and Oceania, the promoting effect is biggest in business market. Trade facilitation could amplify the positive effect of Japan's air transportation capacity, international tourism income and visa-free policy on the inbound tourism efficiency, and effectively buffer the negative impact of natural disasters. The distances of different inbound tourist source countries (regions) from the equator are used as instrumental variables for trade facilitation, the test results show that the distances from the equator is a suitable instrument variable for trade facilitation. The results of robustness test further indicate that the estimated results are robust and reliable. (See Fig. 2.)

The remainder of this paper is organized in the following manner. The next section is literature review. Section 3 analyzes change characteristics of inbound tourists in Japan. Section 4 introduces the model settings, variable descriptions and data sources. Section 5 mainly discusses the influence of trade facilitation on the inbound tourism efficiency in Japan. Finally, Section 6 concludes the analysis. (See Fig. 3)

2. Literature review

2.1. Measurement methods and influences of trade facilitation

Trade facilitation can ease trade conflicts, help countries around the world to reduce trade costs, and achieve sustainable growth in trade, thereby reducing the harm caused by the economic crisis (Portugal-Perez & Wilson, 2009). According to the definition of the WTO, trade facilitation means more transparent customs procedures, continuously reduced trade taxes and fees, and easier goods transit. There are increasing number of countries are taking steps to improve trade facilitation because trade facilitation can promote the equal and free

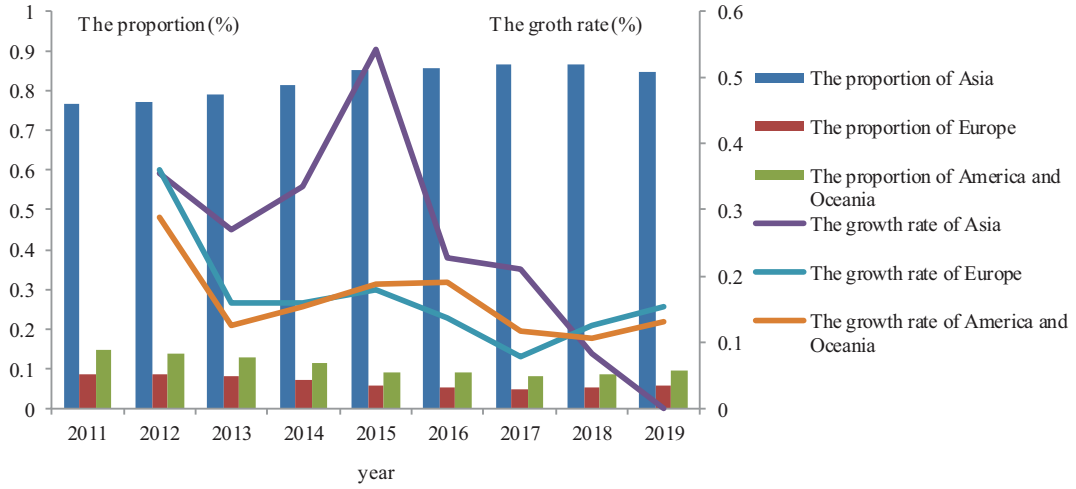

Fig. 2. Proportion and growth rate of tourists from various continents to Japan.

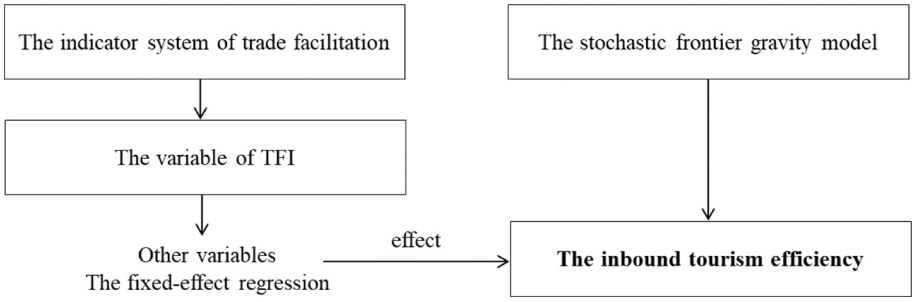

Fig. 3. The empirical framework diagram.

development of bilateral trade activities (Adomavičiūtė & Daujotaitė, 2017). Wilson, Mann, and Otsuki (2003) earliest used port and customs efficiency to measure trade facilitation. Later, some scholars added new indicators on this basis to gradually improve the measurement system for trade facilitation. Ramasamy (2010) used business processes to decompose trade costs which ensure measures of trade facilitation more accurate. Amin and Haidar (2004) considered that the number of customs clearance documents and the relationship between trading countries should also be included in the trade facilitation measurement system. In terms of its influence, trade facilitation can significantly reduce transportation costs of trade (Eberhard-Ruiz & Calabrese, 2018), increase profits in international trade (Persson, 2010), help host countries to attract much more foreign investment (Engman, 2009).Finally, promote the diversification of a country's export structure (Shepherd & Dennis, 2011), improve its export performance (Portugal-Perez & Wilson, 2012), and bring huge economic benefits to trading partner countries (Shepherd & Wilson, 2009). In summary , scholars gave relative complete definition of trade facilitation and discussed its measurement methods and influence. However, with the deepening of theoretical innovation and practice of international trade, the definition and measurement methods of trade facilitation also need to keep pace with the times (Otsuki, 2005). The predecessors chose a small number of trade facilitation indicators with a narrow perspective (Yang & Wu, 2018), but in recent years, some scholars have enriched the index system of trade facilitation, and made its evaluation method more scientific (Yao & Gao, 2018). In terms of influence, the border effects (Arevalo & Merlo, 2020) and spillover effects (Chai and Dong) of trade facilitation on imports and exports have gradually become the academic hot spot, which to a certain extent represents the research direction in this field.

2.2. *Influencing factors and measures of inbound tourism development in Japan*

Inbound tourism is an important part of Japan's national soft power (Pokarier & Tamiya, 2007), which is a hot topic in related academic circles. The role of policy in guiding the inbound tourism development in Japan is significant. Soshiroda (2005) pointed out in order to restore the post-war economy and build an international image, Japan has introduced a series of policies to promote the inbound tourism development. Henderson (2016) find the government's tourism policy plays a key role in increasing the attractiveness of domestic tourist destinations in Japan. Chi, Chang, Takahashi, et al. (2018) considered "Tourism Nation Promotion Project" has stimulated Japan's inbound tourism demand. In addition, factors such as natural disaster, economy development, infrastructure, diplomatic relations also have an impact on Japanese inbound tourism. Earthquakes and large-scale natural disasters will curb demand for inbound tourism in Japan (Murakami, Kawamura, Suzuki, et al., 2015; Wu & Hayashi, 2014), exchange rate fluctuations and transportation costs will affect the demand of travelling to Japan of tourists from South Korean (Kim & Lee, 2017), the MICE industry is also an important factor (Iwamoto, Matsuo, Fukushima, et al., 2016). Air charter tours have formed a significant component of inbound tourism in Japan (Wu, 2014). The deterioration of diplomatic relations have a negative impact on China-Japan tourism development (Kim, Prideaux, & Timothy, 2016).In terms of measures of inbound tourism development, Japan's marketing of tourist destinations (Funck, 2012), promotion of online tourism (Bandara & Silva, 2016), properly organized and managed tourism activities (Vafadari, 2013) have provided valuable development experience for countries around the world to improve their inbound tourism efficiency. From the literature mentioned above, scholars have made a comprehensive exploration of the influencing factors of Japan's inbound tourism and proposed various promoting measures. Due to the COVID-19, the inbound tourism of different countries suffered huge losses (SHT, 2020). Japan's labor market experienced dramatic fluctuations and the income of some people declined, which undoubtedly hindered the inbound tourism development (Kikuchi, Kitao, & Mikoshiba, 2020). Japan is a country with frequent occurrences of natural disasters, epidemics and natural disasters will bring double pressure on its inbound tourism (Patandianan & Shibusawa, 2020). Therefore, it is necessary to pay attention to the negative impact of epidemics and disasters on inbound tourism (Gössling, Scott, & Michael Hall, 2020), and explore scientific coping methods (Miwa et al., 2018).

2.3. *Trade facilitation and inbound tourism*

Many scholars consider that trade facilitation promoted the development of trade in goods in the first place, then further positively affected inbound tourism (Caesar, 2013; Delimatsis, Diebold, Molinuevo, Panizzon, & Sauvé, 2019) and proved that the result does exist in Turkey (Çalışkana et al., 2019), Thailand (Chaisumpunsakul & Pholphirul, 2018) and other countries. At the same time, the development of inbound tourism can also enhance the level of trade facilitation (Santana-Gallego, Ledesma-Rodríguez, & Pérez-Rodríguez, 2015). Trade facilitation can promote the development of inbound tourism through different channels, The World Bank (2005) found trade facilitation broke the blocked border, repaired post-war damaged infrastructure, and restored inbound tourism in the South Caucasus. In Gambia, inbound tourism benefited from improved business environment because of trade facilitation (The World Bank 2008). Wilks and Page (2003) found the hold of large-scale events under the background of trade facilitation could also effectively promote the development of inbound tourism. Within this literature, the beneficial influence of trade facilitation on inbound tourism has become the consensus of the academic circles. The efficiency of inbound tourism can better reflect the performance of inbound tourism market (Barišić & Cvetkoska, 2020), but there are few studies on the efficiency of inbound tourism in Japan (Comerio, Pacicco, & Serati, 2020). As a world-renowned tourism power, Japan has a high degree of openness to the world (Tuck Bank, 2006), the lifting effect of trade facilitation of different inbound tourist source countries (regions) on inbound tourism efficiency in Japan could not be ignored. As the tourism industry is extremely sensitive to emergencies (Demir, Gozgor, & Paramati, 2019), the COVID-19 has a profound impact on Japan's inbound tourism, exploring the impact of

public health emergencies on tourism will be the trend in the future.

3. The change characteristics of inbound tourists in Japan

According to the statistics data of "Number of foreign visitors to Japan" of The Japan National Tourism Organization (JNTO),[2] inbound tourist source countries (regions) of Japan are widely distributed in Asia, Europe, America and Oceania. Considering the completeness of the data, 12 countries and regions in Asia, 16 countries in Europe, and 6 countries in America and Oceania[3] (total of 34 countries and regions) were selected for analysis. The period of observation is from 2011 to 2019. The figure below shows the proportion (histogram) and growth rate (line chart) of tourists from various continents to Japan. The proportion of Asian tourists to Japan was above 70%, meaning Asian was the main source area for Japan's inbound tourists. The proportion of America and Oceania tourists to Japan ranged from 8% to 15% during the observation period, which was slightly higher than that of Europe. The proportion of Europe has always been below 10%. The growth rate of Asian tourists has been on the rise until 2015, the trend of decline in Europe, America and Oceania was obvious from 2012 to 2013, while the number of tourists in Europe, America and Oceania has rebounded in recent years.

From the Table 1, compared to January to August in 2019, the number of inbound tourists from different continents to Japan has witnessed a sharp decline in the same period this year due to the COVID-19. Although the total number of inbound tourists from Asia still exceeded that of other continents, the decline was as high as 82.82% and ranked first. The drop of inbound tourists from Europe was 81.41%, second only to Asia. Inbound tourists from America and Oceania experienced the least decline, but the decline also exceeded 70%. In summary, the COVID-19 has a huge impact on inbound tourism development in Japan, and the sharp decline in inbound tourists will seriously hinder the inbound tourism efficiency in Japan.

4. Model settings, variable descriptions and data sources

A stochastic frontier gravity model is used to explore the influence of trade facilitation in different countries (regions) on the efficiency of Japan's inbound tourism. The stochastic frontier gravity model is widely used in the measurement of bilateral trade efficiency. The model can clearly describe the loss of trade efficiency due to the existence of trade costs, which can make accurate estimation of trade efficiency (Xin, 2020; Yang & Chunjie, 2020). Inbound tourism is a part of international trade, so stochastic frontier gravity is suitable for the analysis of inbound tourism efficiency (Rui & Xuegang, 2018). Considering that the technical efficiency changes with time, and in order to accurately estimate the time-varying technical efficiency of each sample, the time-varying attenuation model is used. The model form is as follows:

$$y_{it} = f(x_{it,}\beta)exp(v_{it} - u_{it}) \tag{1}$$

In the above formula, y_{it} is the actual output of the observed individual i at t and is the number of inbound tourists in Japan in this study. x_{it} is the input vector, β is the vector of parameters to be estimated, and v_{it} is a random error that obeys the normal distribution with mean 0 and variance σ^2. u_{it} is a non-efficiency factor, generally assumed to be negative, and obeys a semi-normal, logarithmic, or truncated normal distribution. v_{it} and u_{it} are independent of each other. The frontier output is defined as the scale of output under the optimal production efficiency condition, that is, $u_{it} = 0$, the specific expression is as follows:

$$y_{it}^{*} = f(x_{it,}\beta)exp(v_{it}) \tag{2}$$

$$TE_{it} = \frac{y_{it}}{y_{it}^{*}} = exp(-u_{it}) \tag{3}$$

TE_{it} in the above formula is the technical efficiency, which is the ratio of actual output to frontier output. It is Japan's inbound tourism efficiency in this study. According to the assumption of the stochastic frontier gravity model, the number of inbound tourists in Japan is affected by the economic condition, population size of itself and its inbound tourist source countries (regions), and spatial distances between Japan and its inbound tourist source countries (regions). Theoretically, tourist destinations hope to maximize the number of inbound tourists at the lowest cost. Therefore, the stochastic front panel data model can be used to analyze the optimal frontier level of inbound tourism in Japan. The logarithmic expression is as follows:

$$lnTE_{ijt} = lnf(x_{ijt}, \beta) + v_{ijt} - u_{ijt}, u_{ijt} \geq 0 \tag{4}$$

T_{ijt} is the number of inbound tourist arrivals from j countries or regions at time t in the above formula, x_{ijt} are core explanatory variables, v_{it} is random error, u_{ijt} is trade inefficiency term, and trade efficiency is estimated value of technical efficiency. Following the basic principles of the stochastic frontier gravity model, the following econometric model to measure the influence of trade facilitation on the number of inbound tourists to Japan is set, all variables are logarithmic:

$$\begin{aligned} lntourist_{ijt}(lnvistor_{ijt}, lnbusiness_{ijt}, lnothers_{ijt}) &= \alpha_0 + \beta_1 lnperGDP1_{it} + \beta_2 lnperGDP2_{jt} \\ &+ \beta_3 lnpop1_{it} + \beta_4 lnpop2_{jt} + \beta_5 lndis_{ij} + \beta_6 sea_{ij} + \beta_7 lnTFI_{jt} + \varepsilon_{ij} \end{aligned} \tag{5}$$

In the above formula, "tourist" is the total number of inbound tourists to Japan, and the variables of *vistor*, *business*, and *others* represent the number of sightseeing tourists, business tourists, and tourists of other types visiting Japan from different inbound tourist source countries (regions). The research objects are from 34 countries (regions) in Asia, Europe, America and Oceania. The data comes from the "Number

Table 1
Change of inbound tourists from different continents to Japan because of COVID-19.

	January to August in 2019	January to August in 2020	Growth rate (%)
Number of inbound tourists from Asia	18,603,283	3,195,690	−82.82%
Number of inbound tourists from Europe	892,576	165,880	−81.41%
Number of inbound tourists from America and Oceania	1,824,254	420,350	−76.95%

[2] The data is from https://www.jnto.go.jp/jpn/statistics/visitor_trends/index.html.

[3] The countries and regions in Asia are South Korea, Taiwan, Hong Kong, Thailand, Singapore, Malaysia, Indonesia, Philippines, Vietnam, India, Israel. The European countries are the United Kingdom, France, Germany, Italy, Russia, Spain, Sweden, the Netherlands, Switzerland, Belgium, Finland, Denmark, Norway, Austria, Portugal, and Ireland. The countries in America and Oceania are the United States, Canada, Mexico, Brazil, Australia, and New Zealand.

of Visitors to Japan" of the official website of the JNTO, the period of observation is from 2011 to 2019. In general, if there are relatively more inbound tourists in a tourism destination after controlling factors such as economy, geography, and population, it means that the tourism products and services of the destination are more attractive to inbound tourists and the inbound tourism efficiency is relative high.

The variables *perGDP1* and *perGDP2* are the per capita GDP of Japan and its inbound tourist source countries (regions) respectively. The variables *perpop1* and *perpop2* are the total population of Japan and its inbound tourist source countries (regions).The data comes from the DataBank of the World Bank.[4] The variable *dis* is the spatial distances between Japan and its inbound tourist source countries (regions). The data comes from the CEPII database.[5] The variable *sea* represents whether the countries (regions) are near the sea, the value is 0 if they are landlocked countries (regions). Otherwise, the value is 1.

The variable *TFI* is the level of trade facilitation of different inbound tourist source countries (regions), which is the core explanatory variable. With reference to the practices of Wilson et al. (2003); Wilson, Mann, and Otsuki (2005), this paper selects corresponding indicators of infrastructure, government efficiency, customs environment, and technological level to build an indicator system to measure the level of trade facilitation. The data comes from the "Global Competitiveness Report" which could be downloaded in the website of The World Economic Forum. The specific indicators of trade facilitation are shown in the Table 2.

The score interval of each indicator is in the range of 1–7. The scores of each indicator are summed up, and the arithmetic average of the total score is used to obtain the level of trade facilitation of different inbound tourist source countries (regions). A higher score indicates a higher level of trade facilitation in that country or region.

The inbound tourism efficiency of different inbound tourist source countries (regions) in Japan can be deduced based on the formula (5). The following econometric model is set to further explore the influence of the trade facilitation of each inbound tourist source country (region) on the inbound tourism efficiency in Japan:

$$lnTE1_{ijt}, lnTE2_{ijt}, lnTE3_{ijt} = \alpha_0 + \beta_1 lnincome_{it} + \beta_2 lntrans_{it} + \beta_3 lnair_{jt} + \beta_4 lndemand_{jt} + \beta_5 OECD_{jt} + \beta_6 lnexemption_{jt} + \beta_7 distar_{it} + \beta_8 COVID_{it} + \beta_9 lnTFI_{jt} + D_t + D_c + \varepsilon_{ij} \quad (6)$$

Table 2
The indicator system of trade facilitation (TFI).

First-level indicators	Second-level indicators	The interval of score
Infrastructure	Quality of roads	1–7
	Quality of railroad infrastructure	1–7
	Quality of port infrastructure	1–7
	Quality of air transport infrastructure	1–7
Government efficiency	Efficiency of government spending	1–7
	Burden of government regulation	1–7
	Transparency of government policymaking	1–7
	Reliability of police services	1–7
Customs environment	Efficiency of customs procedures	1–7
Technological level	Availability of latest technologies	1–7

[4] https://data.worldbank.org.cn/country.
[5] http://www.cepii.fr/CEPII/en/bdd_modele/bdd.asp.

TE1, *TE2*, and *TE3* are the inbound tourism efficiency of sightseeing, business and other types markets in Japan in the above formula. The variable *income* is international tourism income of Japan, which can better measure tourism industry supply capacity in tourism destination country. The higher the international tourism income of a tourism destination, the more attractive the place is to inbound tourists. International tourism income generated by inbound tourism activities can support the construction of tourism projects and perfect services in tourism destinations, and promote the supply capacity of tourism industry in one place. The variable *trans* is air transport passenger volume of Japan. As an island country, Japan's air transport plays an important role in international tourism. Therefore, air transport passenger volume is used to measure the accessibility of transportation of inbound tourism in Japan. The data of the above two variables is from the World Bank's DataBank. The variable *air* is the available airline seat (km/week, millions) of each inbound tourist source country (region) which measures the travel convenience of tourists from different countries and regions. The variable *demand* is the salary level and work efficiency of tourists in each inbound tourist source country (region), and represents the tourists' ability to pay for and their willingness to outbound travel,[6] which is an effective indicator reflecting tourists' outbound tourism demand. The value of this variable ranges from 1 to 7, the higher the value, the greater the outbound tourism demands for tourists. Variable *TFI* is the level of trade facilitation of different inbound tourist source countries (regions). The data of the *air*, *demand*, *TFI* are from the "Global Competitiveness Report".

In the dummy variable, *OECD* represents whether or not each inbound tourist source country belongs to an *OECD* (Economic Cooperation Development Organization) country, *OECD* member states have reached a binding relevant treaty to promote the development of international trade in the framework of the organization, which promotes international tourism exchanges among member states. Among the different inbound tourist source countries in Japan, the value of countries belonging to *OECD* is 1 and the value of the rest is 0. The variable *exemption* represents whether or not Japan has implemented a visa-free policy for an inbound tourist source country (region). The value of inbound tourist source countries (regions) which benefited visa-free policy of Japan is 1, otherwise is 0. The variable *disaster* represents natural disasters in Japan. Natural disasters, as external factors of force majeure, have a great impact on inbound tourism. Japan has experienced many natural disasters in recent years, the effect of natural disasters on inbound tourism cannot be ignored. Three representative earthquakes, the 311 Japan earthquake in 2011, the Sanriku earthquake in 2012, and the Fukushima prefecture earthquake in 2016, are selected to measure the impact of natural disasters on the efficiency of inbound tourism in Japan. The COVID-19 that broke out in 2019 has caused huge losses to international tourism industry, which will undoubtedly have a big impact on the efficiency of inbound tourism in Japan. The value of *COVID* is 1 in 2019 or is 0 in other years. The variables D_t and D_c represent the time effect and the country and region effects. The two variables can solve the problems of missing variables and multilateral resistance to trade. Except for dummy variables and D_t and D_c , the other

[6] A high work efficiency of one person means more leisure time for outbound travel activities, and the subjective willingness of outbound travel will increase accordingly.

Table 3
Results of the influence of trade facilitation on the number of inbound tourists in Japan.

	Overall		Sightseeing		Business		Other types	
	Time-invariant	Time-varying	Time-invariant	Time-varying	Time-invariant	Time-varying	Time-invariant	Time-varying
lnperGDP1	1.135***	1.191***	1.643***	0.695***	0.491***	3.466***	0.025	0.055
	(0.120)	(0.117)	(0.143)	(0.186)	(0.078)	(0.911)	(0.115)	(0.124)
lnperGDP2	0.695***	0.576***	0.867***	1.009***	0.406***	0.265***	0.405***	0.258**
	(0.085)	(0.094)	(0.113)	(0.116)	(0.065)	(0.060)	(0.082)	(0.099)
lnpop1	−94.234***	−24.041***	−16.102***	−4.815***	−13.872***	−0.131	−52.971***	−43.504***
	(3.431)	(7.818)	(4.188)	(1.741)	(2.338)	(0.089)	(3.361)	(8.057)
lnpop2	0.711***	0.602***	0.693***	0.795***	0.621***	0.753***	0.790***	0.720***
	(0.120)	(0.145)	(0.109)	(0.103)	(0.073)	(0.047)	(0.057)	(0.042)
lndis	−2.387***	−4.323***	−2.407***	−2.682***	−1.401***	−1.393***	−2.014***	−1.937***
	(0.239)	(0.300)	(0.285)	(0.270)	(0.175)	(0.107)	(0.067)	(0.235)
sea	0.770	0.447	0.823	0.955	0.377	0.381	0.501**	0.612
	(0.740)	(0.863)	(0.646)	(0.587)	(0.400)	(0.251)	(0.193)	(0.538)
lnTFI	0.341**	0.861***	2.766***	2.943***	1.153***	0.486***	3.988***	2.811***
	(0.155)	(0.281)	(0.346)	(0.295)	(0.218)	(0.185)	(0.899)	(0.360)
Constant	84.090*	25.057***	96.177***	25.293***	70.551	87.799***	96.663***	22.745***
	(63.439)	(6.674)	(8.275)	(7.848)	(43.964)	(8.460)	(2.831)	(8.914)
σ^2	0.854	2.367	0.778	0.702	0.295	0.418	1.654	0.521
γ	0.961	0.986	0.940	0.949	0.952	0.977	0.981	0.943
μ		3.674		30.357		2.897		1.217
η		−0.012		0.013		0.033		0.013
Log likelihood	5.784	−10.766	−45.219	−11.336	131.531	175.816	24.026	21.127
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	306	306	306	306	306	306	306	306

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

variables are logarithmic.

5. Empirical results and discussion

5.1. The influence of trade facilitation on the number of inbound tourists in Japan

Based on the relevant data from 2011 to 2019, the time-invariant and time-varying stochastic frontier gravity models are used to measure the influence of trade facilitation on the total number of inbound tourists of sightseeing, business and other types in Japan. The Table 3 shows the results. Both the models have similar estimated results, which confirm the robustness of the models. The estimated results of inbound tourism markets of different types in Japan are very similar. The estimated coefficients of per capita GDP of Japan and its inbound tourist source countries (regions) are significantly positive, indicating that the growth of per capita GDP of Japan and its inbound tourist source countries (regions) can promote growth in inbound tourism markets. From the perspective of tourism industry supply, the growth in per capita GDP of tourism destination means the increase in economy, which has laid a solid economic foundation for inbound tourism development in Japan and can improve the industrial supply capacity. From the perspective of demand, the growth in per capita GDP of inbound tourist source countries (regions) indicates the increase in the per capita wealth of their residents, which has stimulated the residents' potential demand in outbound tourism consumption. As a well-known tourism power, Japan is often the first choice for global tourists.

The estimated coefficients of the population size of Japan and its inbound tourist source countries (regions) are opposite. Japan's estimated coefficients are significantly negative, indicating that the growth of the population size of Japan has restrained growth of its inbound tourists, the reasons can be attributed to the following: First, Japan has a small land area and limited tourism resources. Under the dual pressure of domestic and inbound tourism, the carrying capacity of the tourism industry is challenged and it cannot meet the increasing demand in inbound tourism. Second, Japan is currently facing problems such as low birth rates and aging population. The average number of births per woman in Japan was only 1.42, and the percentage of males and females surviving to 65 years old was about 89% and 94% respectively in 2018,[7] which could not provide sufficient human capital for inbound tourism development. However, the expansion of the population size of Japan's tourist source countries (regions) has provided a potential market for inbound tourism in Japan, which could increase the number of inbound tourists to Japan. The estimated coefficient of the variable *lndis* is significantly negative, indicating that a longer spatial distance reduces the travel demand to Japan of inbound tourists. Long-distance travel increases uncertainties during the journey and weakens inbound tourists' willingness to travel. And a longer spatial distance means higher travel costs. The estimated coefficient of the trade facilitation is significantly positive, this shows the improvement of trade facilitation has deepened cooperation between Japan and its inbound tourist source countries (regions) in tourism industry, the improvement of transportation facilities, the increase in government efficiency, the simplicity of customs clearance procedures and the popularization of sophisticated technologies under the background of trade facilitation create great convenience for residents to travel abroad.

5.2. The influence of trade facilitation on inbound tourism efficiency in Japan

The fixed-effect regression is used to measure the influence of trade facilitation on inbound tourism efficiency in Japan. According to the Table 4, the results in markets of different types are similar, the trade facilitation had a significant promotion effect on efficiency of the inbound tourism, and the promoting effect on the inbound business tourism market is most obvious. Inbound tourist countries and regions with higher levels of trade facilitation can offer better tourism transportation networks, high-quality tourism business environments, low costs of tourism customs clearance, sophisticated science and technology, and higher disposable income. These factors have stimulated local residents' willingness to travel abroad, increased their marginal propensity for outbound tourism consumption, reduced residents' cross-

[7] Data is from the DataBank of World Bank.

Table 4
The results of benchmark regression (overall).

	TE1	*TE2*	*TE3*	*TE1*	*TE2*	*TE3*
lnincome	1.984***	0.435***	0.084*	1.984***	0.436***	0.084*
	(0.058)	(0.116)	(0.047)	(0.060)	(0.118)	(0.047)
lntrans	0.976***	0.319	0.011	0.962***	0.297	0.006
	(0.217)	(0.433)	(0.175)	(0.223)	(0.440)	(0.175)
lnair	0.062**	0.257***	0.013	0.075***	0.276***	0.017
	(0.024)	(0.048)	(0.019)	(0.024)	(0.049)	(0.019)
lndemand	0.060*	−0.109	0.050*	0.081**	−0.077	0.056*
	(0.035)	(0.069)	(0.028)	(0.035)	(0.070)	(0.027)
OECD	0.556***	0.505***	0.485***	0.514***	0.569***	0.498***
	(0.021)	(0.043)	(0.017)	(0.019)	(0.037)	(0.015)
exemption	2.057***	0.427***	0.821***	2.070***	0.446***	0.817***
	(0.030)	(0.060)	(0.024)	(0.030)	(0.060)	(0.024)
disaster	−0.171***	−0.021	−0.007	−0.173***	−0.025	−0.008
	(0.007)	(0.015)	(0.006)	(0.008)	(0.015)	(0.006)
COVID	−0.414***	−0.086***	−0.016***	−0.413***	−0.085***	−0.016***
	(0.007)	(0.015)	(0.006)	(0.007)	(0.015)	(0.006)
lnTFI	0.234***	0.358***	0.072**			
	(0.060)	(0.121)	(0.038)			
Constant	−99.170***	−22.405***	−2.673	−98.728***	−21.730***	−2.537
	(2.638)	(5.257)	(2.124)	(2.705)	(5.329)	(2.127)
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
R^2	0.993	0.960	0.806	0.993	0.959	0.804
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	306	306	306	306	306	306

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

border travel costs, strengthened tourists' ability to use international tourism information, and ultimately expanded scale of cross-border tourism in tourist source countries (regions), which has a direct role in promoting the efficiency of inbound tourism in Japan. The estimated coefficients of the variable *lnincome* in the inbound tourism markets of three types are all significantly positive, indicating that the increase in international tourism income of Japan has provided financial guarantee for inbound tourism development. Sufficient funds can help Japan to optimize the structure of tourism products and services, improve the construction of tourism industry infrastructure, and strengthen overseas marketing and publicity, which will greatly benefit the improvement in efficiency of inbound tourism. The estimated coefficients of *lntrans* and *lnair* are significantly positive, indicating that air transportation has played an important role in inbound tourism development in Japan. The willingness and ability of inbound tourists has a significant positive impact on the efficiency of inbound tourism in Japan. With regard to the dummy variable, inbound tourists from OECD countries and the visa-free policy improved the efficiency of inbound tourism in Japan, but the negative impact of natural disasters and COVID-19 on the efficiency of inbound tourism is obvious. The regression without *TFI* is also conducted and it is found that the estimated coefficients of *disaster* has decreased, indicating that trade facilitation partially alleviated the negative impact of natural disasters. The estimated coefficients of *lntrans* have risen, indicating that the improvement of trade facilitation

Table 5
The results of benchmark regression (Asian).

	TE1	*TE2*	*TE3*	*TE1*	*TE2*	*TE3*
lnincome	1.949***	0.383**	0.083	1.952***	0.383**	0.084
	(0.124)	(0.169)	(0.057)	(0.129)	(0.168)	(0.057)
lntrans	1.044**	0.065	0.236	0.946*	0.068	0.211
	(0.464)	(0.629)	(0.211)	(0.480)	(0.623)	(0.212)
lnair	0.093	0.598***	0.104***	0.176***	0.596***	0.084***
	(0.059)	(0.080)	(0.027)	(0.053)	(0.069)	(0.023)
lndemand	0.053	0.590***	0.172***	0.201**	0.585***	0.209***
	(0.100)	(0.136)	(0.046)	(0.088)	(0.115)	(0.039)
OECD	3.154***	0.091*	1.048***	3.072***	0.088***	1.028***
	(0.035)	(0.048)	(0.016)	(0.021)	(0.027)	(0.009)
exemption	3.298***	2.409***	0.726***	3.392***	2.406***	0.750***
	(0.096)	(0.131)	(0.044)	(0.093)	(0.121)	(0.041)
disaster	−0.164***	−0.020	−0.006	−0.168***	−0.020	−0.008
	(0.016)	(0.022)	(0.007)	(0.017)	(0.022)	(0.007)
COVID	−0.411***	−0.071***	−0.025***	−0.408***	−0.071***	−0.024***
	(0.016)	(0.022)	(0.007)	(0.017)	(0.022)	(0.007)
lnTFI	0.456***	0.224***	0.113*			
	(0.165)	(0.013)	(0.065)			
Constant	−101.374***	−21.669***	−7.670***	−99.975***	−21.711***	−7.322***
	(5.627)	(7.630)	(2.570)	(5.815)	(7.555)	(2.578)
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
R^2	0.995	0.976	0.923	0.989	0.976	0.921
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	108	108	108	108	108	108

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

Table 6
The results of benchmark regression (Europe).

	TE1	*TE2*	*TE3*	*TE1*	*TE2*	*TE3*
lnincome	2.017***	0.461***	0.105**	2.010***	0.439***	0.097**
	(0.053)	(0.106)	(0.045)	(0.057)	(0.122)	(0.048)
lntrans	0.883***	0.168	−0.182	0.932***	0.320	−0.132
	(0.201)	(0.398)	(0.168)	(0.213)	(0.455)	(0.182)
lnair	0.048	0.181***	0.064**	0.014	0.076	0.030
	(0.032)	(0.063)	(0.027)	(0.033)	(0.070)	(0.028)
lndemand	0.132***	0.091	0.188***	0.150***	0.147	0.206***
	(0.042)	(0.084)	(0.035)	(0.045)	(0.096)	(0.038)
OECD	1.113***	1.267***	0.994***	1.120***	1.289***	1.001***
	(0.063)	(0.124)	(0.052)	(0.066)	(0.142)	(0.057)
exemption	0.292***	1.127***	0.425***	0.364***	0.201	0.496***
	(0.069)	(0.120)	(0.058)	(0.071)	(0.152)	(0.061)
disaster	−0.181***	−0.034**	−0.016**	−0.182***	−0.037**	−0.017**
	(0.007)	(0.015)	(0.006)	(0.008)	(0.017)	(0.006)
COVID	−0.418***	−0.088***	−0.015***	−0.418***	−0.090***	−0.016**
	(0.007)	(0.014)	(0.005)	(0.007)	(0.016)	(0.006)
lnTFI	0.235***	0.724***	0.233***			
	(0.059)	(0.117)	(0.049)			
Constant	−98.696***	−20.894***	−2.173	−98.881***	−21.466***	−2.358
	(2.448)	(4.830)	(2.046)	(2.596)	(5.539)	(2.222)
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
R^2	0.998	0.983	0.917	0.997	0.978	0.901
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	144	144	144	144	144	144

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

stimulated the development of Japan's air transport and promoted the inbound tourism development. Trade facilitation had the greatest effect on inbound tourism efficiency of business market.

The Table 5 shows the estimated results in the Asian market. The increase in international tourism income in Japan, OECD countries, and visa-free policies played the most significant role in promoting the inbound tourism efficiency of sightseeing market. The improvement of inbound tourism efficiency of business market was more dependent on air transportation capacity and tourist demand in inbound tourist source countries (regions). When *TFI* is added, the effect of Japan's air transportation capacity in promoting the inbound tourism efficiency has increased significantly. The promoting effect of trade facilitation on inbound tourism efficiency of sightseeing market was most significant.

According to the Table 6, the estimated results of various variables in the European inbound tourism market are very similar to those in Asia. Japan's international tourism income had the greatest influence on the inbound tourism efficiency of sightseeing market, and OECD countries had a more significant effect on the inbound tourism efficiency of business and other types markets. When *TFI* is added, the negative impact of natural disasters has weakened. The estimated coefficient of *TFI* in inbound business tourism market is biggest.

According to the Table 7, in America and Oceania, the estimated coefficients of *lnincome, lntrans, lnair* are only significantly positive in inbound sightseeing tourism market. The estimated coefficients of

Table 7
The results of benchmark regression (America and Oceania).

	TE1	*TE2*	*TE3*	*TE1*	*TE2*	*TE3*
lnincome	1.914***	0.336	0.021	1.912***	0.284	0.006
	(0.090)	(0.356)	(0.138)	(0.089)	(0.378)	(0.142)
lntrans	1.276***	1.092	0.204	1.281***	1.347	0.278
	(0.336)	(1.328)	(0.517)	(0.331)	(1.410)	(0.532)
lnair	0.087**	−0.127	−0.006	0.086**	−0.073	0.008
	(0.038)	(0.151)	(0.058)	(0.037)	(0.159)	(0.060)
lndemand	0.210***	0.728***	0.242***	0.215***	0.953***	0.307***
	(0.055)	(0.220)	(0.085)	(0.050)	(0.213)	(0.080)
OECD	1.500***	2.725***	1.627***	1.490***	2.280***	1.498***
	(0.048)	(0.189)	(0.073)	(0.014)	(0.062)	(0.023)
exemption	0.173***	0.888***	0.457***	0.172***	0.749**	0.155***
	(0.014)	(0.319)	(0.124)	(0.014)	(0.335)	(0.023)
disaster	−0.166***	−0.037	−0.005	−0.165***	−0.009	0.003
	(0.012)	(0.049)	(0.019)	(0.011)	(0.050)	(0.019)
COVID	−0.412***	−0.094**	0.010	−0.412***	−0.097**	0.011
	(0.011)	(0.046)	(0.018)	(0.011)	(0.049)	(0.018)
lnTFI	0.100***	0.979**	0.284*			
	(0.021)	(0.397)	(0.154)			
Constant	10.969*	−29.873*	−5.559	−101.074***	−34.589**	−6.926
	(4.087)	(16.115)	(6.281)	(4.007)	(17.037)	(6.428)
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
R^2	0.998	0.948	0.665	0.998	0.939	0.634
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	54	54	54	54	54	54

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

Table 8
Influence of sub-indicators of trade facilitation on inbound tourism efficiency in Japan.

	TE				*TE1*			
lnInfrastructure	0.084				0.224***			
	(0.057)				(0.040)			
lnGovernment efficiency		0.195***				0.021		
		(0.055)				(0.042)		
lnCustoms environment			0.024				0.189	
			(0.061)				(0.043)	
lnTechnological level				0.106*				0.133***
				(0.058)				(0.043)
Other control variables	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
R^2	0.894	0.898	0.893	0.894	0.994	0.993	0.994	0.993
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	306	306	306	306	306	306	306	306

	TE2				*TE3*			
lnInfrastructure	0.686***				0.179***			
	(0.073)				(0.031)			
lnGovernment efficiency		0.289***				0.093***		
		(0.081)				(0.032)		
lnCustoms environment			0.242***				0.007	
			(0.088)				(0.035)	
lnTechnological level				0.112				0.027
				(0.086)				(0.034)
Other control variables	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	ontrolled	ontrolled	Controlled	Controlled	Controlled	Controlled	Controlled
R^2	0.969	0.961	0.960	0.959	0.825	0.810	0.804	0.804
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	306	306	306	306	306	306	306	306

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

lndemand, OECD, exemption are significantly positive in inbound tourism market of all types. When *TFI* is added, the estimated coefficients of *lnincome* and *exemption* both increase, indicating that trade facilitation can improve the inbound tourism efficiency by pushing forward the growth of Japan's international tourism income and visa-free policy. Similar to Europe, the positive effect of trade facilitation on inbound tourism efficiency of business market was most obvious.

5.3. Further discussion

Further discuss the influence of sub-indicators of trade facilitation of inbound tourist source countries (regions) on the inbound tourism efficiency in Japan. As can be kwon from the Table 8, the increase in government efficiency and technological level promoted the inbound tourism efficiency. The positive effect of government efficiency was stronger than that of technological level. High government efficiency is conducive to shaping a good business environment for tourism industry and building a healthy tourism market order (Jenkins, 2020). Efficient administrative agencies can provide tourists with good public services and improve their satisfaction. With the progress of the times, the role of technology in promoting the inbound tourism development also cannot be ignored (Ivanov, 2020). The improvement of infrastructure promoted

Table 9
Endogenous test results.

	Variable name	*lnTFI* The first stage	*lnTE* The second stage	*lnTE1* The second stage	*lnTE2* The second stage	*lnTE3* The second stage
Overall	*lnTFI*	—	0.415***	3.397***	1.926*	0.164***
		—	(0.069)	(1.297)	(1.163)	(0.039)
	lnequator	0.041**	—	—	—	—
		(0.017)	—	—	—	—
	Other control variables	Controlled	Controlled	Controlled	Controlled	Controlled
Asia	*lnTFI*	—	1.248***	0.057**	0.126***	0.031***
		—	(0.124)	(0.027)	(0.032)	(0.003)
	lnequator	0.051***	—	—	—	—
		(0.011)	—	—	—	—
	Other control variables	Controlled	Controlled	Controlled	Controlled	Controlled
Europe	*lnTFI*	—	0.025***	0.500***	0.227***	0.342***
		—	(0.006)	(0.045)	(0.031)	(0.111)
	lnequator	0.145***	—	—	—	—
		(0.047)	—	—	—	—
	Other control variables	Controlled	Controlled	Controlled	Controlled	Controlled
America and Oceania	*lnTFI*	—	6.945***	4.448***	7.944***	7.617***
		—	(0.493)	(0.329)	(0.562)	(0.465)
	lnequator	0.346***	—	—	—	—
		(0.026)	—	—	—	—
	Other control variables	Controlled	Controlled	Controlled	Controlled	Controlled

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

Table 10
Robustness test results.

	Overall			Asia		
	TE1	*TE2*	*TE3*	*TE1*	*TE2*	*TE3*
lnincome	1.953***	0.413***	0.055***	1.954***	0.297***	0.134***
	(0.047)	(0.043)	(0.016)	(0.081)	(0.059)	(0.019)
lntrans	1.105***	0 0.427**	0.062	1.124***	0.432*	0.145
	(0.197)	(0.179)	(0.072)	(0.338)	(0.249)	(0.088)
lnair	0.186***	0.238***	0.063***	0.121	0.552***	0.164***
	(0.046)	(0.043)	(0.004)	(0.103)	(0.076)	(0.006)
lndemand	0.119	−0.097	0.066**	0.039	0.548***	0.134***
	(0.074)	(0.067)	(0.026)	(0.176)	(0.130)	(0.039)
OECD	0.883***	0.031	0.112	1.859***	0.235	0.874***
	(0.288)	(0.262)	(0.263)	(0.462)	(0.575)	(0.244)
exemption	1.796***	1.062***	0.181	1.890***	1.390***	0.053***
	(0.348)	(0.316)	(0.357)	(0.370)	(0.457)	(0.016)
disaster	−0.155***	−0.029**	−0.007	−0.151***	−0.029*	−0.009
	(0.014)	(0.013)	(0.005)	(0.024)	(0.018)	(0.006)
COVID	−0.437***	−0.089***	−0.016***	−0.432***	−0.076***	−0.027***
	(0.014)	(0.013)	(0.005)	(0.025)	(0.018)	(0.006)
lnTFI	0.333**	0.423***	0.688***	0.679**	0.210***	0.137***
	(0.128)	(0.118)	(0.047)	(0.277)	(0.053)	(0.042)
Constant	−102.380***	−24.328***	−4.746***	−102.793***	−24.829***	−6.504***
	(2.671)	(2.429)	(1.004)	(4.606)	(3.408)	(1.198)
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Log likelihood	273.791	302.922	545.168	96.489	123.089	225.063
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	306	306	306	108	108	108

	Europe			America and Oceania		
	TE1	*TE2*	*TE3*	*TE1*	*TE2*	*TE3*
lnincome	1.948***	0.379***	0.008	2.012***	0.588***	0.092**
	(0.067)	(0.040)	(0.016)	(0.105)	(0.120)	(0.045)
lntrans	1.138***	0.464***	0.104	1.013**	0.145	−0.061
	(0.271)	(0.164)	(0.072)	(0.455)	(0.515)	(0.193)
lnair	0.271***	0.199***	0.177***	0.013	0.002	0.022
	(0.078)	(0.053)	(0.003)	(0.090)	(0.131)	(0.048)
lndemand	0.084	0.094	0.126***	−0.163	0.636***	0.214***
	(0.123)	(0.076)	(0.028)	(0.173)	(0.196)	(0.073)
OECD	0.660*	0.395	0.104	1.196***	2.223**	1.643***
	(0.355)	(0.305)	(0.117)	(0.428)	(1.051)	(0.188)
exemption	0.466***	0.402***	0.463***	0.245	0.948***	0.822***
	(0.083)	(0.071)	(0.081)	(0.319)	(0.283)	(0.240)
disaster	−0.156***	−0.037***	−0.009*	−0.146***	−0.017	0.001
	(0.020)	(0.012)	(0.005)	(0.033)	(0.038)	(0.014)
COVID	−0.440***	−0.094***	−0.017***	−0.431***	−0.091**	0.009
	(0.020)	(0.012)	(0.005)	(0.034)	(0.038)	(0.014)
lnTFI	0.420**	0.749***	0.291***	0.369***	0.783**	0.236*
	(0.187)	(0.114)	(0.042)	(0.112)	(0.358)	(0.133)
Constant	−103.417***	−24.016***	−5.540***	−99.713***	−19.804***	−2.755
	(3.675)	(2.232)	(0.980)	(6.154)	(7.031)	(2.612)
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Country(region) effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Log likelihood	141.063	207.912	309.267	53.041	41.378	89.331
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	144	144	144	54	54	54

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

the inbound tourism efficiency in sightseeing, business, and other types' tourism market. The estimated coefficient of *lnInfrastructure* is highest in business tourism market, which is 0.686. Infrastructure is very important for developing outbound tourism in tourist source countries (regions) and has direct influence on inbound tourism development in tourism destinations. Only when tourist source countries (regions) have high-quality of roads, railroads, ports and air infrastructure, can they effectively transport tourists to the tourism destination country-Japan, and make the number of inbound tourists of Japan grow rapidly in a short time. The estimated result of *lnCustoms environment* is only significant in business tourism market, indicating that a good customs environment have simplified the procedures for outbound business tourists, reduced the time and cost of customs clearance. In general, the estimated coefficients of *lnInfrastructure*, *lnGovernment efficiency*, *lnCustoms environment* in business tourism market are higher than those of other markets, reveal the importance of trade facilitation to inbound business tourism market in Japan.

5.4. Endogenous and robustness test

The variable of trade facilitation may be endogenous, to overcome endogenous problems, the distances of different inbound tourist source countries (regions) from the equator (represented by *equator*, logarithmic) are used as instrumental variables for trade facilitation. Because if a country (region) is farther away from the equator, the country (region) is more affected by the western developed countries and its degree of

trade facilitation is higher. The two-stage least squares method (2SLS) is used to conduct the endogenous test. The results in the Table 9 shows that estimated coefficients of *lnequator* and *lnTFI* are both significantly positive, indicating that *lnequator* is a suitable instrument variable for trade facilitation.

The robustness test is conducted by changing the econometrics method. Considering that the value of inbound tourism efficiency ranges from 0 to 1, which is a restricted dependent variable, the panel Tobit method is used to perform the robustness test. The test results are as follows:

It can be seen from the Table 10, after the panel Tobit method is adopted, the estimated coefficients of trade facilitation are all significantly positive. The influence of trade facilitation on inbound tourism markets of different types and continents is similar to the estimated results of benchmark regression. The estimated results of other variables are also very similar, further indicating that the estimated results are robust and reliable.

6. Concluding remarks

This study analyzes the change characteristics of inbound tourists in Japan, which has formed a comprehensive understanding of the changes in the number and growth rate of sightseeing, business and other types inbound tourists from different continents. And also discuss the impact of COVID-19 on Japan's inbound tourism. Empirical results show that trade facilitation has improved the efficiency of inbound tourism market in Japan comprehensively. The research conclusions have important implications for countries around the world to take advantage of trade facilitation opportunities to develop inbound tourism and some suggestions are provided: ①The basic spirit of trade facilitation "simplify and coordinate trade procedures and accelerate the cross-border circulation of production factor" should be uphold and opening up in the tourism industry should be persisted. ②The plan of "Visit Japan Campaign" deserves to be imitated and other countries should focus on the construction of tourism transportation infrastructure.③Tourism destination countries(regions) should pay attention to emerging markets to tap potential tourism demand and expand the target market of tourism visa exemption policy. ④Tourism destination countries(regions) should strengthen early warning of natural disasters and public health emergency to ensure the personal safety and health of inbound tourists. This article could be improved in the following aspects. Firstly, improving the quantification of trade facilitation to make its measurement more accurate; secondly, discussing the influencing mechanism of trade facilitation on the inbound tourism efficiency; thirdly, exploring the influence of trade facilitation on the potential of inbound tourism efficiency, and continuously improve the existing research system.

Declaration of competing interest

No conflict of interest exits in the submission of this manuscript, and manuscript is approved by all authors for publication.

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