



Chinese tourists in Taiwan: Crowding out effects, opening policy and its implications

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ABSTRACT

In July 2008, Taiwan passed a legislation allowing Chinese tourists to travel into Taiwan. We are interested in crowding-out effects which may have a negative impact on Taiwan's tourism. However, lack of data compels us to employ monthly tourist arrivals from China to Japan as a reference for impacts of opening policies. We project that Chinese tourists into Taiwan due to the opening policy for individual tourists would increase substantially. We also analyze tourist arrivals from Japan, Hong Kong, and the United States to explore the crowding-out effect. Using seasonal ARIMA models with joint estimation of intervention and outlier effects, we find that Chinese tourists significantly crowd out Taiwan's international tourists from Japan and the United States, but not those from Hong Kong, even with Taiwan's increased tourism capacity. Therefore, our results indicate that Taiwan should either further enhance tourism capacity or decelerate its opening policy to avoid severe crowding-out effects.

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1. Introduction

As the economy improves, people put more emphasis on the quality of life; especially people in developed countries. Therefore, tourism becomes a growing economic activity. According to the World Tourism Organization, there were 629 million international tourists worldwide in 1997, and the number increased to 1027 million in 2008 with an average 5% annual growth rate. In addition, compared with heavy industry or the manufacturing industry, which consumes energy, emits carbon dioxide, and pollute air and water during the production process, the tourism industry is relatively eco-friendly and achieves more sustainable development.

China, with a large population and tremendous potential as an economic power, has become one of the main sources of international tourism over the last decade. According to the World Tourism Organization, the number of Chinese outbound tourists steeply increased from 5 million in 1997 to 46 million in 2008 with a 68% annual growth rate; 13 times more than the average growth rate of all other countries.

In July 2008, Taiwan authorities passed a legislation allowing Chinese tourists to travel into Taiwan. This controversial policy stirred up public opinion and ignited intense debates over its economic and political impacts. Even though this policy still restricts inbound tourists from China to 4000 people per day in 2011, and further restricts inbound tourism from China to only tour groups, the policy has already increased the number of Chinese tourists and generated tremendous amounts of revenue for Taiwan. According to the statistics from the Tourism Bureau of

Taiwan, monthly Chinese tourist arrivals into Taiwan were 44,000 in January 2009. This number steeply increased to 101,000 in January 2011. When the Taiwan government further allows Chinese individual tourists travel into Taiwan, this number would be much higher.

Compared with China, a large country with a population of 1.3 billion, Taiwan is just a small island with relatively limited tourism capacity. Increasing Chinese tourist arrivals is beneficial for both the tourism industry and the economy, but too many Chinese tourists may have unexpected negative impacts on Taiwan's overall tourism industry. More specifically, this huge increase of Chinese tourists may cause hotels and restaurants to be over-booked and may lower the quality of Taiwan's international tourism. Moreover, if Chinese tourists exceed Taiwan's tourism capacity and supporting facilities cannot be constructed in time, this excess demand may crowd out Taiwan's current diverse international tourists, or cause a disorder of tourism in Taiwan. Some research finds that developing more tourism could crowd out local traditional sectors, such as fishing, agriculture, and mining (Adams & Parmenter, 1995; McCool & Martin, 1994). In this paper, we investigate whether the crowding-out effect occurs among tourists from different home countries into Taiwan.

Table 1 shows Taiwan's international tourist arrivals from several major countries based on the Tourism Bureau of Taiwan. We can briefly compare the differences before and after Taiwan's 2008 openness policy for Chinese tourists. We find that Chinese tourist arrivals steeply rose from 329,000 in 2008 to 1.6 million in 2010, making China the largest source of international tourism for Taiwan. Hong Kong tourist arrivals also rose from 491,000 in 2007 to 794,000 in 2010. However, tourists from Japan and the United States (U.S.) decreased in the years between 2007 and 2010. In terms of proportion, tourist arrivals from Japan declined from 31.4% to 19.4%, and those from U.S. declined from 10.7% to

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Table 1
International tourist arrivals to Taiwan (2005–2010; units: 1000).

	2005	%	2006	%	2007	%	2008	%	2009	%	2010	%
Japan	1124	33.3	1161	32.5	1166	31.4	1087	28.3	1001	22.8	1080	19.4
Hong Kong	433	12.8	432	12.1	491	13.2	619	16.1	719	16.4	794	14.3
United States	390	11.5	395	11.1	398	10.7	387	10.1	369	8.4	396	7.1
China	173	5.1	243	6.8	320	8.6	329	8.6	972	22.1	1630	29.3
Others	1258	37.2	1341	37.5	1661	44.7	1810	36.9	1334	30.3	1667	29.9
Worldwide	3378	100.0	3572	100.0	3716	100.0	3845	100.0	4395	100.0	5567	100.0

1. %, Proportion.

2. China's data before openness (2008) are from The Mainland Affairs Council of Taiwan. The rest of data are from The Tourism Bureau of Taiwan.

7.1%. Moreover, even though the number of tourist arrivals from Japan and U.S. increased slightly in 2010 compared with the prior two years (seemingly due to recovery from the global financial crisis), these numbers did not exceed the level prior to Taiwan's 2008 openness. Since the increase of international tourist arrivals into Taiwan is mainly attributed to Chinese tourists, the decline of Japanese and U.S. tourists indicates a potential *crowding-out effect* due to the steep increase of tourists coming from China.

In this paper, our primary interest is to evaluate the impact due to new legislation allowing Chinese tourists to travel to Taiwan in July 2008. To evaluate this policy impact, we employ seasonal ARIMA (*Autoregressive Integrated Moving Average*) models (Box & Jenkins, 1976) and treat the policy change as an *intervention* (Box & Tiao, 1975). Since atypical data often occur in such time series, we employ outlier detection and joint estimation methods (Chang, Tiao, & Chen, 1988; Chen & Liu, 1993; Liu & Hudak, 1992; Tsay, 1988) to automatically detect and handle the outliers. In addition, we include *moving-holiday effects* (Bell & Hillmer, 1983; Hillmer, 1982; Lin, Liu, Tseng, & Su, 2011; Liu, 1980) in the intervention analysis.

Traditional regression models with dummy variables are often employed to evaluate effects due to policy changes or one-time events (e.g., Crouch, Schultz, & Valerio, 1992; Wang, 2009; Witt & Witt, 1995). Such models may not be most suitable due to autocorrelations of the data as well as the impact patterns and lag structure of the event effects. Thus, ARIMA-related models are used to study tourism data with such phenomenon instead (e.g., Chu, 2008; Coshall, 2005; Gil-Alana, 2005; Goh & Law, 2002; Huang & Min, 2002; Kim & Moosa, 2001; Kulendran & Shan, 2002; Lim & McAleer, 2000; Min, 2005; Papatheodorou & Song, 2005). However, little time series tourism research uses joint estimation of intervention and outlier effects to handle policy changes and one-time events.

Our focus in this research is to evaluate the impact of Chinese tourists on Taiwan's international tourism. However, because data for Chinese tourist arrivals into Taiwan is rather limited, we employ Chinese tourist arrivals into Japan as a reference study where several stages of Japanese opening policy for Chinese tourists occurred. The Japanese opening process contains four stages: (1) openness for tour groups, (2) school trips, (3) family tours, and (4) individual tourists. Based on the result, we draw comparison of the Japanese opening policy to that of Taiwan, and evaluate the additional increase of Chinese tourist arrivals in Taiwan due to the opening policy for individual tourists. To study the crowding-out effect from Chinese tourists in Taiwan directly, we examine the monthly tourist arrivals data from Japan, Hong Kong, and U.S. between January 1991 and December 2010.

In Section 2, we provide an overview of worldwide outbound tourism at the region/country level as well as outbound tourism from China. We also briefly describe the present situation of tourism between Taiwan and China. The methodology of ARIMA models with joint estimation of model parameters and outlier effects is introduced in Section 3. The analysis results and their economic implications are presented in Section 4. Section 5 provides discussion and conclusions.

2. Tourism in China and Taiwan

Before analyzing the tourism time series data, it is important to have an understanding of the tourism in China and Taiwan. In this section, we provide an overview of the growth of outbound tourism in China, the tourism relationships between Taiwan and China, and international tourism into Taiwan.

2.1. The growth of outbound tourism in China

Economic development and improvement of worldwide transportation result in booming international tourism, especially in developed countries. Based on data from the World Tourism Organization, Table 2 lists the number of annual outbound tourists in some important regions/countries between 1997 and 2009. During this period, Europe's outbound tourists increased from 140 million to 235 million. In U.S., this number grew from 53 million to 61 million. In the ASEAN region, this number also increased from 36 million to 50 million. These figures show that the outbound tourism is growing worldwide.

To facilitate a better understanding of relative tourism growth in these regions/countries, the numbers of annual outbound tourists are indexed to 1997 levels (i.e. the numbers are set to be 100 in 1997) and displayed in Fig. 1. The relative growth rates of outbound tourists are quite stable in most of the regions/countries, except for China. In China, the index increased to 895 in 2009, which is almost nine times of that in 1997, while Korea is around two times and the others are lower than two times. After Xiao-Ping Deng's reform in 1978, tourism of China also goes through several important reforms and promotions. Moreover, accompanying the considerable economic growth, Chinese people with higher income have more willingness to travel. This growth trend indicates that China would become one of the major home countries of international tourists in the near future (see e.g., Airey & Chong, 2011; Lim & Wang, 2008; Pan, 2003; Zhang & Heung, 2002).

Although China will become a major home country for international tourism, Chinese outbound tourism is highly influenced by policies set forth in the destination regions/countries. In Fig. 2, we display outbound tourism from China using the data from the World Tourism Organization. The numbers of Chinese outbound tourists reflect different degrees of restrictions in these destination regions/countries. Chinese tourist arrivals increase in less-restricted regions/countries such as Hong Kong, Macao, and ASEAN. Hong Kong, for example, which removed the quota of 1500 daily Chinese tourists in 2002 and opened for individual Chinese tourists in 2004, increased its Chinese tourist arrivals from 2 million in 1998 to 9.7 million in 2009. However, Chinese tourist arrivals stay low in highly-restricted regions/countries such as U.S., Japan, and Korea. U.S., for instance, which imposes strict qualification requirements and visa restrictions for Chinese tourists, only increased its Chinese tourist arrivals from 0.2 million in 1998 to 0.5 million in 2009.

In recent years, many countries realized the benefit of tourism from China and have implemented various stages of openness policies. Japan, for instance, executed the "Inbound Travel Promotion Project (Visit Japan Project)" from 2003, which targeted 12 nations to promote

Table 2
Outbound tourists for select countries and regions (1997–2009; units: 1000).

Year	Worldwide	%	Europe	%	U.S.	%	ASEAN	%	China	%	Japan	%	Korea	%
1997	605,449		140,127		53,229		35,502		5324		16,803		4542	
1998	637,072	5.2	158,148	12.9	55,696	4.6	34,681	-2.3	8426	58.3	15,806	-5.9	3067	-32.5
1999	658,718	3.4	159,683	1.0	57,222	2.7	35,524	2.4	9232	9.6	16,358	3.5	4342	41.6
2000	730,614	10.9	171,234	7.2	61,327	7.2	40,631	14.4	10,473	13.4	17,819	8.9	5508	26.9
2001	739,845	1.3	172,123	0.5	59,442	-3.1	46,485	14.4	12,133	15.9	16,216	-9.0	6084	10.5
2002	759,873	2.7	192,072	11.6	58,066	-2.3	40,560	-12.7	16,602	36.8	16,523	1.9	7123	17.1
2003	755,639	-0.6	201,560	4.9	56,250	-3.1	43,868	8.2	20,222	21.8	13,296	-19.5	7086	-0.5
2004	819,649	8.5	205,449	1.9	61,809	9.9	44,496	1.4	28,853	42.7	16,831	26.6	8826	24.6
2005	882,562	7.7	224,717	9.4	63,503	2.7	45,217	1.6	31,026	7.5	17,404	3.4	10,080	14.2
2006	903,809	2.4	221,184	-1.6	63,662	0.3	47,388	4.8	34,524	11.3	17,535	0.8	11,610	15.2
2007	961,787	6.4	228,773	3.4	64,024	0.6	48,706	2.8	40,954	18.6	17,295	-1.4	13,325	14.8
2008	982,699	2.2	232,712	1.7	63,549	-0.7	49,838	2.3	45,844	11.9	15,987	-7.6	11,996	-10.0
2009	961,575	-2.1	235,326	1.1	61,419	-3.4	50,055	0.4	47,656	4.0	15,446	-3.4	9494	-20.9

1. %, Annual growth rate.
2. Source: The World Tourism Organization.

Japanese tourism. Among these nations, China is the third largest home country of Japanese international tourists. Japan government conducted a four-stage opening policy to increase Chinese tourist arrivals beginning in 2000. The monthly Chinese tourist arrivals to Japan are plotted in Fig. 3 based on the Japan National Tourist Organization. We observe that an upward trend of monthly Chinese tourist arrivals from 21,505 in January 1996 to 92,120 in January 2010, and the average annual growth rate is 32.3%. These four-stages of the opening policy are also marked in Fig. 3.

In addition to Japan, some previously highly-restricted countries are also gradually open for Chinese tourists. In December 2007, U.S. and China signed a memorandum of understanding (MOU) to facilitate Chinese group tours to U.S. The United States government is also considering passing new legislation to relax the visa restrictions of Chinese tourists according to U.S. Commercial Service. In South Korea, China has become the second largest home country of international tourists since 2001, and received much attention by the authorities. All of these policy changes suggest that the growth of the outbound tourism of China has attracted international attention. To benefit from this trend of international tourism from China, many countries, including Taiwan, are willing to change their policy to attract Chinese tourists.

2.2. *Tourism between Taiwan and China*

In 1949, the Nationalist government withdrew from mainland China to Taiwan and a prolonged confrontation began. After almost forty years

of confrontation, the Taiwan government changed its policy to allow Taiwan residents to visit their families in mainland China in 1987. After this epoch-making policy, the interactions across the two sides of the Taiwan Straits intensified. For instance, China's Taiwan Affairs Office issued "Regulations for Encouraging Investment by Taiwan People" in 1988. In 2001, the "Mini Three Links" (direct postal, shipping and trade links) was implemented, and cross-strait direct flights were also set forth in 2008. After strenuous policy debates, the Taiwan government finally allowed Chinese tourists to travel to Taiwan in July 2008.

Fig. 4 shows the tourist arrivals between Taiwan and China in the past two decades based on the data from the Taiwan National Immigration Agency. The number of tourist arrivals from Taiwan to China increased dramatically from 44,000 in 1988 to 5.8 million in 2010. On the contrary, restricted by policy, the number of tourist arrivals from China to Taiwan only increased from 386 in 1988 to 291,696 in 2008; a much slower pace. Nevertheless, after Taiwan's opening to Chinese tourists in 2008, this number dramatically increased to 967,000 in 2009 and then 1.5 million in 2010.

Despite the dramatic increase in tourists from China, a more careful evaluation is required to assess the overall impact of Taiwan's opening policy toward Chinese tourists. We should consider Taiwan's tourism capacity limitations of tourist attractions, accommodations, restaurants, transportation facilities and services, which have quite fixed supplies and take much time to maintain and expand. Unlike the U.S., Canada or Europe, which have large territories, Taiwan is an island country with a high population density. Opening to Chinese tourists has benefits

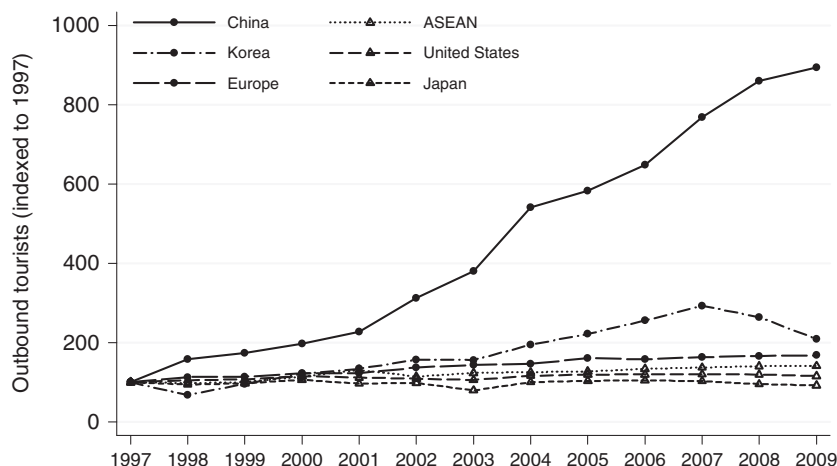


Fig. 1. Outbound tourists for select countries and regions (indexed to 1997).

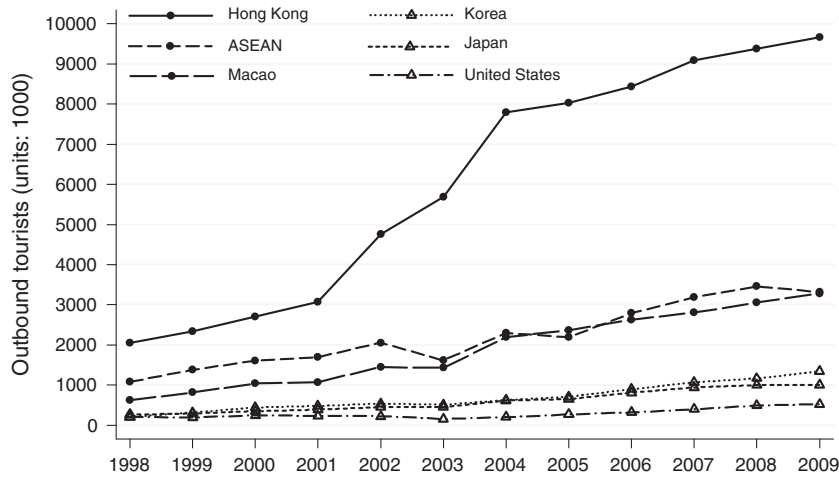


Fig. 2. Outbound tourists from China to select destinations (1998–2009).

if Taiwan's international tourism capacity can accommodate, but can also cause potential complications and serious issues if the demand overwhelms Taiwan's tourism capacity. The sheer number of Chinese tourists may crowd out existing international tourists or, even worse, reduce the quality of Taiwan's tourism causing the permanent loss of existing tourism sources. Therefore, whether the opening policy is beneficial or detrimental should be evaluated more cautiously.

2.3. International tourism into Taiwan

Taiwan, well-known for its development and manufacturing of high-tech components and products has become a developed country. Compared with other countries, Taiwan is also rich in tourism resources, offering both natural beauty and cultural experience, but did not use them effectively in the past decades. According to the World Travel & Tourism Council, tourism contributes only 3.6% of Taiwan's GDP in 2010, while it contributes 9% in Japan and 16% in Hong Kong. Therefore, Taiwan's authorities are aggressively promoting Taiwan's tourism in recent years.

Fig. 5 displays monthly international tourist arrivals from three major sources (Japan, Hong Kong and U.S.) and worldwide based on the data from the Tourism Bureau of Taiwan. In Fig. 5 (A)–(C), we could see the changes of Taiwan's international tourist arrivals from Japan, Hong Kong and U.S. after the openness for Chinese tourists in July 2008. For Japan and U.S., the levels of tourist arrivals seem to shift downward,

while it shifts upward for Hong Kong. Note that we focus on the level or trend changes before and after July 2008.

Fig. 5(D) shows that Taiwan's monthly worldwide tourist arrivals increased from 160,194 in December 1991 to 530,594 in December 2010. This number increase has almost doubled in the recent two years, mainly contributed by the surge of Chinese tourists. Using the data between July 2008 and December 2010, Fig. 6 reveals this phenomenon in better detail. After Taiwan's openness for Chinese tourists in July 2008, tourist arrivals from China steeply increased, relative to those from Japan, Hong Kong and the United States. In this study we shall employ more rigorous time series models in the next section to investigate whether a crowding-out effect indeed exists.

3. Data and methodology

Between July 2008 and December 2010, we only have 30 monthly observations of Chinese tourist arrivals to Taiwan. The lack of data limits rigorous time series analysis that can be conducted. Fortunately, we can use the Japanese opening process for Chinese tourists as a reference to project future policy impact on Taiwan. The monthly Chinese tourist arrivals into Japan between January 1996 and December 2010 (180 observations) are plotted in Fig. 3. Additionally, Fig. 5(A)–(C) contains the data of Taiwan's major sources of international tourist arrivals, including the monthly tourist arrivals from Japan, Hong Kong, and United States between January 1991 and December 2010 (240 observations). We

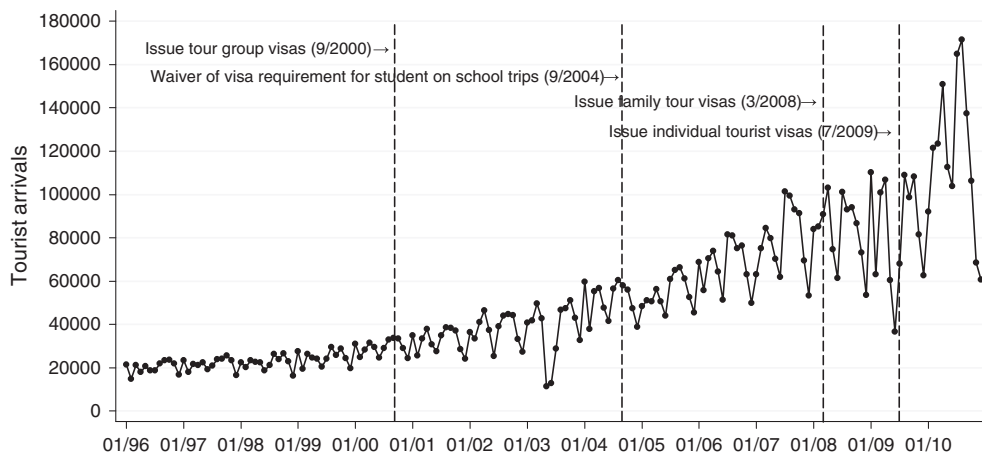


Fig. 3. Monthly tourist arrivals from China to Japan (1/1996–12/2010).

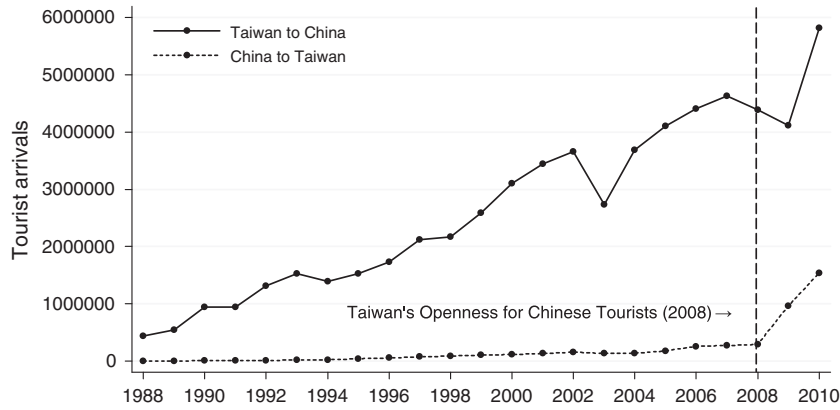


Fig. 4. Tourist arrivals between Taiwan and China (1988–2010).

use these three time series to directly analyze whether the crowding-out effect exists.

To choose the most adequate model, several characteristics are noticed for the series in Figs. 3 and 5. First, and the most obvious, is the upward trend with seasonal variation. Second, several major outliers exist, such as Taiwan's major earthquake in September 1999 (Huang & Min, 2002), the SARS epidemic in March 2003 (Min, 2005; Wang, 2009), and the H1N1 epidemic in June 2009. Thus, we need to employ the joint outlier estimation, which detect and account for the effects of outliers, and allow us to focus on the primary policy impact of interest. Third, the variance of these time series increases over time. Thus, a proper variance stabilizing transformation is needed. A logarithm transformation is employed in this study. Last but not least, the Chinese New Year is an important holiday in Chinese societies, including both in China and Taiwan (Lin et al., 2011). Because the Chinese New Year occurs sometimes in January and sometimes in February of the Gregorian calendar, and cannot be captured by seasonal factors. This calendar effect, also known as *moving-holiday effect*, should be included in the model. Considering these characteristics, seasonal ARIMA models with an intervention component (openness for Chinese tourists) shall be considered.

3.1. Seasonal ARIMA model

Assuming $\{Y_t\}$ is a time series of tourist arrivals, and t is the time from 1 to n , a Box–Jenkins seasonal ARIMA model can be written as

$$\phi_p(B)\Phi_P(B^s)(1-B)^d(1-B^s)^DY_t = C_0 + \theta_q(B)\Theta_Q(B^s)a_t, \quad a_t \stackrel{iid}{\sim} N(0, \sigma_a^2) \quad (1)$$

where B is the backshift operator ($BY_t = Y_{t-1}$), C_0 is a constant term, $\phi_p(B)$ and $\theta_q(B)$ are the regular autoregressive (AR) and moving average (MA) polynomials, and $\Phi_P(B^s)$ and $\Theta_Q(B^s)$ are the seasonal AR and MA polynomials. The subscript p (and P) and q (and Q) are used to indicate the order of the associated regular (and seasonal) AR and MA polynomials, respectively. The superscript d (and D) is the regular (and seasonal) differencing order, and s is referred to as *seasonality*. The model in Eq. (1) is often denoted as ARIMA(p,d,q)(P,D,Q).

The above model can also be expressed in the following alternative form

$$(1-B)^d(1-B^s)^DY_t = C + \frac{\theta_q(B)\Theta_Q(B^s)}{\phi_p(B)\Phi_P(B^s)}a_t, \quad C = \frac{C_0}{\phi_p(B)\Phi_P(B^s)}. \quad (2)$$

In this form, the constant term C is the mean of the time series if both d and D are zero. The term C is the trend of the series if $d = 1$ or $D = 1$,

and it becomes a higher order trend if $d > 1$ and/or $D > 1$. The form of the ARIMA in Eq. (2) is more desirable since the constant term C has an interpretable meaning.

3.2. Intervention analysis with outlier adjustment

Given that a known external event (intervention) occurs at time T , intervention analysis can be used to estimate the impact of the post-intervention period relative to the pre-intervention period. There are two basic types of interventions, $I_t^{(T)}$: The *step function*, $S_t^{(T)}$, and the *pulse function*, $P_t^{(T)}$. Other types of interventions often can be expressed as an extension or combination of these two basic types.

If an intervention occurs at time T and stays permanent, this intervention can be defined in the time series model as a step function

$$I_t^{(T)} = S_t^{(T)} = \begin{cases} 1, & t \geq T \\ 0, & t < T. \end{cases} \quad (3)$$

If an intervention occurs only at time T , then this intervention can be defined in the time series model as a pulse function

$$I_t^{(T)} = P_t^{(T)} = \begin{cases} 1, & t = T \\ 0, & t \neq T. \end{cases} \quad (4)$$

Both step functions and pulse functions allow us to estimate a variety of intervention effects. For example, a step intervention occurs at time T and has a fixed effect, ω , after b time periods, the effect of the intervention component can be expressed as

$$\omega B^b I_t^{(T)} \quad \text{or} \quad \omega B^b S_t^{(T)}. \quad (5)$$

As another example, if a step intervention occurs at time T causing a gradual response after b time periods, the intervention component can be expressed as

$$\frac{\omega B^b}{1-\delta B} I_t^{(T)} \quad \text{or} \quad \frac{\omega B^b}{1-\delta B} S_t^{(T)} \quad (6)$$

where $0 < \delta < 1$. Note that if $\delta = 0$, model (6) is reduced to model (5). Various types of impact patterns can be examined using combinations intervention effects in Eqs. (5) and (6). A time series model may also include more than one intervention component.

It is quite common for time series to have outliers, which may be caused by known or unknown events. Outliers may bias parameter estimates in the model, in particular, the intervention effects (Liu & Chen, 1991). Therefore, outlier detection and estimation must be an integral part of any rigorous intervention analysis (Liu, 2006). There are four basic types of outliers (Chang et al., 1988; Tsay, 1988): *Additive outlier*

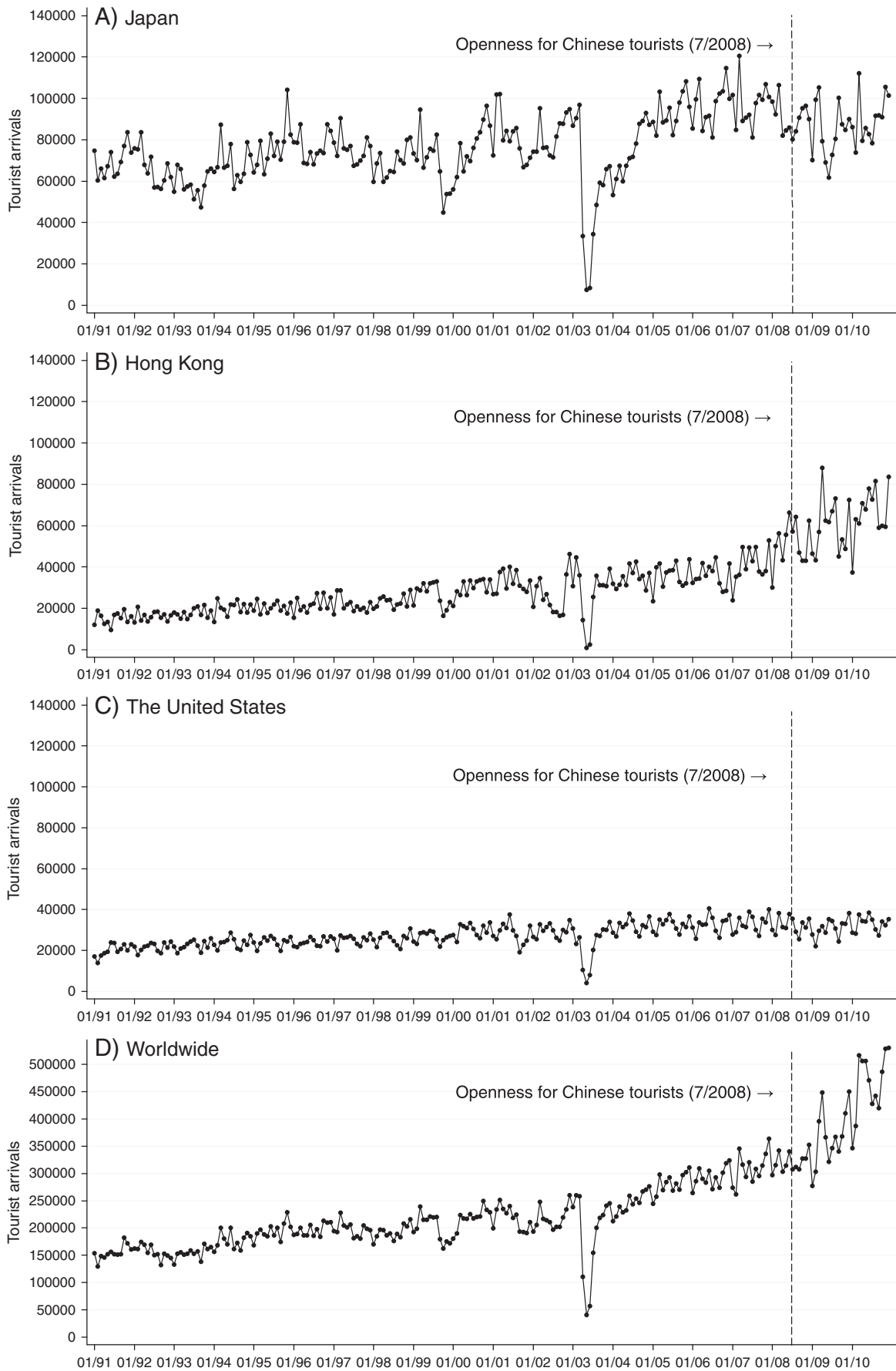


Fig. 5. Monthly international tourist arrivals to Taiwan (1/1991–12/2010).

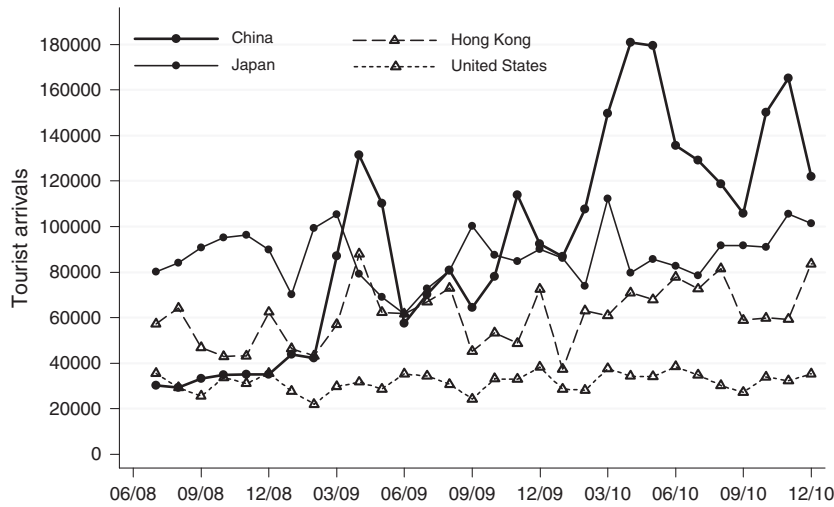


Fig. 6. Monthly international tourist arrivals to Taiwan (7/2008–12/2010).

(AO), *innovational outlier* (IO), *level shift* (LS) and *temporary change* (TC). Other types of outliers can usually be expressed as combinations of these four basic types. Automatic outlier detection can assist researchers in discovering both known and unknown important events (Chen & Liu, 1993; Lin et al., 2011; Liu, 2006) and has been shown to be very useful in various time series analyses. To estimate an ARIMA-intervention model in the presence of outliers, model parameters and outlier effects must be jointly estimated. When conducting joint estimation of model parameters and outlier effects, the procedure consists of the following three steps: (1) detect outliers, (2) adjust the series for outliers, and then (3) estimate the model parameters based on the adjusted series. This three-step procedure is repeated until no additional outliers are found. The details of this joint estimation procedure are described in Chen and Liu (1993) and implemented in the SCA Statistical System (Liu & Hudak, 1992), which is used in this study.

4. Empirical results

In this research, we are interested in whether the crowding-out effect of Chinese tourists exists in Taiwan, and whether Taiwan's government should accelerate or decelerate further openness. We employ the seasonal ARIMA model with intervention, which is coded as a step function corresponding to openness policy change, and estimate the model by using joint estimation of model parameters and outlier effects.

4.1. Evaluation of Japanese policy for Chinese tourists

Even though the lack of data of Chinese tourist arrivals to Taiwan limits the capability to conduct rigorous analysis of such time series, the abundant data of monthly Chinese tourist arrivals to Japan (between January 1996 and December 2010) can be used as a reference to study the policy impact of tourism openness. Referring to the experience in Japan, we can obtain the benchmark of Taiwan's future tourism opening process for Chinese tourists.

The Japan government adopted four major opening policies for Chinese tourists in the following sequence: (1) issuing tour group visas in September 2000 (OPEN1); (2) waiver of visa requirement for students on school trips in September 2004 (OPEN2); (3) issuing family tour visas in March 2008 (OPEN3); and (4) issuing individual tourist visas in July 2009 (OPEN4). These four openness policies are set as four intervention variables in Model 1. Because these policies persist after they are initiated, the step functions (rather than the pulse functions) are used to represent them. Also since the variance of the time

series increases over time, we use the logarithm as a variance stabilizing transformation.

Using Box and Jenkins (1976) model identification methods, we identify that a seasonal ARIMA(1,0,0)(0,1,1)₁₂ model is an adequate model for Chinese tourist arrivals to Japan. In this model identification procedure, the calendar effect of the Chinese New Year is considered. For brevity, we use ∇₁₂ to represent the 12th order difference, which means ∇₁₂Y_t = (1 - B¹²)Y_t, thus ∇₁₂ln(Y_t) is equivalent to a percentage change from the same month one year earlier. With four openness intervention policies and the calendar effect multiplied by time trend (MH_t × K_t), the parameter estimates and relevant t-values are presented in Model 1. In all models in this section, MH_t represents the proportions of the Chinese New Year holiday in a month of that year (Lin et al., 2011; Liu, 1980). K_t = 1 for the time periods in the first year, K_t = 2 for the time periods in the second year, and so on.

Model 1.

$$\begin{aligned} \nabla_{12} \ln(Y_t) = & 0.0602 + (-0.0042)\nabla_{12}OPEN1_t + (-0.0151)\nabla_{12}OPEN2_t + (-0.0389)\nabla_{12}OPEN3_t \\ & (t = 20.80) \quad (t = -0.32) \quad (t = -1.17) \quad (t = -3.02) \\ & (t = 6.90) \\ & + 0.0509 \nabla_{12}OPEN4_t + 0.0102 \nabla_{12}MH_t \times K_t + \frac{1-0.4977 B^{12}}{1-0.1924 B} a_t, \quad \hat{\sigma}_a^2 = 0.0328. \\ & (t = 3.95) \quad (t = 9.51) \quad (t = 2.35) \end{aligned} \tag{7}$$

The outliers detected, their estimates and t-values under joint estimation of model parameters, and outlier effects are listed in Table 3. Major events, such as the SARS and the H1N1 epidemic, are detected and shown in the table.

In Model 1, the constant term (6.02%) is the annual growth rate (i.e., trend) of Chinese tourist arrivals to Japan. The moving-holiday calendar effect due to the Chinese New Year indicates significant increases of Chinese tourist arrivals to Japan in a linear upward trend. According to the estimated results in Model 1, only the openness for individual tourists (OPEN4) has a significant positive effect on Chinese tourist arrivals to Japan. The effect indicates that the openness policy for individual tourists would further increase Chinese tourist arrivals to Japan by 5.09% compared with the same month in the prior year. According to the World Tourism Organization, the average monthly tourist arrivals from China to Japan is 93,240 in 2008. Thus, this additional increase is around 4746 Chinese tourist arrivals per month. Note that in Model 1, an upward trend is already captured by differencing with the inclusion of a trend parameter. Thus, this model evaluates the increase of tourists due to policy changes that is above the ongoing upward trend.

Table 3
Outliers detected and their estimates (tourist arrivals from China to Japan).

Date	Outlier (<i>t</i> -value)	Events
1/1998	LS	
5/2003	TC	SARS epidemic in Japan
8/2003	TC	
5/2009	TC	H1N1 epidemic in Asia
6/2009	TC	H1N1 epidemic in Asia
8/2009	IO	Asian Baseball Championship held in Japan
10/2010	LS	Last month of Expo 2010 Shanghai China and local peak of exchange rate (CNY/JPY)

IO: innovational outlier, LS: level shift, TC: temporary change.

The other three openness policies for group tours, school trips, and family tours did not further increase Chinese tourist arrivals to Japan. That is, based on the upward trend, there is no additional increase in tourist arrivals due to these three openness policies. However, even though these openness policies may not significantly increase tourist arrivals in the short run, they should not decrease them either. Thus, except that the coefficient of *OPEN1* is very close to zero, the negative estimates of *OPEN2* and *OPEN3* may be contributed by other events, which negate the effects of openness policies in Japan. One such event occurred in the spring of 2005 when a series of nationwide anti-Japanese demonstrations (provoked by some historical issues) took place in China. Then in late 2008, the global financial crisis occurred which substantially reduced international tourism worldwide.

In Taiwan, the government had gradually deregulated for Chinese students to study in Taiwan in 2009, opened for tour groups with a limit of 3000 daily tourists in 2008 and then loosened the limit to 4000 in 2011. It also planned to open for individual tourists from specific cities in China in late 2011. Based on the data from other countries, we know that Chinese tourist arrivals, especially the individual tourists, are highly related to openness policy changes in the destination countries. Thus, Taiwan's further openness for Chinese individual tourists may result in more Chinese tourists and accelerate the crowding-out effects in Taiwan's international tourism.

Compared with Japan, which took nearly ten years for the opening process for Chinese tourists, Taiwan shortened this opening process to three years. Under the present situation, openness policy for Chinese individual tourists may substantially increase Chinese tourist arrivals. However, the soaring number of Chinese tourists may have unexpected impacts on Taiwan's tourism. More specifically, if the soaring number of Chinese tourists do cause a crowding-out effect, then the further opening policy should be considered more cautiously.

4.2. Policy impact of openness for Chinese tourists in Taiwan

Now, we employ the intervention analysis to directly investigate the crowding-out effect of Chinese tourists in Taiwan using monthly international tourist arrivals to Taiwan from Japan, Hong Kong, and U.S. between January 1991 and December 2010.

In July 2008, the Taiwan government officially allowed Chinese tourists to visit Taiwan. This openness policy is set as an intervention (*OPEN*) in Model 2. Since this policy stays after its inception, the step function is used, which means the intervention variable is set to be one beginning in July 2008 and zero prior to July 2008. We also use the logarithm as a stabilizing transformation for these time series since the variance of these time series increases over time.

With the Chinese New Year effects considered, we use Box and Jenkins (1976) methodology and find that the seasonal ARIMA(1,0,0)(0,1,1)₁₂ model is also appropriate for Taiwan's international tourist arrivals from Japan, U.S., and Hong Kong. Including the intervention of openness policy in July 2008 and the Chinese New Year effect ($MH_t \times K_t$), the joint parameter estimates and outlier effects are presented in Model 2 and Table 4.

Model 2. Japan:

$$\nabla_{12} \ln(Y_t) = 0.0107 + (-0.0451)\nabla_{12}OPEN_t + (-0.0062)\nabla_{12}MH_t \times K_t + \frac{1-0.7102B^{12}}{1-0.7249B}a_t \quad (t = 15.89)$$

$$(t = 3.83) \quad (t = -2.00) \quad (t = -11.23) \quad (t = 15.71)$$

$$\hat{\sigma}_a^2 = 0.0320 \quad (8)$$

United States:

$$\nabla_{12} \ln(Y_t) = 0.0110 + (-0.0449)\nabla_{12}OPEN_t + 0.0010\nabla_{12}MH_t \times K_t + \frac{1-0.6568B^{12}}{1-0.3297B}a_t \quad (t = 13.31)$$

$$(t = 10.86) \quad (t = -4.95) \quad (t = 2.03) \quad (t = 5.20)$$

$$\hat{\sigma}_a^2 = 0.0240 \quad (9)$$

Hong Kong:

$$\nabla_{12} \ln(Y_t) = 0.0306 + 0.0627\nabla_{12}OPEN_t + 0.0073\nabla_{12}MH_t \times K_t + \frac{1-0.4912B^{12}}{1-0.3868B}a_t \quad (t = 8.02)$$

$$(t = 9.65) \quad (t = 2.87) \quad (t = 7.63) \quad (t = 5.69)$$

$$\hat{\sigma}_a^2 = 0.0495. \quad (10)$$

The outliers detected, their estimates and *t*-values are listed in Table 4 for each model. Major events, such as Taiwan's earthquake, the SARS epidemic, and terrorist attacks in U.S., are detected and shown in the table.

According to the parameter estimates in Model 2, the estimated effects of the openness policy are negative for U.S. and Japan (significant at 1% and 5% levels respectively), but positive for Hong Kong (significant at 1% level). Therefore, the crowding-out effects of Chinese tourists on Taiwan's international tourist arrivals may exist for Japan and U.S., but not for those from Hong Kong. The effect implies that Taiwan's openness policy for Chinese tourists would decrease the tourist arrivals from Japan by 4.51% and from U.S. by 4.49% in comparison with the same month in the prior year. Based on the Tourism Bureau of Taiwan, Taiwan's average monthly tourist arrivals from Japan and the United States are 90,558 and 32,266 in 2008, and the average expenditure is 1218 and 3385 USD per person respectively in Taiwan. Thus, these two percentages imply that tourist arrivals decrease 4084 from Japan and 1449 from U.S. per month. The associated decrease of Taiwan's tourism income is around 5 million USD from Japan and 4.9 million USD from U.S. per month.

It is interesting to note that in Eq. (10) of Model 2, Taiwan's openness policy for Chinese tourists does not crowd out Hong Kong tourists into Taiwan, which increases instead. This estimated effect implies that Taiwan's openness policy for Chinese tourists would increase the tourist arrivals from Hong Kong by 6.27% compared with the same month in the prior year. This percentage implies an increase of 3232 tourist arrivals from Hong Kong to Taiwan per month, which increases Taiwan's tourism income by around 3.5 million USD (Taiwan's average monthly tourist arrival from Hong Kong is 51,555 in 2008, and the average

Table 4
Outliers detected and their estimates (Taiwan's international tourist arrivals).

Date	Japan		Hong Kong		United States		Events
	Outlier (t-value)		Outlier (t-value)		Outlier (t-value)		
1/1993			AO	0.135 (t = 3.38)			
4/1997			LS	-0.079 (t = -3.81)			
9/1998			LS	0.079 (t = 3.77)			
10/1999	TC	-0.181 (t = -6.13)	TC	-0.201 (t = -5.07)			Major earthquake in Taiwan
1/2000					LS	0.035 (t = 4.49)	
9/2001					TC	-0.130 (t = -6.60)	Terrorist attacks in U.S.
4/2002			IO	-0.216 (t = -4.35)			Air China airline crash
6/2002			TC	-0.243 (t = -5.96)			
8/2002			TC	-0.209 (t = -5.06)			
11/2002			TC	0.271 (t = 6.76)			
2/2003					TC	-0.089 (t = -4.33)	
4/2003	TC	-0.360 (t = -12.13)	TC	-0.402 (t = -9.38)	IO	-0.439 (t = -17.82)	SARS epidemic
5/2003	TC	-0.767 (t = -25.88)	TC	-1.338 (t = -30.79)	TC	-0.732 (t = -32.98)	SARS epidemic
6/2003	AO	-0.259 (t = -8.75)			TC	-0.079 (t = -3.38)	SARS epidemic
7/2003	TC	0.150 (t = 4.11)	TC	0.713 (t = 17.41)	TC	0.236 (t = 10.14)	Taiwan was declared free of SARS
8/2003					TC	0.129 (t = 5.91)	
2/2004	TC	-0.125 (t = -4.23)					
4/2004					IO	0.120 (t = 4.98)	
4/2005			AO	-0.156 (t = -3.88)	IO	0.084 (t = 3.51)	
4/2008			AO	-0.184 (t = -4.58)			Violent typhoon Neoguri attacks Hong Kong

AO: additive outlier, IO: innovational outlier, LS: level shift, TC: temporary change.

expenditure is 1070 USD per person in Taiwan according to the Tourism Bureau of Taiwan.)

The increase of tourist arrivals from Hong Kong to Taiwan may be caused by two other reasons unrelated to the openness to Chinese tourists. First, is the advertisement of Taiwan's tourism in Hong Kong in recent years; and second, is the political unrest in Thailand between 2008 and 2009. According to the Tourism Bureau of Taiwan, the Taiwan government spent considerable money advertising tourism in both China and Hong Kong in recent two years, thus further increasing the tourist arrivals from these two areas. Regarding Thailand's political unrest, Thailand and Taiwan are the two main destinations for outbound tourists from Hong Kong in the past, but the violent political conflict in Thailand drove Hong Kong tourists to switch their destination from Thailand to Taiwan. According to the World Tourism Organization, before the political crisis in Thailand, the numbers of Hong Kong's outbound tourists were 448,057 to Thailand and 469,224 to Taiwan in 2007. However, after the political crisis, the number to Thailand reduced to 343,896 and the number to Taiwan rose to 590,820 in 2008. These figures changed further to 378,948 and 690,993 respectively in 2009.

4.3. More evidence for the crowding-out effect of Chinese tourists

In this subsection, we discuss further evidence to support our findings in Model 2, which indicate the existence of a crowding-out effect from Chinese tourists in Taiwan. The crowding-out effect could be an artifact since the time of inception of Taiwan's openness policy for Chinese tourists (from July 2008) which occurred during the period of the global financial crisis (from September 2008 to June 2009 according to the National Bureau of Economic Research of United States). To delineate the effects of these two events, we provide additional evidence to distinguish these two effects and support our findings in Model 2.

First, Table 5 shows the changes of the total outbound tourists for Japan, U.S. and Hong Kong from 2006 to 2009. For Japan, the total outbound tourists decreased by 3.39% in 2009, which may be caused by the global financial crisis. However, the outbound tourists from Japan to Taiwan decreased by 8.41% in 2009. The additional decrease may be caused by the crowding-out effect of Chinese tourists. For U.S., the total outbound tourists decreased by 3.35% in 2009, but the outbound tourists from U.S. to Taiwan decreased more than 5.85% in 2009. Even though the global financial crisis impacted worldwide

international tourism industry, the disproportional decrease of Taiwan's international tourist arrivals from Japan and U.S. supports the findings that there is indeed a crowding-out effect due to Chinese tourists in Taiwan. As for Hong Kong, the shock of the global financial crisis decreased its total outbound tourists by 4.4% in 2009, but the outbound tourists from Hong Kong to Taiwan increased by 16.2% instead in 2009. This positive effect is also consistent with the estimated results in Eq. (10) of Model 2. The reason for the increase was explained earlier.

In another aspect, we can take a look at the present situation of Taiwan's hotel industry as a reference of the tourism capacity in Taiwan. Fig. 7 shows Taiwan's monthly hotel accommodation statistics, including the monthly numbers of rooms and the respective occupancy rates as reported by the Tourism Bureau of Taiwan. In the past four years, occupancy rates are rather constant, whose average is 65.6%, while the numbers of rooms rose from 21,093 in July 2008 to 24,527 in December 2010. The annual growth rate of the number of rooms was 0.05% before Taiwan's openness for Chinese tourists in July 2008, and steeply increased to 6.51% after the openness. This result indicates that Taiwan's tourism capacity has been increased substantially in anticipation to meet the increased tourists' needs and maintain a constant accommodation occupancy rate. Without the substantial increase of hotel rooms after July 2008, the crowding-out effects for the tourist arrivals from U.S. and Japan would be much more substantial.

However, based on the results in Model 2 and information in Fig. 7, we see that a net crowding-out effect still exists, even though the government and private enterprises have enhanced the tourism capacity in Taiwan. The result means either the opening process for Chinese tourists is too fast to be well-prepared or the enhancement of the tourism capacity is still inadequate in Taiwan.

Table 5
Change of outbound tourism in Japan, U.S. and Hong Kong (2006–2009; units: 1000).

Year	Japan		United States		Hong Kong	
	Total	To Taiwan	Total	To Taiwan	Total	To Taiwan
2006	17,535	1128	63,662	363	75,812	432
2007	17,295	1139	64,024	364	80,682	491
	(-1.37%)	(+0.99%)	(+0.57%)	(+0.17%)	(+6.4%)	(+13.7%)
2008	15,987	1065	63,549	362	81,911	619
	(-7.56%)	(-6.45%)	(-0.74%)	(-0.42%)	(+1.5%)	(+26.1%)
2009	15,446	976	61,419	341	78,336	719
	(-3.39%)	(-8.41%)	(-3.35%)	(-5.85%)	(-4.4%)	(+16.2%)

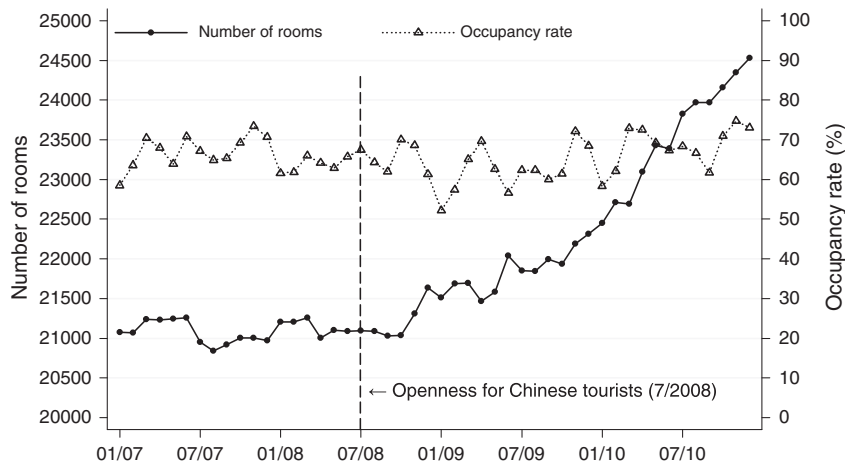


Fig. 7. Monthly tourism accommodation statistics in Taiwan (1/2007–12/2010).

In addition, the estimated results are quite robust. We try different lagged interventions of policy changes and obtain similar results to zero lagged interventions in Model 2. However, to separate the effects between Taiwan's opening policy and the global financial crisis, the effects of zero lagged interventions are more significant than the effects of lagged interventions.

5. Conclusion and discussion

In summary, after Taiwan's openness policy for Chinese tourists in July 2008, Chinese tourists significantly crowd out Taiwan's international tourists from Japan and U.S., but not those from Hong Kong. The crowding effect occurs even with Taiwan's increased tourism capacity. Taiwan's further openness for Chinese individual tourists would additionally increase Chinese tourist arrivals in the near future, which may enlarge and broaden the crowding-out effect. Thus, the opening policy should be made cautiously.

Due to lack of time series data of Chinese tourist arrivals into Taiwan, we first study the Japanese opening process for Chinese tourists. This serves as a reference of the impacts due to such policy changes. We found that only the policy of opening for individual tourists further increased Chinese tourist arrivals. Using Taiwan's monthly international tourist arrivals data between January 1991 and December 2010 and ARIMA-intervention models, our estimated results indicate that the soaring number of Chinese tourists would crowd out Taiwan's existing and diverse international tourists. The effect is a decrease of 4084 tourist arrivals from Japan and 1449 from U.S. per month, even with Taiwan's increased tourism capacity.

According to the Tourism Bureau of Taiwan (2009 Annual Survey Report on Visitors Expenditure and Trends in Taiwan), the average expenditures are 1218 and 3385 USD per person for Japan and United States tourists. Using these numbers as a guide, the crowding-out effect would result in a decrease of Taiwan's tourism revenue by around 5 million USD and 4.9 million USD respectively. However, Taiwan's openness policy for Chinese tourists increases tourist arrivals from China by 53,351 per month in average based on the Tourism Bureau of Taiwan. This results in an increase of Taiwan's tourism revenue by 47.7 million USD per month. Therefore the openness policy for Chinese tourists does increase Taiwan's international tourism revenue substantially.

Although in the short run, increased numbers of Chinese tourists bring in large and immediate tourism revenue to Taiwan, we cannot ignore the crowding-out effect of Chinese tourists in the long run. Compared with China, a continental country with large territories, Taiwan is a small island with limited tourism capacity. Even though Taiwan's tourism capacity has improved in recent years, the crowding-out effect of Chinese tourists still exists. That means, to maintain the quality of

tourism, the Taiwan government should either actively enhance tourism capacity or slow down the opening policy. Regardless of the policy Taiwan government decides, policy makers cannot be too hasty and must allow Taiwan time to adapt and adjust to this new tourism environment. Otherwise, the overloaded tourism capacity would disrupt Taiwan's tourism industry and damage Taiwan's tourism reputation in the long run.

More information will be gained from time series analysis after extending the time span of available data associated with the evolution of Taiwan's opening policy. Furthermore, the univariate time series methods could be extended to multivariate methods to reveal the dynamic relationships between these series. However, there is always a trade-off between a succinct but limited model and a general but complex one. Except for the international tourism in Taiwan, we are also interested in how the 2008 openness policy for Chinese tourists affects Taiwan's domestic tourism. More specifically, whether the crowding-out effect of Chinese tourists exists for domestic tourists in Taiwan as well. These topics are both important and interesting for further research.

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