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MANAGEMENT | RESEARCH ARTICLE

The economic determinants of tourism seasonality: A case study of the Norwegian tourism industry

Jinghua Xie^{1,2*}

Abstract: Since seasonality has long been recognized as one of the most critical problems in the tourism industry, many studies have been conducted to investigate its reasons. Nevertheless, almost all the studies focus on climate and institutional reasons, ignoring the possible economic determinants. In this study, we use econometric models to estimate how economic factors such as tourist's income, the relative costs in a tourist's home country, and destination country affect tourism seasonality, using the seasonal demand of the Japanese and Chinese tourists in the destination of Norway as a case study. The results suggest the long-ignored economic determinants are crucial in affecting tourism seasonal concentration. Various price strategies by considering the different price sensitivity of tourists in peak and off-peak seasons are necessary to modify seasonality. The mitigating effect of economic growth on tourism seasonality is parallel to the level of economic development. The finding is in line with the expectation that global tourism seasonality due to tourists from emerging markets may debilitate as these countries keep up with growth in the future.



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PUBLIC INTEREST STATEMENT

Overtourism is a problem in many tourism destinations today. Local people in popular destinations would like to control the number of tourists, while the tourism industry would like to have more tourists to make the industry profitable. In this debate, seasonality is a key issue. If tourists come smoothly in a year, the overtourism problem can be significantly solved. No doubt, climate and institutional reasons such as school holidays are the most important reasons for the seasonal concentration. Nevertheless, the economic factors, such as tourists' income and relative costs in tourist's home country and destination country, are also important. Our study suggests destination firms and governments can enlarge price margins between peak season and off-peak season to modify seasonality. Different pricing strategies should also be taken to different market segments regarding both tourism activities and tourists' characteristics.

Subjects: The Business of Tourism; Economics of Tourism; The Tourism Industry

Keywords: economic determinant; income; relative price; tourism seasonality; Norway

1. Introduction

Tourism has become one of the world's largest industries with its significant contribution to the global economy. This trend will continue to grow as the industry is fueled by the global economic upswing, which results in strong outbound demand from almost all source markets (UNWTO, 2018). Despite an enormous amount of positive effects of tourism on economic growth, employment, and poverty reduction, in recent years, there is a hot debate on the negative impact of overtourism on tourism sustainability (Goodwin, 2017; Oklevik et al., 2019; UNWTO, 2018). Many destinations in the world have experienced too many tourists coming in a short period, which brings environmental problems and various conflicts between tourists and residents. The problem of overtourism can be improved in many destinations if the seasonal concentration can be alleviated and tourists would arrive smoothly in a year. Therefore, seasonality is regarded as one of the main challenges concerning sustainable tourism (Ferrante, Magno, & De Cantis, 2018).

Given the importance of tourism seasonality, researchers have investigated various reasons for seasonal concentration in the last decades and concluded that climate and institution features are the most crucial reasons (Butler, 2001; Cuccia & Rizzo, 2011; Frechtling, 1996; Li, Goh, Hung, & Chen, 2018; Lundtorp, Rassing, & Wanhill, 1999). It is undoubted that tourism, particularly nature-based tourism, is subject to the appraisal of climatic resources and institution patterns like school or calendar holidays and special events, which decide the time window when people can travel and take holidays. However, in the literature, little interest and attention have been extended to investigate the economic factors that influence the seasonality. To our best knowledge, only one study by Nadal, Font, and Rossello (2004) has investigated the economic determinants of tourism seasonality. Moreover, their study has attempted to identify the relationship between economic variables and a seasonal coefficient, rather than focus on demand elasticities. Demand elasticity is an important measurement term in the economic discipline. Taking income elasticity as an example, it measures how customers adjust their demands in response to the change in their incomes. We suspect demand elasticities vary in high and low seasons and therefore have an important influence on tourism seasonality. As observed in changes in holiday preferences and proved by the findings given by Nadal et al. (2004), people intend to divide their holidays into several sub-periods when they have high income at their disposal. Relatively high-income people have more freedom to decide when they will take holidays. High-income people are generally less sensitive to price changes in peak- and off-peak seasons.

If seasonality is limited to climate and institution patterns, the governments and industry can propose and develop winter products in destinations. For example, like many other countries, Norway has recently proposed to use the whole nation in the all-year-round (Innovation Norway, 2017).¹ However, if the macroeconomic factors are important in influencing seasonality, the governments and industry will be able to anticipate seasonality and gain an insight into future trends in the distribution of tourist arrivals (Nadal et al., 2004). Accordingly, the industry can identify the customer profiles for the tourists in the peak and off-peak seasons. Strategic marketing tools can then be developed to reduce seasonality.

The main objective of this study is to fill in the gap in tourism literature and explore the economic determinants of seasonal tourist concentration. As mentioned, different from the study by Nadal et al. (2004), we are to explore the differences in tourists' responses in peak season and off-peak season to economic factors such as income and relative costs in tourism demand. Asia is one of the most growing markets for Norwegian tourism (Innovation Norway, 2018). In Asia, China and Japan are two of the most important source markets. Besides, Japan is a conventional market for Norwegian tourism, and China is an emerging market. The seasonal evolution of these two countries also shows a big difference. Furthermore, Japan is a developed

economy, and China is still a developing economy. Therefore, we select these two source markets in the empirical study to provide a diverse set of circumstances to investigate.

The remaining parts of the paper are organized as follows. We start with a literature review on overtourism and tourism seasonality before providing background to our case study. Next, the research methods and data are presented, followed by the empirical results. The paper concludes with a discussion of the main findings and implications.

2. Literature review

The discussion on the negative effect of seasonality has, in a long time, focused on the tourism industry's performance in economic and management aspects. The main consequences documented are inefficiency use of facility and resources in an entire year and the problem in recruiting quality employees due to seasonal employment (e.g., Baum, 1999; Koenig-Lewis & Bischoff, 2005; Manning & Powers, 1984; Pegg, Patterson, & Gariddo, 2012). Some literature (e.g., Baum, 1999; Baum & Lundtorp, 2001) also discusses seasonal demand can cause a problem in attracting inward investment in tourism and ensuring sustained support from transport providers. In an empirical study given by Xie and Zhang (2019), seasonal mitigation is found to contribute significantly to the economic performance of the hotel industry in Norway.

In the literature, relatively little attention has been given to the environmental and cultural consequences of seasonal concentration. However, as discussed by Turrión-Prats and Duro (2018), seasonal imbalance can be damaging to the natural environment in terms of erosion, vegetation, wildlife, and waste. The dual nature of seasonality brings the problem of overcrowding in high season, affecting the resident population and their satisfaction levels. Associated with the emerging global overtourism problem, recently, more discussion has been extended to the social and environmental effect of seasonality (Cheer, Milano, & Novelli, 2019; Gon, Grassetti, Marangon, Rizzi, & Troiano, 2019). Considering the above economic, social and environmental impacts of seasonality, we can draw a statement that seasonality is an essential problem in tourism sustainability.

Although the uncontrollable factors such as climate and institution features are the main reasons for tourism seasonality as discussed (Butler, 2001; Cuccia & Rizzo, 2011; Frechtling, 1996; Li et al., 2018; Lundtorp et al., 1999), seasonality is also a more complex organizational and marketing issue (Baum & Hagen, 1999). Price and income are two key variables in the study of tourism demand (Song & Witt, 2000) since tourists respond to their demand for tourism according to travel costs and their economic conditions. As discussed by Cortés-Jiménez, Durbarry, and Pulina (2009), demand elasticities such as income elasticity and price elasticity are useful in assessing tourists' behavior scientifically and in generating useful managerial implications for tourism-related industries and tourist destinations. Therefore, the economic measures such as a significant price margin (dynamic pricing) between a peak season and an off-peak season for the same product and service can adjust and influence the time when tourists would arrive (Goldin, 1971). This is confirmed by a most recent study of Turrión-Prats and Duro (2018). They discussed seasonal price variation and market diversification can reduce the peaking problems, and seasonality problems can be alleviated by designing effective marketing strategies.

3. The Chinese and Japanese markets for the Norwegian tourism industry

In the study, we follow Eurostat (Eurostat, 2019) and define tourism encompasses not only private holiday trips but also business trips. However, we expect the majority of the Chinese and Japanese tourists in the destination of Norway are holiday takers. Hotel overnight stay reflects both the length of stay and the number of visitors and is one of the most popular statistical terms in hotel and tourism studies (Falk & Hagsten, 2015; Xie & Tveterås, 2020; Xie & Zhang, 2019). In recent years, the tourism industry has been growing significantly in Norway. According to Statistics Norway (2019), the total hotel overnight stays grew from 17.11 million to 23.73 million between 2005 and 2018, an increase of 39%. Among them, the overnight stays given by overseas visitors increased by 45% and domestic visitors by 31%.

Europe is the conventional primary market for Norwegian tourism, accounting for 74% of the total hotel overnight stays (Statistics Norway, 2019). However, in recent years, the European market has almost stopped growing. On the contrary, Asian countries, particularly China, become one of the most important source markets for the Norwegian tourism industry. Two main factors have triggered the boom of Chinese tourists in Norway. One factor is the strong economic growth that has significantly stimulated the overall Chinese outbound travel (Lin, Liu, & Song, 2015). According to the United Nations World Tourism Organization (UNWTO, 2018), the Chinese spent \$258 billion on international travel, which accounts for about one-fifth of the world's total tourism expenditure in 2018. Another factor is the significant depreciation of the Norwegian kroner (NOK) against the Chinese Yuan (Xie & Tveterås, 2019a). Since international tourists measure their real costs in their own currencies, a weak destination currency means it becomes relatively cheaper to travel to the destination than before. The weak NOK has increased price the competitiveness of Norway as a destination and consequently attracted more Chinese to visit Norway (Xie & Tveterås, 2019a, 2019b)

According to Statistics Norway (2019). Between 2005 and 2018, the Chinese tourists' hotel overnight stays increased by about seven times. Consequently, 40% of the total Asian tourist hotel overnight stays are from China in 2018. The demand in the Japanese market, however, has been stagnant in recent many years. Japan used to be the most important Asian market for the Norwegian tourism industry; however, it accounts for only 10% of the total Asian market demands in 2018 (Statistics Norway, 2019).

Norwegian nature and fjord are the most popular attractions for international tourists to visit Norway (Innovation Norway, 2018). Although the weather in Norway is warmer than many other places in a similar latitude due to the warmth of the Gulf Stream, the summer season is still most pleasant for tourists to visit Norway. Additionally, in many source countries in the world, June, July, and August are the time for summer vacation for schools. This leads to around 50% of the international tourists visit Norway in the summer season between May and September every year (Figure 1). Figure 1 shows the demeaned monthly hotel overnight stays for the Chinese tourist, Japanese tourists, and total foreign tourists, respectively, between 2005 and 2018. A strong seasonal pattern with a peak in the summer months can be obviously observed, considering that 74% of the foreign tourists are from the neighboring European countries, including Sweden, Denmark, England, and Germany. Figure 1 suggests that Japanese and Chinese come more in the summer season compared to Europeans. The sharper peak in the Chinese curve and flatter tail in the Japanese curve further indicate that the Chinese market has higher seasonal concentration than the Japanese market.

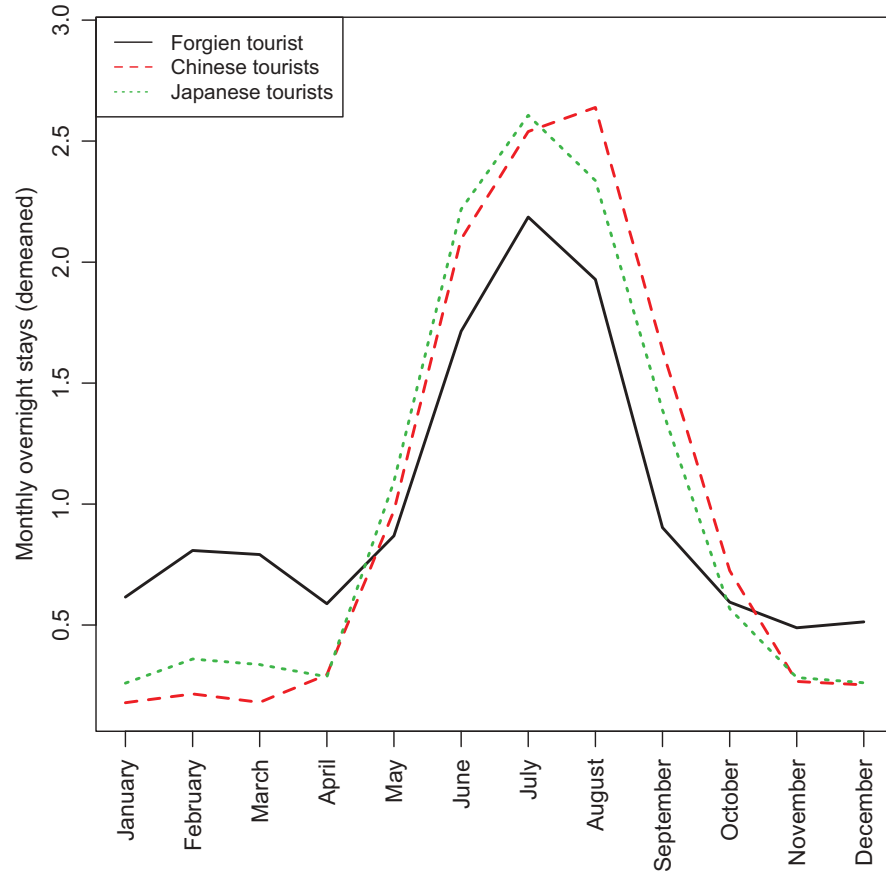
To get an initial insight into the changes in the seasonal concentration for Norwegian tourism in the last years, we have constructed the Gini index and presented in Figure 2. The Gini index is the most common measure of seasonality used in tourism literature (Fernández-Morales, Cisneros-Martínez, & McCabe, 2016). The Gini measure of seasonality for market i (e.g., China) is defined as:

$$Gini_{i,t} = 1 + \frac{1}{n} - \frac{2}{n} \sum_{k=1}^n w_k S_{i,k,t} \quad (1)$$

where $Gini_{i,t}$ denotes the tourism concentration for market i in year t , n is the total number of months having guest overnight stays from market i , $S_{i,t,k}$ ($= S_{i,1}, S_{i,2} \dots$) is monthly share out of total overnight stays in year t , which are ranked descending according to their sizes, w_k ($= 1, 2, 3 \dots$) is the weight with the smallest one assigned to the month with the largest share, and the second smallest to the month with the second-largest share, and as so on.

A declining trend in the foreign tourist curve in Figure 2 shows, in general, the seasonal problem has been improved in the last ten years in the international tourist market sector. As consistent with what suggested by Figure 1, both Japanese and Chinese tourists are much more seasonal concentrated compared to the overall foreign market. Compared to the Japanese market, the

Figure 1. Seasonal pattern in the Norwegian tourism industry.



Chinese market is even more seasonal, with a higher Gini index. Nevertheless, an apparent phenomenon is shown that from 2005 and 2018, the seasonal concentration has been reduced in the Japanese market. For the Chinese market, a similar conclusion cannot be easily drawn since the Chinese curve moves up and down. However, there is a decreasing trend for seasonal concentration in the Chinese market in recent five years.

The projects taken by the Norwegian government and tourism industry to develop winter attractions and improve market strategy may have successfully attracted visitors in the winter season. Therefore, the seasonal variation has been generally reduced. However, in this study, we are interested in the research question that the trends of the seasonal concentration demonstrated in Figure 2 are somehow related to economic factors such as income and price.

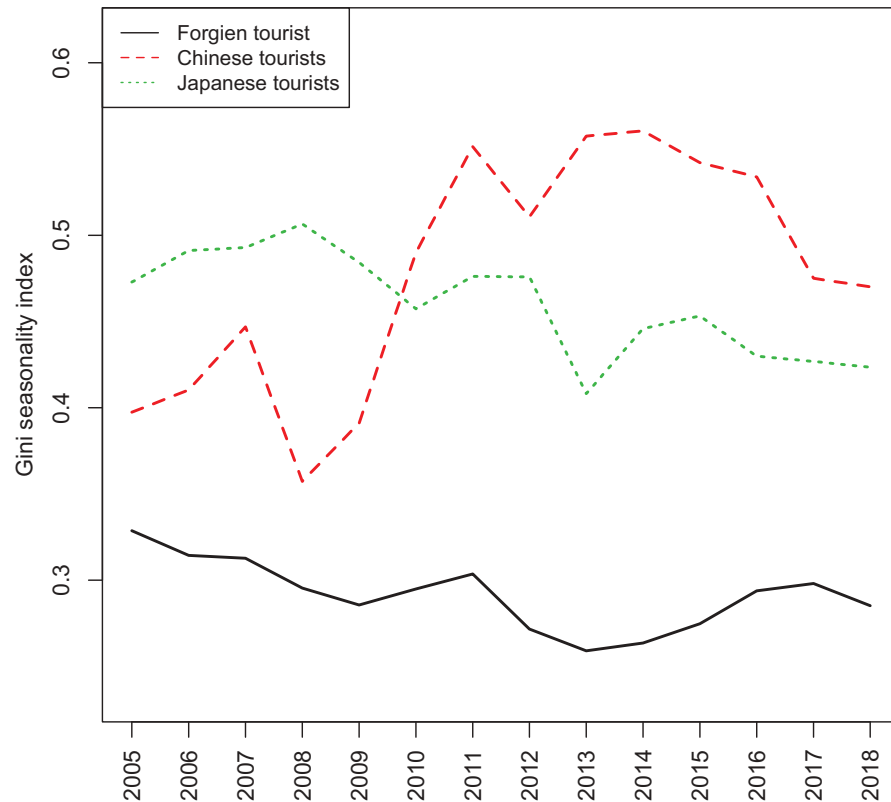
4. Data source and methodology

To estimate the economic determinates of tourism seasonality, we start with a basic demand model by following one of the most cited books on tourism demand modeling (Song & Witt, 2000).

$$\log Y_{i,t} = a_{i,0} + a_{i,1} \Delta \log Income_{i,t} + a_{i,2} CPI_{i,t} + a_{i,3} \log EX_{i,t} + a_{i,4} Trend + \sum_{k=2}^{12} b_{i,k} M_k + u_{i,t} \quad (2)$$

As summarized by Lim (1997) and suggested by Lin et al. (2015), in the literature, the international tourism demand model typically includes explanatory variables such as the income of source country (*Income*), the relative cost of a source country and destination country (*CPI*), and currency exchange rate (*EX*). The *Trend* variable is included in the specification to capture the preference changes in tourists from China and Japan. The monthly dummies (*M*) are set for months from February to December, with January being the base. In the equation, *i* stands for China (one model), and Japan (another model), Δ stands for the difference operator, \log represents

Figure 2. Change of seasonal concentration in the Norwegian tourism industry.



natural logarithm, and u is the error term. $Y_{i,t}$ denotes the number of overnight stays for the tourists from County i in month t .

As discretionary income is unobservable, researchers rely on personal, disposable, or national income, GDP, and GNP as a proxy of income. As we are to quantify the impact of economic determinants on monthly tourist arrivals, the monthly data is required. Since the national industrial production value is the only available measure of monthly income level at the country level, in this study, the income level is measured by monthly industrial production value (*Income*) of the source country, China and Japan.

The consumer price index (CPI) in the destination relative to the origin country affects goods and services tourists are likely to consume. The relative CPI is further adjusted by exchange rates between the destination and the origin (Lin et al., 2015). One implicit assumption imposed in this measure is that exchange rate movements indirectly affect tourism demand through price, implying that the relative price is homogenous in terms of foreign currency price, home currency price, and bilateral exchange rate. This homogeneity postulate is described as no “money illusion” (Kinnucan, 2004; Lim, 1997; Wilson & Takacs, 1979). However, in the short run, exchange movements are possibly different from market price movements, and consumers take relative prices and exchange rates into a separate account in their decision-making. The existence of money illusion indicates that exchange rate and relative price have different impacts on tourism demand (Culiuc, 2014; Nadal et al., 2004). Accordingly, the consumer price index of Norway relative to that of source countries is a proxy of the cost of tourist stay ($CPI_{i,t}$). Besides, the exchange rate (EX) is included in the model as an individual variable to catch how changes in Norwegian krone value directly affect tourism demand.

Since the determinants may have a lagged impact on tourism demand and tourists make their decision of overnight stays before they arrive at the destination, we use a 3-months moving average

for each explanatory variable in the specification. Finally, the dependent variable, the tourism demand, is represented by the number of overnight stays (Y) of tourists from the origin countries.

As discussed, *Income* is represented by the industrial production value and expressed in a first-difference logarithm. Thus, it measures economic growth, a standard method used in the literature (Kilian, 2009). The relative *CPI* is calculated by dividing the Norwegian CPI by CPI of Country i . *EX* is the ratio of the foreign currency unit (*FCU*) of krone value (*NOK*), i.e., FCU/NOK . An increase in *CPI* or *EX* thus indicates that travel costs for foreign tourists are raised. Therefore, the expected sign for the coefficients of *CPI* or *EX* is negative.

In order to test whether the impacts of the determinants of tourism demand vary across months, we modify the basic model by adding the interaction terms between monthly dummies and the determinants, one at a time. This leads to the following models:

$$\log Y_{i,t} = a_{i,0} + a_{i,1} \Delta \log Income_{i,t} + a_{i,2} CPI_{i,t} + a_{i,3} \log EX_{i,t} + a_{i,4} Trend + \sum_{k=2}^{12} b_{i,k} M_k + \sum_{k=2}^{12} c_{i,k} \Delta \log Income_{i,t} : M_k + u_{i,t} \quad (3)$$

$$\log Y_{i,t} = a_{i,0} + a_{i,1} \Delta \log Income_{i,t} + a_{i,2} CPI_{i,t} + a_{i,3} \log EX_{i,t} + a_{i,4} Trend + \sum_{k=2}^{12} b_{i,k} M_k + \sum_{k=2}^{12} e_{i,k} CPI_{i,t} : M_k + u_{i,t} \quad (4)$$

$$\log Y_{i,t} = a_{i,0} + a_{i,1} \Delta \log Income_{i,t} + a_{i,2} CPI_{i,t} + a_{i,3} \log EX_{i,t} + a_{i,4} Trend + \sum_{k=2}^{12} b_{i,k} M_k + \sum_{k=2}^{12} f_{i,k} \log EX_{i,t} : M_k + u_{i,t} \quad (5)$$

Equations (3)–(5) are extended equations with the interaction between monthly dummies and the determinant of income, relative CPI, and exchange rate, respectively. To illustrate how seasonal concentration is affected by an economic determinant, we take Equation (3) as an example. For Equation (3), if we temporarily ignore the other variables except for the one of interest (income), it is then reduced into Equation (6). The impact of income on tourist arrivals in a specific month k can be derived by Equation (7)

$$\log Y_{i,t} = a_{i,0} + a_{i,1} \Delta \log Income_{i,t} + b_{i,k} M_k + c_{i,k} \Delta \log Income_{i,t} : M_k \quad (6)$$

$$\frac{d \log Y_{i,t}}{d \Delta \log Income_{i,t}} = a_{i,1} + c_{i,k} \quad (7)$$

In Equation (7), d is the differential function. A joint significance of $(a_{i,1} + c_{i,k})$ indicates that change in income has a significant impact on tourist arrivals from country i in month k .

4.1. Data sources

This study uses monthly data on hotel overnight stays by tourists from China and Japan between 2015 to 2018. The overnight stays dataset is obtained from Statistics Norway (2019). Exchange rates data are from the Norges Bank (2019), the central bank of Norway. The World Bank (2019) provides the consumer price index data and industrial production values for China, Japan, and Norway.

The list of variables used in the analysis and descriptive statistics are presented in Table 1. As shown in the table, China has a higher average monthly economic growth rate than Japan. Norwegian CPI relative to Chinese CPI is lower than that relative to Japanese CPI. The comparative results reflect the actual economic situations in the two countries.

5. Empirical results

Tables 2 and 3 present the estimation results for China and Japan, respectively. For each country, there are four models. Model A is the basic model with the basic specification (Equation (2)). The basic model is modified by adding interactions between monthly dummies and income for Model

Table 1. Variable definition and statistic description

Variable	Definition	China		Japan	
		mean	SD	mean	SD
logY	Tourist overnight stays in logarithm form	8.721	1.283	8.676	0.927
$\Delta\log\text{Income}$	1st-difference of income variable	0.00763	0.03222	-0.000306	0.0241
CPI	The ratio of Norwegian CPI of CPI of the origin country	0.989	0.026	1.033	0.0707
logEX	The ratio of the foreign currency unit (FCU) of krone value (NOK)	0.033	0.185	2.744	0.142

B (Equation (3)), between monthly dummies and CPI for Model C (Equation (4)), and between monthly dummies and exchange rates for Model D (Equation (5)). The robust standard errors of the estimates are estimated for the inference of the estimated coefficients. The adjusted *R*-squared value ranges between 0.908 and 0.932 for the Chinese models and between 0.964 and 0.969 for the Japanese models. The great adjusted *R*-squared values indicate that a high share of the variation in tourist stays in Norway is accounted for by the variables included in the models, such as income, CPI, exchange rate, monthly dummies. Furthermore, for both countries, Model A, the basic model, has the lowest adjusted *R*-squared value. This indicates that modifying Model A by including interaction terms between tourism determinants and monthly dummies (Models B, C, and D) enhances the goodness of fit of the models.

As we discussed, the effect of an economic determinant in a specific month *k* is a sum-up of the estimated coefficient of the economic determinant and the estimated coefficient of the interaction between the economic determinant and the monthly dummy *k* (Equation (7)). This means the estimated coefficients of the interactions alone do not mean so much, and only the joint test of Equation (7) gives a precise measurement of the impact of economic determinants on monthly tourist arrivals. Thus, for the analysis of economic determinants on seasonal concentration, we focus on the test results presented in Table 4.

5.1. Estimation results for Chinese models

As we can see in Table 2, in Model A, the coefficient of $\Delta\log\text{Income}$ is not significant. However, both *CPI* and *logEX* are significant with a negative sign, as expected. Holding the other factors constant, we find Chinese tourists generally are not affected by changes in the level of income but are negatively affected by changes in the stay cost in Norway, as reflected by a high *CPI* or appreciated Norwegian currency. The results are consistent with the recent findings on Chinese tourists given by Xie and Tveterås (2019). Since $\Delta\log\text{Income}$ in Model B is not significant, the income growth does not affect Chinese arrivals in the base month, January.

For China, the test results demonstrate that income level affects the number of tourist arrivals in 5 months in a year. *CPI* and exchange rates, which reflect the relative costs in tourists' home countries and destination countries, are more influential compared to income. They affect Chinese tourist arrivals in almost every month. The statement is supported by the estimated results of *CPI* and the exchange rate in Table 4, which shows that in the Chinese equations, they are statistically significant almost every month at a conventional critical level.

Table 2. Estimation results for China

Variable	Model 1	Model 2	Model 3	Model 4
Intercept	23.0101*** [2.0825]	20.7722*** [1.6709]	20.5028*** [4.6704]	23.9488*** [1.7612]
$\Delta \log \text{Income}$	1.5754 [5.4803]	17.5212 [15.2438]	5.9457 [5.9325]	6.1473 [5.2223]
CPI	-16.9482*** [2.201]	-14.6284*** [1.7422]	-14.7056*** [4.8003]	-18.2156*** [1.832]
$\log \text{EX}$	-2.4091*** [0.3783]	-2.3104*** [0.3256]	-2.2839*** [0.3004]	-2.3532*** [0.7067]
M2	-0.0287 [0.1627]	2.4379*** [0.8686]	-7.0343 [6.3618]	-0.0015 [0.1438]
M3	0.0921 [0.2451]	-0.8818 [0.7925]	7.8032 [5.2583]	-0.0912 [0.2375]
M4	0.711** [0.2968]	1.0452* [0.5873]	7.0893 [4.9183]	0.9153*** [0.2804]
M5	1.8257*** [0.2989]	1.1899*** [0.2983]	3.769 [4.8365]	2.0549*** [0.2837]
M6	2.5775*** [0.3863]	1.577*** [0.2797]	-1.837 [4.6368]	2.911*** [0.3648]
M7	2.7914*** [0.4063]	2.4596*** [0.3591]	0.5137 [4.8282]	3.1318*** [0.3765]
M8	2.8346*** [0.3724]	1.5847*** [0.4233]	-0.7023 [4.6385]	3.1608*** [0.3503]
M9	2.414*** [0.3967]	2.075*** [0.3009]	4.6727 [5.0069]	2.7353*** [0.3788]
M10	1.6478*** [0.2994]	0.9895*** [0.2907]	11.3181** [5.1357]	1.8074*** [0.2719]
M11	0.6892* [0.3914]	0.5507* [0.3086]	21.0175*** [5.5407]	0.8457** [0.3297]
M12	0.5016 [0.4162]	0.2963 [0.3019]	7.3751 [5.2729]	0.8024** [0.3903]
Trend	2.3019***	2.1223*** [0.2615]	2.4748*** [0.2476]	2.4844*** [0.2264]
Interaction with monthly dummy		X = $\Delta \log \text{Income}$	X = CPI	X = $\log \text{EX}$
X : M2		-54.5024*** [17.9643]	7.1088 [6.468]	-1.647** [0.8435]
X : M3		-3.4439 [20.2077]	-7.9848 [5.4081]	0.711 [0.7431]
X : M4		-27.7727* [16.9479]	-6.2502 [5.0055]	0.416 [0.7344]
X : M5		-30.9439* [17.4006]	-1.7765 [4.9075]	-0.406 [0.7172]
X : M6		-61.6947*** [16.8105]	4.715 [4.7559]	-1.063 [0.7231]
X : M7		-26.0613	2.5719	-0.938

(Continued)

Table 2. (Continued)

Variable	Model 1	Model 2	Model 3	Model 4
		[28.3521]	[4.8793]	[0.7425]
X : M8		-41.0665**	3.8408	-0.981
		[18.3407]	[4.7433]	[0.7265]
X : M9		-12.6111	-2.0009	-0.366
		[16.7268]	[5.1533]	[0.7487]
X : M10		24.5029	-9.6036*	0.962
		[21.9731]	[5.2335]	[0.7836]
X : M11		42.6281	-20.3261***	2.713***
		[32.0795]	[5.6305]	[0.8581]
X : M12		0.896	-6.657	0.804
		[17.8728]	[5.3675]	[0.802]
Adj.R_square	0.9084	0.9264	0.9274	0.932

The vital issue in the study is whether tourists' response to economic changes is different in peak season and off-peak season. We further investigate the pattern of the test results between months. Table 4 shows the sum of $\Delta \log \text{Income}$ and its interaction with a monthly dummy is negative for February, June, and July (in the range of -43.0 and -72.1 in Table 4), and positive for October and November with a respective value 40.3 and 49.2 . Except for February, which is usually the month when the Chinese Spring festival is, the results suggest the economic growth spurs Chinese tourists in off-peak seasons (October and November) and reduces their outbound travel in two peak seasons (June and July). Thus, estimation results from Model B imply that Chinese economic development leads to a mitigation of tourism seasonality.

For Model C, the estimation of individual variable *CPI* has a significant impact on January, at the value of -14.7 . Although all the other 11 months respond significantly and negatively to an increase in *CPI*, the reduction varies across months. The most peak seasons, June, July, and August, respond weakly to *CPI* changes. For the off-peak months (e.g., October and November), the response is almost twice or even more of that in the peak season. The smaller response in the peak season for the Chinese arrivals, compared to the off-peak season indicates that a great Norwegian *CPI* relative to Chinese *CPI* would expand tourism seasonality.

Although *CPI* and exchange rates both affect the stay costs for tourists, their impacts on tourism seasonality are different, as reflected in both the estimation results of Models C and D and the test results in Table 4. The estimated coefficient of $\log EX$ is -2.35 (Table 2), the response of tourist arrivals in January, the base. The test results for the three peak months, June, July, August, show the reaction to the exchange rate in these months is significant, which is contrary to the result of *CPI* effects. Thus, devaluation of the exchange rate of the Norwegian currency (NOK) would reduce the degree of the seasonality for the tourists from China and probably from other emerging markets as well. This also means the weakening NOK will enlarge seasonal concentration.

5.2. Estimation results for Japanese models

For Japan, the estimation results of Model A in Table 3 demonstrate that, regardless of the various impacts on tourist arrivals by month, $\Delta \log \text{Income}$ is significant and positive. Economic growth leads to an increase in total tourist arrivals in Norway. Both *CPI* and exchange rates are insignificant, indicating that Japanese tourists generally is not sensitive to changes in *CPI* or exchanges. This is very different from the findings of Model A for China, which shows that Chinese tourists respond negatively to *CPI* and exchange rates, two components of stay costs.

Table 3. Estimation results for Japan

Variable	Model 1	Model 2	Model 3	Model 4
Intercept	7.4773*** [2.5512]	8.8088*** [1.6709]	5.3148** [2.4953]	7.9662*** [2.5004]
$\Delta \log \text{Income}$	2.0948** [0.8979]	17.5212 [15.2438]	1.199 [0.8836]	2.5819*** [0.8841]
CPI	0.6962 [2.346]	-14.6284*** [1.7422]	2.8505 [2.2924]	1.2781 [2.3488]
$\log \text{EX}$	-0.1213 [0.1824]	-2.3104*** [0.3256]	-0.1097 [0.1714]	-0.4886** [0.2326]
M2	0.2944*** [0.0689]	2.4379*** [0.8686]	-0.0124 [0.6091]	-0.5182 [0.8715]
M3	0.1571** [0.0779]	-0.8818 [0.7925]	-0.077 [0.7373]	0.8243 [1.0727]
M4	0.0314 [0.0712]	1.0452* [0.5873]	0.6519 [0.8312]	-0.7521 [1.1044]
M5	1.4096*** [0.0723]	1.1899*** [0.2983]	3.4569*** [0.9817]	0.0685 [0.9824]
M6	2.1343*** [0.0669]	1.577*** [0.2797]	4.6645*** [0.5775]	-0.4531 [0.8774]
M7	2.2005*** [0.0738]	2.4596*** [0.3591]	4.8921*** [0.4853]	-0.1837 [0.7621]
M8	2.137*** [0.0608]	1.5847*** [0.4233]	4.6227*** [0.533]	0.0713 [0.7376]
M9	1.6127*** [0.0653]	2.075*** [0.3009]	3.4295*** [0.7475]	0.8252 [0.9526]
M10	0.7468*** [0.055]	0.9895*** [0.2907]	2.701*** [0.477]	-0.5806 [0.7427]
M11	-0.0194 [0.0768]	0.5507* [0.3086]	0.8402 [0.63]	-0.2074 [0.8861]
M12	-0.044 [0.0717]	0.2963 [0.3019]	-0.4411 [0.6585]	0.1457 [0.9296]
Trend	-0.185 [0.2615]	2.1223*** [0.2615]	-0.4099 [0.4978]	-0.325 [0.5249]
Interaction with monthly dummy		X = $\Delta \log \text{Income}$	X = CPI	X = $\log \text{EX}$
X : M2		-54.5024*** [17.9643]	0.3059 [0.6136]	0.2947 [0.3118]
X : M3		-3.4439 [20.2077]	0.2604 [0.7378]	-0.2515 [0.3851]
X : M4		-27.7727* [16.9479]	-0.5818 [0.8146]	0.2804 [0.3964]
X : M5		-30.9439* [17.4006]	-1.9812** [0.9565]	0.4864 [0.3518]
X : M6		-61.6947*** [16.8105]	-2.4526*** [0.5591]	0.9386*** [0.3087]

(Continued)

Table 3. (Continued)

Variable	Model 1	Model 2	Model 3	Model 4
X : M7		-26.0613	-2.5659***	0.8577***
		[28.3521]	[0.4754]	[0.2696]
X : M8		-41.0665**	-2.3839***	0.7471***
		[18.3407]	[0.5217]	[0.2622]
X : M9		-12.6111	-1.7348**	0.2821
		[16.7268]	[0.7166]	[0.3489]
X : M10		24.5029	-1.8751***	0.4808*
		[21.9731]	[0.4714]	[0.2675]
X : M11		42.6281	-0.7944	0.0592
		[32.0795]	[0.6135]	[0.3104]
X : M12		0.896	0.3917	-0.0746
		[17.8728]	[0.6453]	[0.3314]
Adj_R_square	0.9637	0.9264	0.969	0.9643

Table 4. Test results of monthly impacts

Month	China			Japan		
	Income	CPI	EX	Income	CPI	EX
January	1.5754	-14.86 *	-2.353***	3.599***	2.85	-0.49**
February	-72.158****	-7.60 ***	-4.000***	5.416***	3.16	-0.19
March	-4.016	-22.69 ***	-1.642***	3.811*	3.11	-0.74**
April	10.373	-20.96 ***	-1.937***	6.013*	2.27	-0.21
May	-24.960	-16.48 ***	-2.759***	-4.247	0.87	0.00
June	-43.977***	-9.99 **	-3.416***	-4.662*	0.40	0.45
July	-58.363*	-12.13 ***	-3.291***	-1.676	0.28	0.37
August	-21.547	-10.86 ***	-3.334***	0.723	0.47	0.26
September	6.110	-16.71 ***	-2.719***	-1.303	1.12	-0.21
October	40.323***	-24.31 ***	-1.391**	-1.525	0.98	-0.01
November	49.255**	-35.03 ***	0.360	6.478*	2.06	-0.43
December	22.758	-21.36 ***	-1.549***	4.880**	3.24	-0.56

Model B reports the results for economic growth on seasonal arrivals of the Japanese tourists. It shows tourist arrivals from November to April, the off-peak season, are positively affected by economic growth, with values from 3.81 (for March) to 6.48 (for November). In summer peak months (July and August), the Japanese arrivals are not affected by their income growth, while the third peak month (June) is negatively affected. The F-test results of the sum of individual *CPI* and its interaction with monthly dummies in Table 4 show that none of the test results is significant. Thus, *CPI* does not affect the Japanese tourism demand in general and by month. After controlling for the monthly impact of exchanges, individual *EX* (for the base, January) in Model D becomes significant and negative. For other monthly effects, only march is negatively affected by an appreciated Norwegian currency. Thus, only two off-season months respond negatively to tourist stay costs.

6. Discussion

Seasonality is one of the main challenges to the sustainable development of the tourism industry globally. In our case study of the Norwegian tourism industry, tourism demand is highly skewed toward the summer season. A critical problem to be solved in both academy and practice is to find

the causes and solutions of the seasonal concentration. Our study discusses that besides the well-recognized climate and institutional reasons, economic factors are important in determining the seasonal pattern in a tourism destination since tourists respond differently to the cost margin between peak and off-peak seasons according to their economic conditions.

Empirically, we find the income factor is important in affecting seasonal patterns. Both the Chinese and Japanese tourists would visit Norway more in the winter season when their incomes increase. This result is consistent with the findings given by Turrión-Prats and Duro (2018) that economic growth is associated with concentration reduction. The reason might be, as discussed by Nadal et al. (2004), high-income people are less constrained by the institution feathers and have more freedom in deciding their holidays. Comparing these two countries, we find that Japanese tourists are less sensitive to changes in incomes than Chinese tourists.

For a destination firm, tourist income is an uncontrollable variable as it is determined by the economic development of the source country where tourists come. However, price is definitely under the firm's control. In this empirical study, both the results of CPI and exchange rates suggest the Chinese tourists are sensitive to price changes. The result of CPI suggests enlarging price margins in summer and winter can significantly attract Chinese tourists to visit Norway in winter. This might be explained by the facts that flight ticket for traveling between China and Norway is much more expensive in summer peak season than winter and flight ticket accounts for a significant share of the Chinese tourists' total costs due to the long distance. Interestingly, the effect of the exchange rates is opposite to that of CPI. The exchange rates result suggests when the Norwegian kroner is depreciated, which means it becomes cheaper for the Chinese tourists to travel to Norway both in the peak season and off-peak season, the Chinese tourists will increase their travels in the peak season. This result is again consistent with the finding given by Turrión-Prats and Duro (2018). They suggested "a rise in the value of foreign exchange increase seasonality (p. 30)". Turrión-Prats and Duro (2018) explained this phenomenon as that the reduced cost as a result of weaker destination currency encourages demand associated with low- to medium income tourists who typically want to travel in the peak season.

The study suggests that compared to China, the economic determinants are less critical in affecting the seasonal arrivals of Japanese tourists. Specifically, income does affect Japanese tourists' arrivals in some months, while CPI and exchange rate have very marginal effects. Considering China is characterized by having a lower average GDP per capita than Japan, the result makes sense since people with low income are, in general, more sensitive to price change than those with high incomes.

7. Conclusions

The empirical results in the study suggest that, besides climate and institutional reasons, economic factors such as income, CPI, and exchange rate affect tourism seasonality in general. The comparative results of the Japanese and Chinese tourists in Norway indicate that the mitigating effect of economic growth on tourism seasonality is parallel to the level of development. This is in line with the expectation that global tourism seasonality due to tourists from emerging markets may debilitate as these countries keep up with a growth rate in the future.

The results also support the idea that tourists' responses to economic change in peak seasons differ from their reactions in off-peak seasons. High-income people are generally less sensitive to price changes in peak seasons. As a result, besides climate and institutional reasons, further research should be carried out to investigate the economic determinants in seasonal tourism concentration. This knowledge is necessary and useful for governments and industry to gain an insight into future trends in economic development and the resulted distribution of tourist arrivals, as proposed by Nadal et al. (2004) and Turrión-Prats and Duro (2018). The results are also crucial for destination firms to use economic measures such as price discrimination in reducing the peak

season problems. Different pricing strategies should be taken to different market segments and in different seasons.

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Note

1. Innovation Norway is the Norwegian government's most important organization for innovation and development of Norwegian industry <https://www.innovasjon Norge.no/en/start-page/>.

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