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Abstract

Services have distinct characteristics of simultaneous production and consumption. As a result, capacity utilization is an important measure for evaluating the productivity of service industries. This study quantitatively analyzes the effect of foreign tourists on the occupancy rate of the accommodation industry. The major findings of the analysis are as follows. First, recent depreciation of the yen has contributed significantly to the increase in the number of overseas visitors. Second, the increase in visitors from foreign countries has a positive impact on the occupancy rate of accommodation facilities through temporal smoothing of demand. Third, solely from this demand-smoothing channel, the total factor productivity of the accommodation industry has improved by around one percentage point. These results suggest that policies to increase the number of visitors from foreign countries are effective for improving service sector productivity, as well as boosting external demand.

Keywords: Accommodation industry, Foreign tourist, Exchange rate, Room occupancy rate, Productivity

JEL Classifications: D24, F61, L83

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Foreign Tourists and Capacity Utilization in the Accommodation Industry

1. Introduction

Increasing the productivity of the service industry is a key economic policy issue. The Japanese government has set a numerical target of raising the labor productivity of the service industry by 2% (Service Industry Challenge Program). Unlike manufacturing sector, most service industries are characterized by simultaneous production and consumption. Thus, temporal smoothing of demand contributes to the measured productivity of service industries (Morikawa, 2012). In addition, the density of economic activity of the local area in which services firms and establishments are located has a strong impact on their productivity performance (Morikawa, 2011).

The tourism industry, however, has different characteristics. In this industry, customers themselves go to the place where the service is produced and consume the service there. If a local area is highly attractive as a tourist destination, it could draw visitors from far away—from both the home country and abroad. In other words, the accommodation industry, a core part of the tourism industry, is a unique service industry in that it has a high level of tradability: it can bring in revenue from outside the region or country.

The fact that export volumes of manufactured products have struggled to grow in spite of the depreciation of the yen, which began in the latter half of 2012, has been a cause for concern among policymakers. However, the number of foreign tourists has increased significantly in that time, helping to improve Japan's travel balance. According to my rough estimate, the elasticity of travel receipts to the exchange rate is -3 and about -2 on a quantitative basis, as seen from international balance of payments statistics. Such levels of elasticity are very high. According to the Number of Foreign Visitors to Japan (Japan National Tourism Organization: JNTO), more than 19 million foreign tourists visited Japan in 2015. Consumption expenditure by foreign tourists in Japan rose quickly as a result. Estimates in the Consumption Trend Survey for Foreigners Visiting Japan (Japan Tourism Agency, JTA) indicate that such expenditure climbed to 3.5 trillion yen in 2015.

Meanwhile, expanding the number of foreign tourists in Japan has been a key pillar in the government's economic growth strategy. The Japan Revitalization Strategy of 2013 aimed to attract 20 million foreign tourists to Japan and to grow this number to more than 30 million by

2030. The 2015 Action Program toward the Realization of Japan as a Tourism-oriented Country sets a target of annual consumption by foreign tourists in Japan of 4 trillion yen. About 30% of the consumption expenditure foreign tourists make in Japan goes to pay for accommodation. Thus, the accommodation industry benefits greatly from the rapid increase in the number of foreign tourists.

According to the Economic Census for Business Activity in 2012 (Ministry of Internal Affairs and Communications), the accommodation industry employs 698,000 people across Japan and accounts for 1.3% of all private workplaces. The industry has 4.4 trillion yen in net sales with 1.6 trillion yen in value-added. However, according to the Japan Industry Productivity Database (Research Institute of Economy, Trade and Industry), total factor productivity (TFP) of the industry has been on a long-term declining trend, falling at an annual rate of -0.3% between 1970 and 2012.¹ Although the demand density of a region has a major impact on measured productivity in the service industry, temporal demand fluctuation has a similar impact. According to an empirical analysis focusing on the personal service industry, the greater a business's seasonal variation in demand and the greater the disparity between its weekday and weekend demand are, the lower is its measured productivity (Morikawa, 2012).

The role of information technology (IT) in raising productivity is an issue that researchers have addressed with great interest in recent years (e.g., Jorgenson, 2001; Stiroh, 2002; Brynjolfsson and Hitt, 2003; Jorgenson and Motohashi, 2005; Fueki and Kawamoto, 2009). Research on the transportation industry in particular has shown that the use of IT has a major positive effect on capital utilization rates (Hubbard, 2003; Barla *et al.*, 2010; Dana and Orlov, 2014). This research suggests that the effect IT has on productivity in the service industry is explained largely as an increase in capital utilization rates. It is important to focus on capital utilization rates when analyzing the productivity of the service industry.

Against this background, the present study quantitatively analyzes the effect that foreign tourists to Japan have on the accommodation industry's capacity utilization rate and room occupancy rate. The study first estimates the effect the exchange rate has on the total number of foreigner guest-nights in accommodation. Second, it estimates the effect of the ratio of foreigner guest-nights to total guest-nights at accommodation facilities on the room occupancy rate and

¹ A comparison of the rate of growth in TFP, converted to a yearly basis, between 1987 and 2007 in the accommodation and restaurant industries, as based on the EU KLEMS database, shows a rate of -0.5% for Japan, while there was positive growth of 0.7% in the US. However, in several other countries, the rate was negative: -1% in the UK, -0.3% in Germany, and -0.6% in France.

capacity utilization rate.² In calculating these figures, I use monthly panel data for each type of accommodation facility in each prefecture of Japan for the period from April 2010 to December 2014 taken from the Accommodation Survey (JTA).

Any increase in the number of foreign tourists has a direct impact, that is, the total number of guest-nights in accommodation facilities rises. However, if the temporal accommodation patterns of non-Japanese guests are the same as those of Japanese guests, it is necessary to increase capacity to satisfy peak demand, which in the medium- to long-term, decreases and offsets the positive impact on room occupancy rates. Actually, because the accommodation patterns of non-Japanese guests differ from those of Japanese guests, even with no change in total guest-nights, there is a possibility that the demand-smoothing effect could have an additional positive effect on room occupancy rates. This is because if demand variation for Japanese and non-Japanese combined guests were to level out, the average occupancy rate would rise.

According to the analysis of this study, the depreciation of the Japanese yen since the latter half of 2012 has made a large contribution to increasing foreign tourists. Moreover, the rise in the number of foreign guests has increased guest-nights and helped smooth demand, which has had a major positive effect on room occupancy rates and capacity utilization rates in the accommodation industry. This may result in boosting the measured TFP for the accommodation industry by more than 1 percentage point.

The remainder of this paper is structured as follows. Section 2 provides an overview of the Accommodation Survey used in the analysis of this paper, and explains the method of analysis. Section 3 outlines trends in the numbers of foreign guests in Japan and measure the relationship between exchange rates and number of foreigner guest-nights. Section 4 reports the estimation results of the relationship between the ratio of foreigner guest-nights on the one hand and the accommodation industry's room occupancy rate and capacity utilization rate on the other. Finally, Section 5 summarizes the conclusions and discusses policy implications.

2. Data and Method

² Here, capacity indicates the number of guests a facility can accommodate at one time.

This study uses almost 5 years of monthly data from April 2010 to December 2014 of the Accommodation Survey.³ The purpose of the survey is to track the actual conditions of accommodation throughout Japan and provide basic data for tourism policy. In earlier years, the survey covered only accommodation facilities with at least 10 employees, but the scope of the survey was expanded in April 2010 to cover all accommodation facilities, even those with fewer than 10 employees.⁴ Major survey items include total number of guests, total foreigner guest-nights, breakdown of total number of foreign guests by nationality, and number of guest rooms used.⁵ The results of the survey, which include room occupancy rates and capacity utilization rates, are publicly available and broken down by prefecture in Japan and type of accommodation facility (*ryokan* inns, resort hotels, business hotels, city hotels, etc.). This study uses the publicly available data to construct panel data by prefecture and type of accommodation facility and uses the panel data for the empirical analysis. The items used from the Accommodation Survey include room occupancy rate, capacity utilization rate, prefecture, type of accommodation facility, season (month), total number of guests, and of those, total foreigner guest-nights.

The relationship between the exchange rate and number of foreigner guest-nights is observed prior to performing occupancy rate analysis. Specifically, an estimate with the prefecture \times type of accommodation facility fixed effects (with the prefecture fixed-effects in estimations by type of accommodation facility) is made to measure the elasticity of total number of foreigner guest-nights (logarithm) with respect to the real effective exchange rate (logarithm), and the effect of the weak yen of recent years is evaluated quantitatively. The number of days of each month is used as a control variable.

Next, the relationship between number of foreigner guest-nights and occupancy rate is estimated. Specifically, I run a fixed-effects estimation in which the room occupancy rate and capacity utilization rate are dependent variables and total number of guest-nights inclusive of both Japanese and foreigners (logarithm), the ratio (percentage) of foreigner guest-nights (the

³ One example of prior research using this data is Tanaka (2013). A gravity model was used to analyze determinants of the number of guest-nights of foreign tourists in each prefecture.

⁴ However, only a sampling is taken of small- and medium-sized lodging facilities rather than doing a 100% survey. While 100% of facilities with 10 or more employees are surveyed, one-third of facilities with five to nine employees are sampled and one-ninth of facilities with fewer than five employees are sampled.

⁵ The total number of guests is defined as the “aggregate number of guests each day during the month.” Foreign guests are defined as “guests who do not maintain a residence in Japan.”

ratio of stays by foreigners to total guest-nights), the number of days each month, and the prefecture \times type of accommodation facility fixed effects are used as explanatory variables. The baseline equation to be estimated is expressed as follows.

$$y = \alpha \ln(\text{total guest-nights}) + \beta \text{ratio of foreigner guest-nights} \\ + \gamma \text{number of days in the month} + \lambda + \varepsilon \quad (1)$$

where, the dependent variable (y) is the room occupancy rate, alternatively the capacity utilization rate, and λ represents the prefecture \times type of accommodation facility fixed effects (the prefecture fixed effects in estimations by type of accommodation facility). In other words, the equation allows for unobserved prefecture and type of accommodation facility characteristics, and controls for the number of guest-nights, which fluctuates temporally in each region and type of accommodation facility, to estimate the effect of the ratio of foreigner guest-nights on room occupancy rates and capacity utilization rate.

The major variables used in equation (1) and descriptive statistics are presented in Table 1. The major variables—room occupancy rate, capacity utilization rate, and ratio of foreigner guest-nights—all have reasonable amounts of variations.

3. Trends in Exchange Rate and Number of Foreign Guests

The total number of foreigner guest-nights in all facilities was 2.71 million in April 2010, but fell to about 500,000 in April 2011 immediately after the Great East Japan Earthquake, and since then, has been on a rising trend. The ratio of total guest-nights accounted for by foreigners similarly bottomed out at 2.0% in April 2011 before rising to 11.1% in March 2015. The rate of contribution of foreign tourists to the growth in total guest-nights between 2011 and 2014 was 48%. During the same period, the annualized growth rate in total number of foreigner guest-nights by type of accommodation facility was very strong: about 30% or even higher in each type of facility. Specifically, the growth rate at *ryokan* inns was 47.6%, at resort hotels 39.0%, at business hotels 37.7%, and at city hotels 29.2%. By prefecture, however, there was a great deal of variation in the rate of growth in the number of foreigner guest-nights between 2011 and 2014, from 1.4% annually in Oita Prefecture to 70.3% annually in Gifu Prefecture.

Along with this increase in foreign guests, the room occupancy rate and capacity utilization rate were both on a rising trend. The room occupancy rate for all facility types combined rose 6.6 percentage points, from an average of 51.8% in 2011 to 58.4% in 2014. The capacity utilization rate rose 4 percentage points in the same period, from 34.3% to 38.3%. Viewed by prefecture, the room occupancy rate rose in 41 of the total 47 prefectures.

Next, I performed regression analysis on the relationship between the exchange rate and total number of foreigner guest-nights. A fixed-effects estimate was made of the total number of foreigner guest-nights (logarithm), including the real effective exchange rate (logarithm), month dummies, and prefecture \times type of accommodation facility fixed effects. The result indicates that when all types of accommodation facilities are pooled together, the elasticity of the number of foreigner guest-nights to the real effective exchange rate is about -1.89 (Table 2). This result is nearly the same as the long-term (January 2003 to April 2015) elasticity of the number of foreign visitors to Japan to the real effective exchange rate (-1.94). In other words, the trend is true not only when the yen depreciates as it has in recent years; the numbers remain consistent over the long term, including when the yen is both strong and weak. Estimates by type of accommodation facility show a high level of elasticity for *ryokan* inns (-2.54) and resort hotels (-2.28), suggesting that visitors from foreign countries who visit Japan for tourism purposes are more sensitive to exchange rate fluctuations than are business travelers.⁶

Calculating the total number of guest-nights by Japanese in the same way indicates an elasticity of -0.26 for all types of accommodation facilities together. The absolute value of this is much smaller than the elasticity for foreign tourists, but it is still a statistically significant negative value (column (2) of Table 2). This result suggests the possibility that Japanese tourists also switch between domestic and overseas travel, depending on the exchange rate, in that a weak yen makes Japanese tourists cut back on travel abroad and travel more within Japan.⁷

While some concern has been expressed that exports of manufactured products are not growing much in spite of the yen's depreciation, the weak yen could expand service exports in the form of increasing numbers of foreign tourists.

⁶ According to Witt and Witt (1995), the elasticity of international tourists to the exchange rate is 0.6 to 2.3, with a median of 1.8. The estimates in this study are consistent with prior research.

⁷ However, if the same estimation is conducted by type of lodging facility, the elasticity for *ryokan* inns and resort hotels is statistically insignificant.

4. Foreign Tourists and Capital Utilization

In this section, I estimate the effect that the growing number of foreign guests has on the accommodation industry's room occupancy rate and capacity utilization rate. For the accommodation industry, the benefit from foreign tourists is not only a simple quantitative effect of increasing guest-nights, but the fact that the temporal pattern of demand from foreign tourists differs from that from Japanese guests. Many Japanese tourists travel at the same time as each other, during holidays comprising consecutive days, including weekends and national holidays. Foreign tourists, on the other hand, are not affected by Japan's holiday patterns. With regard to seasonal patterns, guest-nights by Japanese tourists peak strongly in August, while foreigner guest-nights have smaller peaks in April, July, and October. This is one way in which the seasonal patterns differ. Moreover, the average number of guest-nights, found by dividing the total guest-nights by number of guests, is 1.46 for foreigners and 1.29 for Japanese. That is, foreigners stay for more consecutive nights, and this helps to smooth out occupancy rates.

A regression equation is used to explain room occupancy rates with the ratio of foreigner guest-nights, and the results are shown in Table 3. Using pooled data for all types of accommodation facilities, an estimate that includes the prefecture \times type of accommodation facility fixed effects shows that the coefficient for the ratio of foreigner guest-nights is a significant positive figure. The relationship is that, as the number of foreigner guest-nights increases, room occupancy rates rise. Quantitatively, a 1-percentage point increase in the ratio of foreigner guest-nights leads to an approximately 0.2-percentage points increase in the room occupancy rate. This indicates that foreign tourists help to smooth out occupancy rates. Because the estimation method is a simple fixed-effect estimate, the result cannot be interpreted as an indication of causality, but it is largely inconceivable that there is reverse causality running from room occupancy rates to number of foreigner guest-nights. It is plausible that changes in the exchange rate, the easing of the process of obtaining visas for Japan, and a variety of public relations campaigns have resulted in exogenous changes in the number of foreign tourists staying at accommodations facilities, and that the causality runs from the increase in foreign tourists to room occupancy rates.

Estimating by type of accommodation facility, the ratio of foreigner guest-nights is significantly positive for all types except resort hotels. The size of the coefficient is somewhat large for business hotels, but is also above 0.2 for *ryokan* inns and city hotels. In other words,

assuming there is no change in the total guest-nights, including those by Japanese tourists, an increase of 1 percentage point in the ratio of foreigner guest-nights increases the room occupancy rate by more than 0.2 percentage points. Calculating the effect on occupancy rates when the ratio of foreigner guest-nights rises by one standard deviation, the room occupancy rate for all types of accommodation facilities rises by about 1.2 percentage points. Calculation of the same for each individual type of accommodation facility shows the largest increase is at city hotels (2.5 percentage points), which have a large standard deviation for the ratio of foreigner guest-nights, and about 0.9 percentage points at *ryokan* inns and business hotels.

Any increase in room occupancy rates has the effect of raising measured productivity. Unfortunately, the publicly available data from the Accommodation Survey do not include measure of labor input. For that reason, I have to depend on assumptions about the effect on TFP, specifically, how elastic labor input is to fluctuations in the number of guests. If assuming that labor input is fixed, an increase of one standard deviation in the ratio of foreigner guest-nights would lead to a rise of about 1.2 percentage points in TFP. Conversely, if assuming that labor input is completely flexible, the measured effect on TFP would be at roughly 0.4 percentage points, because the effect of any increase in room occupancy rates would be limited to its effect on capital contribution.⁸ My conjecture is that the number and work hours of staff attending to guest rooms are somewhat flexible in relation to temporal fluctuations in the number of guests, but labor input for maintenance and management does not change much even if there are vacant rooms. Therefore, the reality would seem to be somewhere between the two scenarios. Moreover, these calculations do not include the effect of increases in total guest-nights, and thus, the effect of increases in foreign tourists as a whole should be even larger. In other words, the effect on measured TFP of rising occupancy rates as a result of increasing numbers of foreign tourists would be quantitatively large.

Table 4 shows the results of a similar estimate using the capacity utilization rate as the dependent variable. When a single guest stays in a two-person guest room, the room occupancy rate rises by one room but the capacity utilization rate rises only by 0.5 guests. For that reason, these results differ from the capacity utilization rate owing to differences in guest capacity per room and group size patterns of foreign tourists.

Considering the total for all types of accommodation facilities, the coefficient for the ratio of

⁸ I calculated capital contribution by using the figure for the accommodation industry (31.6%) from the 2011 Input–Output Tables for Japan.

foreigner guest-nights is about 0.10, meaning that if the ratio of foreigner guest-nights were to rise by one standard deviation, the capacity utilization rate would rise by about 0.6 percentage points. Quantitatively, this is somewhat smaller than the result for room occupancy rate. This difference is possibly because relatively fewer foreign guests stay together in the same guest room than do Japanese guests. An estimate by type of accommodation facility indicates that the coefficient for the ratio of foreigner guest-nights is negative at resort hotels, but is a significant positive value for *ryokan* inns, business hotels, and city hotels. Similar to the results for room occupancy rate, there is a relatively large effect for city hotels and business hotels when the ratio of foreigner guest-nights rises by one standard deviation. As for *ryokan* inns, the effect of the ratio of foreigner guest-nights is comparatively smaller on capacity utilization rate than it is on room occupancy rate. This is possibly because relatively fewer foreign guests stay in the same guest room.

The results in this section are estimates based on monthly data and therefore, do not include any seasonal variation smoothing effect for demand. Since seasonal patterns in the number of guest-nights are different for foreign versus Japanese tourists, the effect on average occupancy rate throughout the year may be even larger. Although the sample period is rather short, Tables 5 and 6 show the results of a similar analysis using 4 years of annual data (2011–2014). Estimation results for room occupancy rate show a coefficient of about 0.30 for the ratio of foreigner guest-nights when all types of accommodation facilities are pooled together, which is relatively large compared to the estimates from monthly data (about 0.19). This suggests that increases in foreign tourists not only smooth out demand within daily and weekly frequencies but also seasonally. Based on the coefficients estimated from annual data, an increase of one standard deviation in the ratio of foreigner guest-nights would have an effect of 0.6–1.9 percentage points on measured TFP, depending on the facility types. The effect of the increase in the ratio of foreigner guest-nights for the 3-year period of 2011 to 2014 on TFP is roughly estimated at 0.5–1.6 percentage points.

Considering the results by type of accommodation facility, for business hotels, the estimated coefficient based on yearly data is larger than that for monthly data. For resort hotels, the coefficient based on monthly data is insignificant, but the coefficient based on yearly data is a significant positive figure. This can be interpreted as foreigners having a considerable seasonal demand smoothing effect for these facilities. At city hotels, on the other hand, the coefficient for the ratio of foreigner guest-nights based on yearly data is statistically insignificant at the 10%

level, meaning that foreign tourists do not have a seasonal variation smoothing effect in this case, but rather that many foreign guests stay in city hotels during the same seasons as many Japanese guests.

The analysis in this section describes the relationship between the physical input (number of guest rooms and guest room capacity) and output (number of guests). In reality, higher occupancy rates lead to rising service prices, and thus, there is a strong possibility that the effect of higher occupancy rates is greater for the accommodation industry's profitability than its productivity.

5. Conclusions

The service industry, characterized by simultaneous production and consumption, does not have the buffer of inventory and thus, cannot easily take advantage of production smoothing. Therefore, capacity utilization rate is a very important performance indicator when considering the productivity and profitability of the service industry. The number of foreign tourists visiting Japan has risen sharply in recent years, leading to large increases in occupancy rates in the accommodation industry. This study quantitatively analyzes the effect that foreign tourists in Japan have on the accommodation industry's room occupancy rate and capacity utilization rate.

The analysis results can be summarized as follows. First, the depreciation of the Japanese yen in recent years has made a significant contribution to increasing the number of foreign guests in accommodation facilities. Second, the rise in the number of foreign guests has had a direct quantitative effect by increasing guest-nights. In addition, it has helped smooth demand, thereby having a positive effect on occupancy rates in the accommodation industry. As a result, the growing number of foreign guests seems to have had a relatively large positive effect on the measured productivity of the accommodation industry. Third, this effect varies by type of accommodation facility.

These results mean that the effect of yen depreciation on export volumes applies not only to manufactured product exports but also to service exports, in the form of rising numbers of foreigners visiting Japan. The results suggest that increasing the number of foreign tourists, a top priority of Japan's recent growth strategy, not only means creating external demand in this age of the service economy, but is also a useful policy in terms of enhancing the productivity of

the service industry. A shortage of accommodation facilities has become apparent already in some large cities. If the number of foreign tourists continues to grow and the supply of accommodation services further tightens, new accommodation facilities would eventually need to be built and capital investment undertaken by expanding the number of guest rooms. Thus, the rising number of foreign tourists has the potential to generate additional growth of aggregate demand.

The analysis in this study uses publicly available panel data aggregated by prefecture and by type of accommodation facility, and micro data at the level of individual accommodation facilities are not used for the analysis. In addition, since there are no data on labor inputs, the analysis of productivity is only an indirect one. Analysis based on the micro data of the Accommodation Survey would be effective for overcoming these limitations and should be a future research topic.

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Table 1 Summary Statistics

	Mean	Std. Dev.	Std. Dev. (within)
Total guest-nights	488,435	2,413,533	397,606
Foreigner	33,703	187,091	63,673
Japanese	454,733	2,248,620	369,998
Room occupancy rate	48.06	18.64	9.47
Capacity utilization rate	36.33	17.65	8.35
Percentage of foreigner guest-nights	4.07	6.13	3.06
Real effective exchange rate	90.97	11.89	11.89

Notes: The figures are calculated using panel data constructed from the Accommodation Survey (JTA) from April 2010 to December 2014. The effective exchange rate is taken from the website of the Bank of Japan.

Table 2 Elasticity of the Number of Guest-nights to the Real Effective Exchange Rate

	(1) Foreigner guest-nights	(2) Japanese guest-nights
All types	-1.888 *** (0.119)	-0.261 *** (0.069)
<i>Ryokan</i> inns	-2.540 *** (0.179)	0.000 (0.064)
Resort hotels	-2.276 *** (0.306)	0.025 (0.190)
Business hotels	-1.880 *** (0.154)	-0.653 *** (0.065)
City hotels	-1.578 *** (0.209)	-0.280 *** (0.074)

Notes: Fixed-effects estimates with robust standard errors in parentheses. ***: $P < 0.01$, **: $P < 0.05$, *: $P < 0.1$. The sample period is from April 2010 to December 2014. The number of days of each month is used as a control variable.

Table 3 Foreigner Guest-nights and Room Occupancy Rate

	(1) All types		(2) Ryokan inns		(3) Resort hotels		(4) Business hotels		(5) City hotels	
Total number of guest-nights	12.888	***	22.305	***	17.405	***	31.616	***	22.430	***
(logarithm)	(1.093)		(1.286)		(2.057)		(1.641)		(2.449)	
Ratio of foreigners	0.192	***	0.221	***	0.003		0.298	*	0.265	***
	(0.062)		(0.077)		(0.095)		(0.150)		(0.062)	
Observations	13,572		2,736		2,736		2,736		2,736	
R ² (within)	0.2896		0.6605		0.4326		0.5986		0.4214	

Notes: Fixed-effects estimates with robust standard errors in parentheses. ***:P<0.01, **: P<0.05, *: P<0.1. The sample period of the monthly data is from April 2010 to December 2014. The explanatory variables include total number of guest-nights of both Japanese and foreigners (logarithm), the ratio of foreigner guest-nights (the ratio of stays by foreigners to total guest-nights), the number of days each month, and the prefecture × type of lodging facility fixed effects (the prefecture fixed effects for estimations (2)–(5)).

Table 4 Foreigner Guest-nights and Capacity Utilization Rate

	(1) All types		(2) Ryokan inns		(3) Resort hotels		(4) Business hotels		(5) City hotels	
Total number of guest-nights	12.302	***	18.262	***	15.709	***	30.338	***	22.800	***
(logarithm)	(0.912)		(0.966)		(1.880)		(1.746)		(2.411)	
Ratio of foreigners	0.096	*	0.080	*	-0.134	*	0.333	**	0.161	**
	(0.055)		(0.042)		(0.076)		(0.152)		(0.062)	
Observations	13,572		2,736		2,736		2,736		2,736	
R ² (within)	0.3453		0.7597		0.4740		0.5991		0.4156	

Notes: Fixed-effects estimates with robust standard errors in parentheses. ***:P<0.01, **: P<0.05, *: P<0.1. The sample period of the monthly data is from April 2010 to December 2014. The explanatory variables include total number of guest-nights of both Japanese and foreigners (logarithm), the ratio of foreigner guest-nights (the ratio of stays by foreigners to total guest-nights), the number of days each month, and the prefecture × type of lodging facility fixed effects (the prefecture fixed effects for estimations (2)–(5)).

Table 5 Foreigner Guest-nights and Room Occupancy Rate Using Annual Data

	(1) All types		(2) Ryokan inns		(3) Resort hotels		(4) Business hotels		(5) City hotels	
Total number of guest-nights	3.331	**	12.062	***	2.388		11.297	***	7.559	***
(logarithm)	(1.305)		(3.375)		(2.258)		(4.081)		(2.103)	
Ratio of foreigners	0.300	*	0.221	***	0.336	*	0.492	**	0.182	
	(0.156)		(0.056)		(0.193)		(0.211)		(0.136)	
Observations	955		192		192		192		192	
R ² (within)	0.1255		0.3034		0.1696		0.6307		0.6544	

Notes: Fixed-effects estimates with robust standard errors in parentheses. ***:P<0.01, **: P<0.05, *: P<0.1. The sample period is from 2011 to 2014. The explanatory variables include total number of guest-nights of both Japanese and foreigners (logarithm), the ratio of foreigner guest-nights (the ratio of stays by foreigners to total guest-nights), and the prefecture × type of lodging facility fixed effects (the prefecture fixed effects for estimations (2)–(5)).

Table 6 Foreigner Guest-nights and Capacity Utilization Rate Using Annual Data

	(1) All types		(2) Ryokan inns		(3) Resort hotels		(4) Business hotels		(5) City hotels	
Total number of guest-nights	4.108	***	9.079	***	4.009	**	12.342	***	7.870	***
(logarithm)	(1.104)		(1.933)		(1.902)		(3.377)		(2.497)	
Ratio of foreigners	0.343	***	0.193	***	0.271	*	0.659	***	0.321	**
	(0.103)		(0.037)		(0.138)		(0.241)		(0.144)	
Observations	955		192		192		192		192	
R ² (within)	0.1745		0.3164		0.1744		0.6151		0.5773	

Notes: Fixed-effects estimates with robust standard errors in parentheses. ***:P<0.01, **: P<0.05, *: P<0.1. The sample period is from 2011 to 2014. The explanatory variables include total number of guest-nights of both Japanese and foreigners (logarithm), the ratio of foreigner guest-nights (the ratio of stays by foreigners to total guest-nights), and the prefecture × type of lodging facility fixed effects (the prefecture fixed effects for estimations (2)–(5)).