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Does uncertain demand affect service quality?

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ABSTRACT

The purpose of this article is to investigate the impact of demand uncertainty on labor intensity as well as service quality. Theoretical predictions are mixed: on the one hand, risk aversion leads hotels to choose a lower level of capital in response to demand uncertainty, thereby leading to higher labor intensity; on the other hand, the demand-enhancing benefit of service quality may be weakened due to demand uncertainty, thereby leading to a lower service quality decision. Using the data of international tourist hotels in Taiwan, this article shows that demand uncertainty leads to a positive impact on hotels' labor intensity. In addition, hotels located in markets with a higher degree of concentration, having more diversified revenue sources, or belonging to hotel chains also tend to exhibit higher labor intensity.

1. Introduction

A prominent phenomenon in the hotel market is the considerable fluctuation in the market demand for lodging service. This stochastic nature of demand leads to a natural question about hotels' input (labor and capital) decisions in response to demand uncertainty. Hence, the central focus of this study aims to investigate the impact of demand uncertainty on hotels' labor intensity as well as service quality.

A small number of recent hospitality studies have investigated the issue about the impact of demand uncertainty on hotel operation. Chen et al. (2011) examine the link between demand uncertainty and product variety, and their empirical findings support Carlton and Dana's (2008) theoretical prediction: higher degree of demand uncertainty leads to greater product variety. Chen and Chang (2012) find that when demand uncertainty takes the form of instability in product prices, price instability has a negative effect on hotels' profitability. Chen and Yeh (2012) investigate the relationship between uncertain demand and the failure rates of hotels, and they show that uncertain demand increases the likelihood of failure. Along with this line of research, this article intends to further examine the impact of demand uncertainty on hotels' labor intensity and service quality.

In economics literature, Holthausen (1976) investigates the firms' input decisions given the stochastic nature of demand. In his analytical framework, labor is specified as a flexible input, whereas capital is treated as a quasi-fixed one. For the quasi-fixed input, firms must make ex ante production decisions when the market demand is unknown. To avoid excess investment in capital, Holthausen (1976) argues that risk-averse firms tend to choose a lower level of capital in response to demand uncertainty, thereby leading to a lower capital–labor ratio or higher labor intensity. This theory may adequately explain the firms' input decisions in the hotel industry because the capacity of hotels (number of guest rooms) can be treated as a quasi-fixed input, and it seldom varies within a short time period.

In a study on hotel productivity and service quality, Wang et al. (2006) uses the number of housekeeping staff per room as a proxy for hotels' service quality. The reason is that sufficient human resource reduces customers' waiting time and increases the duration of service time per client. Recall Holthausen (1976) argues that demand uncertainty is negatively related to the capital–labor ratio. Hence, his argument implies that demand uncertainty is positively related to the number of housekeeping staff per room (or service quality) because it is proportional to the inverse of capital–labor ratio given that capital is fixed.

In contrast to the aforementioned argument, Geng and Li (2011) claim that the demand-enhancing benefit of service quality may be weakened due to demand uncertainty. Therefore, they argue that demand uncertainty has a negative impact on firm's service quality decision. Following this argument, one may hypothesize that demand uncertainty is negatively related to the average number of housekeeping staff or positively related to the capital–labor ratio.

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The mixed theoretical predictions mentioned above merit further investigation of the effect of uncertain demand on hotels' labor intensity and service quality. Holthausen's (1976) arguments predict that demand uncertainty leads to higher labor intensity and implies higher service quality; by contrast, Geng and Li (2011) provide an opposite prediction. This article intends to investigate this question by proposing a two-step estimating approach and using the data of the international tourist hotels in Taiwan. The empirical results indicate that demand uncertainty in the hotel market appears to have a significant and positive effect on hotels' the labor intensity, supporting the Holthausen's (1976) view on firms' input decision in response to demand uncertainty.

2. Methodology

This article constructs the empirical model in two steps described as follows. In the first step, demand uncertainty is measured as the difference between the actual and forecasted room revenue. For the forecasted revenue, we adopt the approach of Chen and Yeh (2012), assuming the distribution of demand for hotel lodging service is conditional on the actual demand during the past periods. Accordingly, the first-order autoregressive process, AR(1), is written as:

$$RV_t = \alpha_0 MV_t + \alpha_1 Trend + \rho(RV_{t-1} - \alpha MV_{t-1}), \quad (1)$$

where RV_t is the room revenue in the period t, MV_t is a vector of monthly dummies, *Trend* denotes the time trend, and ρ represents the autocorrelations between periods. The difference between the actual and forecasted room revenue from Eq. (1) thus accounts for the demand uncertainty.

In the second step, we further estimate the hotels' labor demand function. Let *Ratio* denote the average number of housekeeping staff per room. The hotels' labor demand function is written as:

$$Ratio_{it} = \beta_0 + \beta_1 UD_{it} + \beta_2{}' X_{it} + u_i + \varepsilon_{it}, \quad (2)$$

where *UD* is the uncertain demand, *X* is a vector of exogenous variables that affect hotels' labor demand, and the component u_i is a random disturbance characterizing the *i*th observation and is a constant over time. Note that the value of the residual from Eq. (1) is used as a proxy for the variable *UD*.

In addition to uncertain demand, this study divides other factors influencing labor demand into two categories: environmental factors and hotel characteristics. The environmental factors include market concentration (denoted by *HHI*), location (denoted by *Metropolitan*), and the distance between hotel and the nearest airport (denoted by *Distance*). A number of existing studies have shown that hotel operation is closely related to the environmental factors (Hu et al., 2010). The hotel characteristics consist of firm diversification (denoted by *Diversification*) and operation type (denoted by *Chain*). Existing studies have indicated that firm diversification and operation type are associated with hotel operation (Lee and Jang, 2007; Chiang et al., 2004; Hwang and Chang, 2003).

Following Allison (2005), this study utilizes both the random-effect and fixed-effect regression model. As shall be explained in Section 4, we conduct the usual Hausman test to examine the appropriateness of the model specification.

3. Data and variables

The data used in this article are based on the operation reports published by the Taiwan Tourism Bureau. It contains the information from 70 international tourist hotels during the period between 1996 and 2008. What follows explains the reason for using the data of this time frame. After Taiwan officially opened its tourism to Chinese visitors in 2009, China immediately became the top one source country for foreign tourists visiting Taiwan. To avoid the potential bias caused by the major structure change in the hotel industry, this article uses only the data prior to year of 2009.

Most variables in Eq. (2) are self-explanatory, and in what follows we further elaborate on the definitions of some main variables. First, the variable HHI (Herfindahl–Hirschman Index) is to measure the degree of market concentration. This index is calculated by summing the squares of the market share of each hotel competing in the same geographical market. This index is superior to other concentration indicators such as four-firm concentration ratio (CR4) because HHI contains the information of all firms rather than the largest one in the market (Pan, 2005). Second, the variable *Entropy* is to measure the degree of firm diversification. Considering that hotels' revenue comes from three revenue sources (room, food and beverage, and others), we use P_y to denote the proportion of the each revenue source relative to total revenue, and then the variable *Entropy* index is defined as:

$$Entropy = \sum_{r=1}^{3} P_r \ln\left(\frac{1}{P_r}\right). \quad (3)$$

4. Results and discussion

Table 1 reports the empirical results obtained from the pooled data model and panel data model, respectively. Prior to the discussion of the empirical results, we validate the specification of the empirical model by conducting both the Breusch and Pagan LM test as well as the Hausman test. First, the value of the Breusch and Pagan LM test is 1722.73, indicating that the data are not poolable. Second, the Hausman test is further conducted to examine whether a random-effect model or a fixed-effect model is more appropriate. The obtained chi-squared value is 8.06, rejecting the null hypothesis that the random-fixed model is in favor of the fixed-effect one. Therefore, in what follows we confine our discussion to the results obtained from the fixed-effect panel data model.

The coefficient of the variable *UD* is positive and statistically significant, indicating that demand uncertainty leads to a positive impact on hotels' labor intensity. In what follows, we articulate the rationale behind this result from the perspective of firms' input decision. With regard to this decision problem, Holthausen (1976) argues that because firms must make ex ante production decisions, risk-averse firms tend to choose a lower level of capital in response to demand uncertainty in order to avoid excess investment in capital. This argument may justify firms' input decision in the hotel industry for the following reasons. First, a significant degree of demand uncertainty does exist in the hotel market because it is difficult to predict when and where people travel. Second, the capacity of hotels (number of guest rooms) can be treated as a quasi-fixed input which seldom varies within a short time period, whereas labor is generally regarded as a flexible input; according to the data used in this study, the average time for hotels to remodel or to adjust their capacity is around 3–4 years. Our results support the argument of Holthausen (1976), claiming that hotels are risk averse, and they are unwilling to increase capital investment in capacities when facing demand uncertainty; instead, they tend to increase the investment in human resource to enhance their service quality and competitive advantage.

The coefficient of the variable HHI is positive and statistically significant. This result reveals that hotels located in the market with a higher degree of concentration tend to exhibit higher labor intensity. This is probably because hotels with a higher degree of market concentration are generally sizeable ones that possess larger lodging capacity. To reduce the risk caused by demand uncertainty, they tend to be reluctant to further expand their capacity, thereby leading to a lower capital–labor ratio and higher labor intensity.

Table 1
The empirical results ($n = 700$).

Variable	Pooled data model		Panel data model			
	OLS		Random effects		Fixed effects	
	Coefficient	*t* statistics	Coefficient	*t* statistics	Coefficient	*t* statistics
UD	9.17E−05	3.95***	2.00E−04	4.86***	2.45E−04	4.55***
HHI	−0.10	−2.93***	0.05	1.65*	0.07	2**
Metropolitan	−0.03	2.53**	0.04	1.06	–	–
Distance	−1.74E−04	−2.53**	−2.35E−04	−1.24	–	–
Diversification	0.23	7.19***	0.12	4.18***	0.58	3.61***
Chain	0.01	1.08	0.03	1.94*	4.93E−03	2.02**
Constant	0.10	3.31***	0.14	4.24***	0.31	4***
R-squared	0.23		0.18		0.15	
LM test (*P* value)	1855.53 (0.00)				–	–
Hausman test (*P* value)	–	–	8.06 (0.09)			

Note:
* Significance at the 10% level.
** Significance at the 5% level.
*** Significance at the 1% level.

The coefficient of the variable *Diversification* is positive and statistically significant. In this study, the degree of product diversification refers to the extent that hotels diversify their revenue from various sources: room revenue, food and beverage revenue, and others. This result indicates that hotels with a higher degree of product diversification are more labor intensive. This is probably because the more diversified hotels become, the less likely they exhibit increasing returns to scale; hence, they are less efficient in the use of inputs and become more labor intensive. In addition, the coefficient of the variable *Chain* is positive and statistically significant, revealing that chain hotels exhibit higher labor intensity than independent ones. This is because most chain-branded hotels operating in Taiwan are luxury ones, and they require a higher standard of service quality than independent ones.

5. Conclusion

This article investigates the input decision problem of hotels in response to the lingering market uncertainty. Particularly, this article examines the impact of demand uncertainty on hotels' labor intensity as well as service quality. Using the data of international tourist hotels in Taiwan, this article demonstrates that demand uncertainty leads to a positive impact on hotels' labor intensity, which also implies higher service quality. This result indicates that hotels tend to be risk averse when facing escalating demand uncertainty. Hence, they are reluctant to increase capital investment; instead, they are apt to increase the investment in human resource in order to enhance their service quality and competitive advantage. The empirical results also show that hotels located in the markets with higher degrees of concentration, having more diversified revenue sources, or belonging to hotel chains tend to exhibit higher labor intensity.

According to a recent study on *Harvard Business Review*, hotel industry is one of the industries greatly plagued by demand uncertainty (see Dyer et al., 2014). The reason is fairly straightforward: hotels often have difficulties predicting demand for their service because many factors influence whether, where, and when people travel (Dyer et al., 2014). Demand uncertainty further complicates hotels' input decision problem because they must make ex ante decisions when certain market conditions are unknown. This article broadens a better understanding about how hotels allocate their resources in response to the accelerating demand uncertainty in the hotel market.

References

Allison, P.D., 2005. Fixed Effects Regression Methods for Longitudinal Data. SAS Institute Inc., NC, USA.

Carlton, D.W., Dana Jr., J.D., 2008. Product variety and demand uncertainty: why markups vary with quality. J. Ind. Econ. 56 (3), 535–552.

Chen, C.M., Yeh, C.Y., Hu, J.L., 2011. Influence of uncertain demand on product variety: evidence from the international tourist hotel industry in Taiwan. Tour. Econ. 17 (6), 1275–1285.

Chen, C.M., Yeh, C.Y., 2012. The causality examination between demand uncertainty and hotel failure: a case study of international tourist hotels in Taiwan. Int. J. Hosp. Manag. 31 (4), 1045–1049.

Chen, C.M., Chang, K.L., 2012. The effect of price instability on hotel profitability. Tour. Econ. 18 (6), 1351–1360.

Chiang, W.E., Tsai, M.H., Wang, L.S.M., 2004. A DEA evaluation of Taipei hotels. Ann. Tour. Res. 31, 712–715.

Dyer, J., Furr, N., Lefrandt, C., 2014. The industries plagued by the most uncertainty. Harv. Bus. Rev. (published online on September 11, 2014).

Geng, Q., Li, K., 2011. Service quality and inventory designs under demand uncertainty. Rev. Bus. Res. 11 (5), 120.

Holthausen, D.M., 1976. Input choices and uncertain demand. Am. Econ. Rev. 66, 94–103.

Hu, J.L., Chiu, C.N., Shieh, H.S., Huang, C.H., 2010. A stochastic cost efficiency analysis of international tourist hotel in Taiwan. Int. J. Hosp. Manag. 29, 99–107.

Hwang, S., Chang, T., 2003. Using data envelopment analysis to measure hotel managerial efficiency change in Taiwan. Tour. Manag. 24, 357–369.

Lee, M.J., Jang, S., 2007. Market diversification and financial performance and stability: a study of hotel companies. Int. J. Hosp. Manag. 26 (2), 362–375.

Pan, C.M., 2005. Market structure and profitability in the international tourist hotel industry. Tour. Manag. 26, 845–850.

Wang, F.C., Shang, J.F., Huang, W.T., 2006. Productivity and service quality changes in international hotels in Taiwan. Ann. Tour. Res. 33 (2), 571–574.