The Non-linear Impact of Labor Costs on the Nexus of Service Quality and Profitability in Taiwanese Hospitality Industry*

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Abstract

This paper adopts a panel smooth transition regression model to investigate the threshold effects of service quality on profitability for 48 major international tourist hotels in Taiwan during the 2000-2013 period. The empirical results indicate that the relationship between service quality and hotel profitability is nonlinear, with different changes over time and among hotels and transition variables. Moreover, labor costs influence the marginal effects of service quality on hotel profitability, indicating that average employee wages can have a nonlinear influence on hotel profitability. Finally, when labor costs are under the threshold value, service quality (in terms of guest rooms or food and beverages) has a positive effect on hotel profitability, and the effect of food and beverage quality is more obvious than the effect of

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* Grammatical and writing style errors in the original version have been corrected by our colleague who is a native English speaker.

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DOI: 10.3966/054696002018060103005

guest room quality. However, once labor costs exceed the threshold value, the marginal effect of service quality on hotel profitability will be inconsistent and may even result in an overall decline in hotel profitability.

Keywords: Panel Smooth Transition Regression (PSTR) Model, International Tourist Hotel, Profitability, Service Quality, Labor Cost

JEL Classification: F66, G40

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I. Introduction

According to statistics from the Taiwan Tourism Bureau (2018a), after implementation of the policy that relaxed restrictions on visits by mainland Chinese tourists to Taiwan, the number of tourists from mainland China visiting Taiwan was 329,204 in 2009 and 2,585,428 in 2012. By the first quarter of 2010, the number of tourists traveling to Taiwan from China exceeded that from Japan, and China had become the largest source country of inbound tourism in Taiwan. Additionally, the total foreign exchange income from tourism was approximately $11.7 billion in 2012, indicating 6.36% growth relative to 2011 as the point of view as it is workable that government tries to promote tourism to benefit economic development (Wang et al., 2007; Lee and Wang, 2012). The average daily spending of tourists was estimated at $234.31 per person, with hotel spending representing the second highest type of consumption (representing 31.68%). The hotel industry plays a crucial role in the tourism industry; with the rapid increase in international tourists arriving in Taiwan, a growing number of international tourist hotels have been established. Consequently, considering a variety of possible ways to generate profit has become one of the most important topics in the hotel industry.

King (1995) argues that hospitality business activity reveals a special relationship between

service providers and consumers. Hotels should create additional value for customers by improving the quality of their services and by efficiently training and motivating employees, thereby increasing customers' revisit rates. Wilkins et al. (2007) argue that service quality is a multilevel assessment with intangibility and inseparability characteristics. The authors further state that service quality is evaluated based on feedback from visitors who interact with and receive service delivery from hotel service personnel. Previous studies on the effects of service quality on profitability have provided a good foundation of knowledge, but at least two limitations should be further addressed. First, previous studies have largely used linear models to examine hotel profitability. Furthermore, according to Hsiao (2003), when cross-sectional data are heterogeneous, making assumptions for specific variables has the same effect, which can be misleading. Second, traditional linear models cannot measure the threshold effect of labor costs on hotel profitability. In fact, different scales of labor costs may have differential effects on how service quality affects the profitability of international tourist hotels. To resolve the problems of heterogeneity and nonlinearity simultaneously, we employ a panel smooth threshold regression (PSTR) model (González et al., 2004; Fok et al., 2005) to estimate hotel profitability.

This paper contributes to the literature in two distinct ways. First, this paper adopts a proper econometric method for the estimation of hotel profitability. This method can effectively resolve the heterogeneity problem and capture the nonlinear dynamic process of changes in hotel profitability. Second, we employ the average salaries of employees as the threshold variable in the PSTR models and evaluate how the average employee wage has a nonlinear influence on the relationship between hotel profitability and service quality, which has crucial policy implications for hotel management.

The remainder of this paper is organized as follows. Section 2 briefly introduces the empirical models, including a linear model and a PSTR model. Section 3 focuses on the testing methods, including the unit root test, linear tests, and threshold regime tests. Section 4 presents the empirical results and discussion. Section 5 concludes the paper.

II. Literature Reviews

A. Profitability and Service Quality

In addition to increasing the degree of customer satisfaction and purchase intentions (Cronin and Taylor, 1992; Richardson et al., 1994), improving service quality can have a strong, positive influence on an enterprise's profitability (Parasuraman et al., 1988; Easton and Jarrell, 1998; Fisher et al., 2006; Lin et al., 2009). Lee and Chou (2014) investigate the determinations of profitability in the Taiwanese hospitality industry and find that improving the levels of service in both the guest room and food and beverage sectors has a significant and positive effect on operating profits, indicating that enhanced service quality can effectively increase hotel profit margins (Kamakura et al., 2002). From Taiwan's international tourist hotels during 1998-2007 period, Yeh and Chen (2012) estimate that the average hotel cost will increase by NT $ 1,563,304 per year if the rate of accommodation in a single international hotel is reduced by 1% via investigating the annual financial statement data. However, some scholars have proposed the view that the return on expenditures of service quality is diminishing and that beyond a certain level of service quality improvement, such expenditures are not cost-effective (Rust et al., 1995). Moreover, traditional service profit chain theory may disregard this potentially negative effect of service quality on profitability because when hotels hire more staff to improve service quality, labor costs also rise (Chen and Lin, 2012). Therefore, the question of whether improving service quality can effectively benefit hotel profitability remains unanswered.

In general, service quality can be measured based on perceptions or operational methods. The former depends on the degree of customer experience, and the estimation process is susceptible to influence by subjective personal feelings. The latter has the advantage of being objective and easy to estimate and includes the number of employees and service time. Additionally, Whitla et al. (2007) argue that accommodation services are the most important

source of income for hotels and that sales of food and beverages account for the majority of hotels' total revenue. Thus, some scholars in previous studies have used the operational method to estimate service quality. For example, Wang et al. (2006) and Chen and Lin (2012) use the ratios of staff per guest room and floor area as quality attributes of service delivery. Lee and Chou (2014) add the labor cost perspective and use the employee cost per unit as a proxy for hotel service quality to test the relationship between service and hotel profitability. The efficiency of data collection and the reduction in the data estimated are influenced by personal subjective feelings. This paper follows Wang et al.'s (2006) specification to estimate hotel service quality, including the ratios of guest room numbers and housekeeping staff and the ratios of staff and operating area in the food and beverage department.

B. The PSTR Model

The non-linear model has extensive adopted in empirical research literature, such as the threshold autoregressive (TAR) model, the Markov switching (MS) model, the neural network (NN) model, the smooth transition autoregressive (STAR) model, and the panel smooth transition regression (PSTR) model (Kiran, 2012; Cifter, 2015; Terasvirta et al., 2005; Fouquau et al., 2008). However, the switching process of economic variables in TAR or MS model is radical and discrete which scarcely satisfies its actual movement. In addition, the regime-switching process in NN model is judged through human brain; therefore, the estimation results are short of economic meaning (Wu and Lee, 2014). The STAR and PSTR model have gained increased attention in recent literature (Cheng and Wu, 2013; Wu et al., 2014; Pan et al., 2014).

The PSTR model, recently developed by González et al. (2004) and Fok et al. (2005), consists of two linear parts linked by a non-linear transition function, and it allows the sequence under investigation to move smoothly within two different regimes, depending on the value of a specific transition variable. This model assumes that the behavior of the series changes depending on the value of the transition variable and allows for smooth changes in

cross-sectional correlations, cross-section heterogeneity, and time instability of the impact.

In addition, this model is particularly useful for situations in which the non-linear process is driven by a common regime-switching component but where the response to this component can be different across variables. For example, Traditional linear models cannot measure the threshold effect of service quality on hotel profit, i.e., the marginal effects of service quality on hotel profit vary according to labor costs policy at different regimes and times. In fact, the effects of staff pay policy on hotel management are different as labor costs variables are located in different regimes. Most importantly, PSTR model can endogenously determine the threshold value of the transition variable, which provides useful information for policy authority. Thus, the PSTR specification of hotel profit is a proper method for evaluating the nonlinear dynamics of hotel profit and the nonlinear relationship between hotel profit and service quality in Taiwan.

III. Empirical Models

A. Linear Model

To evaluate the threshold effect of employee wages on hotel profitability, this paper first uses panel data to estimate the effect of service quality on hotel profitability.[1] Following the study of Wang et al. (2006), hotel service quality can be expressed as the ratios of the number of guest rooms and housekeeping staff and the ratios of staff and operating area in the food and beverage department. Additionally, hotel profitability is based on the pre-tax operating profit

[1] Using Hausman test verifies whether there is a correlation between the individual effect and the explanatory variables of the international tourism hotel; therefore, the model should be evaluated by the fixed effect model or the random effect model.

ratio. The empirical linear model is presented as follows:

$$P_{it} = \alpha_0 + \theta_1 RSQ_{it} + \theta_2 FSQ_{it} + \varepsilon_{it} \tag{1}$$

where i = 1, 2,…, N denotes the cross-sectional hotel; t = 1, 2,…, T denotes time; P_{it} denotes the profitability of the international tourist hotel; RSQ_{it} denotes the guest room service quality of the international tourist hotel; FSQ_{it} denotes the food and beverage service quality of the international tourist hotel; and ε_{it} is a residual term.

B. PSTR Model

To resolve the nonlinear and heterogeneity problems simultaneously, we follow the method developed by González et al. (2004), Fok et al. (2005) and González et al. (2005) in constructing a PSTR model to evaluate hotel profitability. The PSTR model includes two extreme regimes and one single transition function and assumes parameters with a function of a threshold variable to change smoothly. The model can be written as follows:

$$P_{it} = \alpha_i + \theta_0 X_{it} + \theta_1 X_{it} G(q_{it}; \gamma, c) + \mu_{it} \tag{2}$$

where i = 1, 2,…, N denotes the cross-sectional hotel; t = 1, 2,…, T denotes time; P_{it} denotes the profitability of the international tourist hotel; X_{it} is a vector of exogenous explanatory variables, i.e., $X_i = (RSQ_{it}, FSQ_{it})$; and $G(q_{it}; \gamma, c)$ is a transition function, and the value is bounded from 0 to 1, with q_{it} as a transition variable and γ and c as the transition parameter and transition threshold value. The transition function describes the smooth-switching process of hotel profitability. Additionally, because of the likely lagged effect of labor costs on hotel profitability, this paper replaces q_{it}, used by González et al. (2005), with q_{it-d}, d = 0, 1,…, 4. The optimal lagged transition variable is determined by the minimum Akaike information criterion (AIC) and Bayesian information criterion (BIC). μ_{it} is a residual term. The logistic specification can be used for the transition function:

$$G(q_{it};\gamma,c)=\left(1+\exp\left(-\gamma\prod_{j=1}^{m}\left(q_{it}-c_j\right)\right)\right)^{-1} \tag{3}$$

where $\gamma>0$ and $C_1\le C_2\le\cdots\le C_m$. When m = 1 and $\gamma\to\infty$, the PSTR model reduces to a panel transition regression model. González et al. (2005) argue that from an empirical perspective, it is sufficient to consider only the cases of m = 1 or m = 2 to capture nonlinearities as a result of regime switching. The PSTR model can be written as follows:

$$P_{it}=\alpha_i+\theta_0X_{it}+\sum_{j=1}^{\gamma}\theta_jX_{it}G_j(q_{it};\gamma_j,c_j)+\mu_{it} \tag{4}$$

where j = 1, 2, ..., r denotes the number of transition functions and (r + 1) is the number of regimes.

C. Estimation and Specification Test

Before performing the estimation of the PSTR model, we must select a transition variable and determine the number of regimes. Following Wu et al. (2013), we employ a three-step procedure for estimating Eqs. (2) and (4). First, we test the linearity against our constructed PSTR model. If the null hypothesis of linearity is not rejected, then we determine the number of transition functions. Finally, we remove the individual-specific means and apply the nonlinear least squares method to the estimate of the parameters of Eqs. (2) and (4).

a. Selection of Transition Variable

Lin et al. (2011) argue that the key to successful hotel management is the effective use of human resources. Additionally, employee wages and related costs typically account for a large proportion of total hotel expenses (Cho and Wong, 2001). Hence, the number of hotel staff

plays a key role in controlling hotel costs. A higher staffing level improves service quality, enabling hotel personnel to respond to customer requests more promptly, which in turn stimulates revenue (Chen and Lin, 2012). In sum, labor costs influence the marginal effects of service quality on hotel profitability. This paper uses average employee wages to construct the transition variable in Eqs. (2) and (4).

b. Linearity and No Remaining Nonlinearity Tests

Following Wu et al. (2013), we examine the linearity testing of Eq. (4) by its first-order Taylor expansion when $at = 0$ to displace the transition function $g(q_{it-d}; r_j, c_j)$. We then obtain the following auxiliary equation:

$$P_{it} = \pi_i + \pi_1 RSQ_{it} + \pi_2 FSQ_{it} + \pi'_1 RSQ_{it} q_{t-d} + \pi'_2 FSQ_{it} q_{t-d} + \eta_{it} \tag{5}$$

where $d = 0, 1, \ldots, 5$ to allow for current and lagged employee payrolls. The linearity test is performed to conduct the testing of H_0: $\pi'1 = \pi'2 = 0$. If the null hypothesis of linearity is rejected, then we test the null hypothesis of a single threshold model against a double threshold model. The testing procedure is continued until the hypothesis without an additional threshold is not rejected. Here, $PSSR_0$ denotes the panel sum of squared residuals under the null hypothesis (i.e., the linear panel model with individual effects), and $PSSR_1$ denotes the panel sum of squared residuals under the alternative (i.e., the PSTR model with two regimes). The corresponding LM-statistic is given by the following:

$$LM_F = \left[\left(PSSR_0 - PSSR_1\right)/K\right] / \left[PSSR_0 / \left(TN - N - K\right)\right] \tag{6}$$

where K is the number of explanatory variables. Under the null hypothesis, the LM-statistic has an asymptotic $X^2(K)$ distribution.

IV. Data and Specification Tests

A. Data

As table 1, there are 56 international tourist hotels in 2000 increasing to 70 in 2013 in Taiwan. The paper just collects 48 major international tourist hotels during the 2000-2013 period because of excluding incomplete data, just set up which belong to business fluctuations, refurbishment of suspension of business, and stop business. The data set consists of time-series and cross-sectional observations are collected from the Taiwan Tourism Bureau. In terms of the selection of variables, this paper refers to the operating profit ratio before tax as the dependent variable and uses the average employee wage as the transition variable; the unit of average employee payrolls is one-hundred thousand per year. The two main factors that affect the operating profit ratio before tax are defined as guest room service quality and food and beverage service quality. The later's unit of total food and beverage operating area is Ping. The variable definitions, descriptive statistics and correlation coefficient analysis of the variables are presented in Tables 2 through 4. In Table 4, the correlation coefficients of the variables range from -0.3516 to 0.2378, indicating that there is no significant problem of endogeneity between the variables.

B. Panel Unit Root

Because the variable data employed herein have the characteristics of time series, omitting variables may create a nonstationary situation as a result of the empirical estimation bias. We employ the Levin et al. (2002) panel data unit root test method to examine the relevant variables, and Table 5 presents the empirical results, indicating that all variables are in a stationary series.

Table 1 International Tourist Hotels in Taiwan, 2000-2013

Year	International tourist hotel number
2000	56
2001	58
2002	62
2003	62
2004	61
2005	60
2006	60
2007	60
2008	60
2009	63
2010	65
2011	69
2012	70
2013	70

Note: Data collected from Taiwan Tourism Bureau and this research arranged. (Taiwan Tourism Bureau, 2018b)

Table 2 Data Measurement

Name	Code	Measurement	Unit	Data source
Operating profit ratio before tax	*P*	Ratio of the period's pre-tax operating income (loss) and total operating income		
Guest room service quality	*RSQ*	Ratio of guest room number and housekeeping staff		Taiwan Tourism Bureau (2018a)
Food and beverage service quality	*FSQ*	Ratio of food and beverage staff and total food and beverage operating area	Ping	
Average employee payrolls	*AS*	Average annual salary of all employees	100,000	

Table 3 Descriptive Statistics

	Min	Max	Mean	Median	Std. Dev.
P	0.4530	0.4530	0.0576	0.0830	0.1829
RSQ	1.2750	9.2410	3.7151	3.4865	1.3549
FSQ	0.4300	4.9520	1.7597	1.3795	1.0228
AS	1.3160	9.0590	5.3397	5.2440	1.4917

Table 4 Correlation Matrix

	P	RSQ	FSQ	AS
P	1			
RSQ	–0.0865	1		
FSQ	0.0857	–0.3346	1	
AS	0.2378	–0.3516	0.0711	1

Table 5 Panel Unit Root Test

	LLCUnit Root Test
	level (individual and trend)
P	–22.7735(0.000)***
S	–27.8878(0.000)***
R	–23.2203(0.000)***
F	–9.9133(0.000)***

Note: H_0: Unit root (assumes common unit root process). *** indicate significance at the 1% levels, respectively.

C. Linear Tests

Confirming that all variables are consistent with a stationary series, we then use the average employee wage as the transition variable in the PSTR model and conduct a linear test. The results are presented in Table 6. According to these estimates, when the location parameter

is one, all test statistics reject the null hypothesis of linearity; when the location parameter is two; except for the testing statistic of the Fisher test, all test statistics reject the null hypothesis of linearity. These results suggest that the relationship between the profitability of international tourist hotels and service quality can be depicted on a nonlinear dynamic path. Therefore, to prevent bias in the estimation results related to structural changes, the empirical estimates should be based on nonlinear models.

Table 6 Linearity Test

Test statistic	Number of location parameters (m)	
	$m = 1$	$m = 2$
Wald Test (LM)	5.217(0.074)*	7.071(0.032)
Fisher Test (LMF)	2.356(0.096)*	1.595(0.175)
LRT Test (LRT)	5.246(0.006)***	7.125(0.000)***

Note: H_0: Linear model. H_1: PSTR model with at least one threshold variable ($r = 1$). * and *** indicate significance at the 10% and 1% levels, respectively

D. The Optimal Number of Threshold Regime Tests

Upon completion of the linear model test, we perform the model type test, and the results are presented in Table 7. According to these estimates, whether the location parameter is one ($m = 1$) or two ($m = 2$), the test statistics do not reject the null hypothesis. In other words, the optimal number of transition functions is one.

Table 7 Test of No Remaining Nonlinearity

Testing statistic	Number of location parameters (m)	
	$m = 1$	$m = 2$
Wald Tests (LM)	1.362 (0.506)	3.228 (0.520)
Fisher Tests (LMF)	0.604 (0.547)	0.715 (0.582)
LRT Tests (LRT)	1.364 (0.506)	3.239 (0.519)

Note: H_0: PSTR with $r = 1$ against H_1: PSTR with at least $r = 2$.

V. Estimation Results and Discussion

After confirming the optimal number of threshold regime tests and linear tests, the PSTR model is applied to investigate the effect of service quality on the profitability of international tourist hotels in Taiwan. To further verify differences between the PSTR model constructed herein and the traditional linear model, this paper also estimates linear model results. The empirical results are presented in Table 8.

A. PSTR Model

According to these estimates, the empirical results are as Table 8 as detailed below:

In the PSTR model, the effect of guest room service quality on hotel profitability is ambiguous, and an increase in the average employee wage improves guest room service quality but reduces hotel profitability. In two extreme cases, $G = 0$ and $G = 1$, the effects are $\theta 1$ (–0.0063) and $\theta 1 + \theta 1'$ (0.0209), respectively. The former case is not considered a marginal effect of labor cost, as expected; although improving the guest room service quality of international tourist hotels has a positive effect on profitability, this effect is not significant. The latter case contains the marginal effect of labor cost types, representing the average employee wage increase; guest room service quality has a negative effect on hotel profitability.

Because lower RSQ value implies higher room service quality, the positive coefficient 0.0209 represents a negative effect on hotel profitability if we increase guest room service quality. Moreover, the effect of food and beverage service quality on hotel profitability is significant and positive, and with an increase in the average employee wage, the marginal effect of food and beverage service quality on hotel profitability is also reduced. In two extreme cases, $G = 0$ and $G = 1$, the effects are $\theta 2$ (0.0277) and $\theta 2 + \theta 2'$ (0.0093), respectively. A possible reason for these effects is that when labor costs rise, hotels adopt service quality strategies to enhance operational performance, likely because the cost of upgrading service quality is greater than the increase in operating profits, thus resulting in lower profitability. These results are similar to the proposition of Rust et al. (1995), who argue that the return on service quality expenditures is diminishing and that beyond a certain point in service quality improvement, these expenditures are not cost-effective.

Finally, when labor costs exceed the threshold value (i.e., $G = 1$), the positive marginal effect of guest room service quality on hotel profitability will become negative; however, the coefficient of food and beverage service quality has been reduced with a positive impact. One possible reason for this result is that most international tourist hotels in Taiwan have a higher proportion of interns and temporary staff in the food and beverage department. Furthermore, a shortage of labor is more apparent in food and beverage service than in guest room service. In summary, the effect of service quality on hotel profitability is nonlinear and varies over time and among hotels according to the average employee wage. Chen and Lin (2012) report a nonlinear relationship between food and beverage service quality and hotel profitability. Moreover, when the transition variable exceeds the threshold value, the effect of each variable on hotel profitability varies greatly. The likely reason for this result is that traditional linear estimation methods may neglect the importance of considering the effects of different levels of labor costs on hotel profitability. That is, traditional linear estimation methods may not accurately represent the relationship among service quality, labor costs and operating performance.

B. Linear Model

This section emphasizes the use of the PSTR model in this paper to estimate international tourist hotel profitability and considers the traditional linear model to estimate and compare the results. In the linear model, the Hausman test should be estimated by using a fixed effect model or a random effect model. If the result rejects *H*0, it means that there is a correlation between the non-observation of the international tourist hotel's individual effect and the explanatory variables, the fixed effect model is estimated to be efficient and consistent, so a fixed-effects model should be used to empirical estimation ; If the test result cannot reject H0, there is no relationship between the non-observation of the international tourist hotel's individual effect and the explanatory variables, the random-effects model should be used as empirical model. The Hausman test statistic is 0.1542, which does not significantly reject the null hypothesis of using the random-effects model; that is, the type of data used in the model should be used in the empirical random-effects model. In Table 8, the coefficient of guest room service quality is 0.0038 and not significant, representing the increasing of guest room service quality on hotel profitability is negative; this may be due to the benefits are less than the associated costs by increasing housekeeping staff to improve food and beverage service quality. Therefore, food and beverage service quality has positive effects on hotel profitability, with coefficients of 0.0178 and significant; in other words, by increasing the food and beverage staff to improve food and beverage service quality, can make the benefits greater than the associated costs.

Notably, using the linear model for empirical estimation causes the estimated results to be biased. For example, in the linear panel data model, the effect of guest room service quality on hotel profitability is fixed at 0.0038, and the effect is not significant; however, in the PSTR model estimates, the estimated results based on different transition variable types (G(AS$_{i,t}$; 3.0729; 4.7597) = 0 and (AS$_{i,t}$; 3.0729; 4.7597) = 1) are based on two intervals (the effects of –0.0063 and 0.0209, respectively). Clearly, the use of the linear panel data model cannot correctly estimate the effect of guest room service quality on hotel profitability, and the effects cannot reflect differences over time and across hotels. Similar findings are observed for effect

Table 8 Result of PSTR Models

Model parameter	PSTR model	Linear panel data model
C	—	0.0125 (0.2683)
θ_1	–0.0063 (–0.5941)	0.0038 (0.4039)
θ_1'	0.0272 (3.4665)***	—
θ_2	0.0277 (2.5205)***	0.0178 (1.9772)**
θ_2'	–0.0184 (–1.8328)*	—
r	3.0729	—
c	4.7597	—
N	514	514
AIC	–4.7398	—
BIC	–4.6876	—
R-squared	—	0.0062
Hausman Test	—	0.1542

Note: θ_1 and θ_1' are guest room service quality, and θ_2 and θ_2' are food and beverage service quality. $\theta_1 + \theta_1' = 0.0209$, $\theta_2 + \theta_2' = 0.0093$. The values in brackets are the t-statistics. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

of food and beverage service quality variable. Therefore, the PSTR model is more appropriate than the linear model in this study.

All in all, the relationship between service quality (i.e., the quality of guest rooms and food and beverages) and hotel profitability is nonlinear and indicates a transition regime, and the threshold value c and the transition parameter γ are 4.7597 and 3.0729, respectively. Moreover, labor costs influence the marginal effects of service quality on hotel profitability, indicating that employee wages can have a nonlinear influence on hotel profitability. Finally, when the threshold value is less than 4.7597, enhancing either guest room or food and beverage service quality has a positive effect on hotel profitability, and the effect of enhancing food and

beverage service quality is clearer than the effect of enhancing guest room service quality. However, when the average employee wage exceeds the threshold value, the marginal effect of service quality on hotel profitability is inconsistent and may even result in a decline in overall hotel profitability.

VI. Conclusion

This paper adopts a PSTR model and considers labor costs (i.e., the average employee wage) as the threshold variable to investigate the threshold effects of service quality (with respect to guest room and food and beverage quality) on hotel profitability in the Taiwanese hospitality industry. The panel data set includes 48 major international tourist hotels in Taiwan over the 2000-2013 period. The empirical results are reviewed below.

According to the empirical results, the following implications are noted. First, the labor costs of the sample hotels can reduce the positive effect of service quality on hotel profitability. Second, the marginal positive effect of service quality on hotel profitability is reduced when labor costs exceed the threshold value. Third, improvements in food and beverage service quality are capable of increasing hotel profitability.

A perception-based method can be used to measure service quality, in addition to the operational method. Thus, this paper suggests that follow-up research use a different method to estimate service quality for the empirical estimates (e.g., PZB model) and suggests a comparison between the operational and perceived methods to determine the consistency of the results. Additionally, researchers can estimate the differences among individual hotels in the relationship between service quality and profitability in future studies and thus provide useful information to hotel managers.

(Received 07 July 2016; Accepted 17 January 2017)

References

Chen, C. M. and Y. C. Lin, 2012, "Does Better Service Induce Higher Profitability? Evidence from Taiwanese Hospitality Industry", *International Journal of Hospitality Management*, 31: 1330-1332.

Cheng, C. H. and P. C. Wu, 2013, "Nonlinear Earnings Persistence", *International Review of Economics and Finance*, 25: 156-168.

Cho, Y. Y. and K. K. F. Wong, 2001, "Determinants of Hotel Employments in Hong Kong", *Cornell Hotel and Restaurant Administration Quarterly*, 42: 50-59.

Cifter, A., 2015, "Stock Returns, Inflation, and Real Activity in Developing Countries: A Markov-switching Approach", *Panoeconomicus*, 62: 55-76.

Cronin, J. and S. A. Taylor, 1992, "Measuring Service Quality: A Reexamination and Extension", *Journal of Marketing*, 56: 55-68.

Easton, G. S. and S. Jarrell, 1998, "The Effect of Total Quality Management on Corporation Performance", *Journal of Business*, 71: 253-307.

Fisher, M. L., J. Krishnan, and S. Netessine, 2006, "Retail Store Execution: An Empirical Study", *SSRN Working Paper*, No. 2319839.

Fok, D., P. H. Frnses, and D. V. Dijk, 2005, "A Multi-level Panel STAR Model for US Manufacturing Sectors", *Journal of Applied Econometrics*, 20: 811-827.

Fouquau, J., C. Hurlin, and I. Rabaud, 2008, "The Feldstein-Horioka Puzzle: A Panel Smooth Transition Regression Approach", *Economic Modeling*, 25: 284-299.

González, A., T. Teräsvirta, and D. V. Dijk, 2004, "Panel Smooth Transition Regression Model and an Application to Investment under Credit Constraint", *Working Paper*, Stockholm School of Economics.

González, A., T. Teräsvirta, and D. V. Dijk, 2005, "Panel Smooth Transition Regression Models", *SEE/EFI Working Paper Series in Economics and Finance*, No. 604.

Hsiao, C., 2003, *Analysis of Panel Data*, Cambridge: Cambridge University Press.

Kamakura, W. A., V. Mittal, F. D. Rosa, and J. A. Mazzon, 2002, "Assessing the Service-profit

Chain", *Marketing Science*, 21: 294-317.

King, C. A., 1995, "What is Hospitality?", *International Journal of Hospitality Management*, 14: 219-234.

Kiran, B., 2012, "Nonlinearity and Fractional Integration in the US Dollar/Euro Exchange Rate", *Panoeconomicus*, 59: 325-334.

Lee, C. W. and C. H. Chou, 2014, "Effect of Service Quality on the Profitability of Hospitality Industry: A Dynamic Panel Data Analysis in Taiwan", *The Empirical Economics Letters*, 13: 1045-1053.

Lee, W. F. and Y. H. Wang, 2012, "Efficiency and Productivity Analysis of International Tourist Hotels in Taiwan: The Bottom-up Decomposition Approach", *Taiwan Journal of Applied Economics,* Special Issue: 39-89.

Levin, A., C. F. Lin, and C. S. J. Chu, 2002, "Unit Root Tests in Panel Data: Asymptotic and Finite-sample Properties", *Journal of Econometrics*, 108: 1-24.

Lin, L., J. S. Horng, Y. C. Chen, and C. Y. Tsai, 2011, "Factors Affecting Hotel Human Resource Demand in Taiwan", *International Journal of Hospitality Management*, 30: 312-318.

Lin, Y. M., W. H. Kong, and C. L. Chang, 2009, "Quasi-fixed Inputs and the Change of Productivity of Taiwanese International Tourist Hotels", *Taiwan Journal of Applied Economics*, Special Issue: 191-225.

Pan, S. C., S. Y. Liu, and P. C. Wu, 2014, "Re-testing the Tourism-led Growth Hypothesis Using Panel Smooth Transition Regression Models", *Tourism Economics*, 20: 39-50.

Parasuraman, A., V. A. Zeithaml, and L. L. Berry, 1988, "Servqual: A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality", *Journal of Retailing*, 64: 12-40.

Richardson, P. S., S. D. Alan, and K. J. Arun, 1994, "Extrinsic and Intrinsic Cue Effects on Perception of Store Brand Quality", *Journal of Marketing*, 58: 28-36.

Rust, R. T., A. J. Zahorik, and T. L. Keiningham, 1995, "Return on Quality (ROQ): Making Service Quality Financially Accountable", *Journal of Marketing*, 59: 58-70.

Taiwan Tourism Bureau, 2018a, "Statistic Data," Retrived April 26, 2018, from http://admin.taiwan.net.tw/statistics/release.aspx?no=136.

Taiwan Tourism Bureau, 2018b, "Statistic Data," Retrived May 09, 2018, from http://admin.taiwan.net.tw/travel/statistic_h.aspx?no=220.

Terasvirta, T., D. V. Dijk, and M. C. Medeiros, 2005, "Linear Models, Smooth Transition Autoregressions, and Neural Networks for Forecasting Macroeconomic Time Series: A Re-examination", *International Journal of Forecasting*, 21: 755-774.

Wang, Y. H., W. F. Lee, and C. C. Wong, 2007, "Productivity and Efficiency Analysis of International Tourist Hotels in Taiwan: An Application of the Stochastic Frontier Approach", *Taiwan Economic Review*, 35: 55-86.

Wang, F. C., J. K. Shang, and W. T. Hung, 2006, "Productivity and Service Quality Changes in International Hotels in Taiwan", *Annals of Tourism Research*, 33: 571-574.

Whitla, P., P. G. P. Walters, and H. Davies, 2007, "Global Strategies in the International Hotel Industry", *International Journal of Hospitality Management*, 26: 777-792.

Wilkins, H., B. Merrilees, and C. Herington, 2007, "Towards an Understanding of Total Service Quality in Hotels", *International Journal of Hospitality Management*, 26: 840-853.

Wu, P. C. and C. C. Lee, 2014, "The Threshold Effect of Central Bank's Intervention on the Nexus of Trade Balance and Macroeconomic Determinants", *The Empirical Economics Letters*, 13: 763-772.

Wu, P. C., S. Y. Liu, and S. C. Pan, 2013, "Nonlinear Bilateral Trade Balance-fundamentals Nexus: A Panel Smooth Transition Regression Approach", *International Review of Economics and Finance,* 27: 318-329.

Wu, P. C., S. Y. Liu, and S. C. Pan, 2014, "Nonlinear Relationship between Health Care Expenditure and Its Determinants: A Panel Smooth Transition Regression Model", *Empirica*, 41: 713-729.

Yeh, C. Y. and C. M. Chen, 2012, "Uncertain Lodging Demand and Hotel Costs: An Empirical Study of International Tourist Hotels in Taiwan", *Taiwan Journal of Applied Economics,* 92: 93-117.

勞動力成本對台灣國際觀光飯店服務品質和獲利能力之非線性影響*

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摘　要

本研究採用橫斷面平滑轉換迴歸模型，利用平均員工薪資爲轉換變數，探討服務品質對台灣國際觀光飯店獲利的門檻效果，研究樣本爲 48 家台灣主要國際觀光飯店，樣本區間爲 2000-2013 年。實證結果顯示，隨著時間、飯店與轉換變數間的不同，服務品質與飯店獲利之間具有非線性關係。此外，勞動成本影響服務品質對飯店獲利的邊際效果，隱含平均員工薪資對飯店獲利有非線性的影響。最後，勞動成本低於門檻值時，服務品質 (客房或餐廳) 對飯店獲利能力具有正向的影響，且餐廳服務品質較客房服務品質的影響更爲明顯。然而，一旦勞動力成本超過門檻值時，服務品質對飯店獲利能力的邊際效果將會產生不一致的現象，甚至可能導致飯店整體獲利能力下滑。

關鍵詞：橫斷面平滑轉換迴歸模型、國際觀光飯店、獲利能力、服務品質、員工薪資
JEL 分類代號：F66、G40

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* 英文語法及書寫均透過母語同事校稿。

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DOI: 10.3966/054696002018060103005