Applying Difference in Difference Method to Value Policy Effect on Hotel Industry

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Abstract

This study applies Difference in Difference (DiD) method to evaluate the policy effect on hotel industry. This study uses the International Tourism Hotels (ITHs) in Taiwan as the subjects. The operational and managerial data of ITHs are collected from the reports by Taiwan Tourism Bureau. The data contained 70 hotel units from year 2005 to 2010. In 2008, the government relaxed the entrance limitation for the tourists from China and the number of inbound visitors has been increasing tremendously. However, our research results indicate that the open policy for visitors from China have no significant positive effect on the profitability of ITHs. Tourism policies can lead to unexpected results to different tourism industry with different operational scale, which should be taken into consideration when making business strategies or governmental policies.

Keywords: Tourism policy; Economic effect; Hotel industry; Open market; Difference in difference method

Introduction

In recent years Taiwan government has implemented many important policies to stimulate the growth of tourism industry. The most significant policy is that the government relaxed the entrance limitation for the tourists from China in 2008. Since then the number of Chinese visitors promptly increase from 0.24 million in 2008 to 0.89 million in 2009, accounting for 272% growth rate. The tourists who visit Taiwan only for tourism purposes have even more significant increase, from 0.09 million in 2008 to 0.60 million in 2009, accounting for 568% growth rate. After the initial boost, the annual growth rate is still very phenomenal in the following years, as can be seen in Table 1.

Taiwan's tourism industry is clearly on the expansion stage. However, the Annual Survey Reports on Visitors Expenditure and Trends in Taiwan, conducted by Taiwan Tourism Bureau from 2009 to 2011 [1], has shown that the percentage of trip expenses on lodgings is decreasing (39.33%, 37.83%, and 35.06%, respectively) while the proportion of inbound visitors from China is increasing (Table 2). More specifically, during this period, the proportion of visitors staying in international tourist hotels (ITHs) are decreasing (47.31%, 34.98%, and 32.38%, respectively) while a significant increasing proportion of

visitors choose standard hotels for accommodation (45.26%, 57.50%, and 60.41%, respectively). The outcome may imply that the open market policy is not as helpful as expected to ITHs. The high growth of inbound visitors may result in over-expansion of tourism industry, which should draw close attention by the government. It is very crucial to distinguish the real policy effect from all the related economic indexes so that the government can issue effective policies to promote the industry in a sustainable development framework (Table 2).

Therefore, this research is attempting to adopt the difference in difference (DiD) method to estimate the real policy effects on ITHs. The DiD method estimates panel data by pooling cross sections across

Indexes	2009	2010	2011
# of total visitors (millions)	4.40	5.57	6.09
# of increased visitors (millions)	0.55	1.17	0.52
# of Chinese visitors (millions)	0.97	1.58	1.73
% of Chinese visitors among total visitors	22%	28.37%	28.40%
Foreign exchange earnings from tourism (US$ billions)	6.82	8.72	11.07
Average expenses per visit (US$)	1,551	1,566	1,818
Average nights of stay per visit	7.17	7.06	7.05
Average expenses per day per visit (US$)	216.30	221.84	257.82
% of expenses in lodging	39.33%	37.83%	35.06%
% of stays in international tourist hotels	47.31%	34.98%	32.38%
% of stays in tourist hotels	7.43%	7.52%	7.21%
% of stays in standard hotels	45.26%	57.50%	60.41%
Data Source: Summarized from Annual Survey Report on Visitors Expenditure and Trends in Taiwan, released by Taiwan Tourism Bureau			

Table 2: Related tourism indexes from 2009 to 2011 in Taiwan.

Year	Chinese Visitors	Growth rate of Chinese Visitors	Chinese Tourists	Growth Rate of Chinese Tourists
2002	155,872		2,151	
2003	133,422	-14%	12,768	494%
2004	132,109	-1%	19,150	50%
2005	152,181	15%	54,162	183%
2006	221,891	46%	98,548	82%
2007	226,742	2%	81,903	-17%
2008	240,494	6%	90,035	10%
2009	894,065	272%	601,754	568%
2010	1,512,127	69%	1,188,929	98%
2011	1,648,973	9%	1,286,574	8%
2012	2,450,589	49%	2,001,941	56%
Data Source: National Immigration Agency, Taiwan				

Table 1: The Numbers of Chinese Visitors and Tourists in Taiwan from 2002 to 2011.

time and uses a control group to exclude the other structural changes assumed to be identical between the treatment and control groups. Consequently, the DiD estimator can reveal the actual effect caused by the treatment. This research, therefore, applies the method to estimate the economic effects on ITHs with the implementations of tourism related policies. The examination on policy effects can provide the government more specific information for policy decision.

There have been many research works on valuing policy effects by adopting input-output models. The input-output method is very useful to predict the multiplier effect through government expenditure in terms of production values, number of jobs employed, national income, and etc. This method is also highly depended on the industry correlation coefficients estimated by central governments (in Taiwan, the matrix is renewed every 5 years and adjusted every year). However, the prediction can only show the impact for an industry in aggregation, which can only provide limited information for the industrial management. Furthermore, technology innovation and market volatility usually cause the structural shocks in the economy, which change the industrial correlation considerably. The inflexibility of this method, not able to reflect the economic change in time, would result in false predictions on policy effects. Therefore, the DiD method is proposed to reveal policy effects based on the operational data of a focal industry for managerial purpose. Currie and Thomas [2] applies this method to detect the policy effects of Head Start which aims to improve the learning skill, social skill, and health status of poor children in US. Kiel and McClain [3] also applies this method to evaluate the policy effect of building an incinerator on the house prices. Moreover, the DiD method uses panel data and compares the control group of business units[1] with the treatment groups before and after the time period of policy implementation by controlling the possible biases from unobservable factors [4]. Therefore, the unbiased policy effect can be revealed without the noise from other economic factors.

Data and Research Method

This study focuses on the hotel industry and uses ITHs as the subjects [5]. ITHs are classified by the Tourism Bureau of Taiwan. The operational and managerial data are collected from the reports by Taiwan Tourism Bureau [6]. The data contained 70 hotels from year 2005 to 2010, which makes the data in a panel format.

This research investigates the profit effects of ITHs after the policy implementation. Profit margin (PM) is defined as the performance index. In contrast with the other performance indexes such as revenue or profit, PM can provide more comparative rate of returns across the other investment alternatives to investors or developers. PM is defined as the explained variable:

$$PM = \frac{\text{total revenue} - \text{total cost}}{\text{total revenue}} \times 100\% \qquad (1)$$

Taiwan government relaxed the entrance limitation for the tourists from China in 2008. Since Taiwan share the same Mandarin Language with China and is one of the closest islands to the enormous market, the increased tourists from China are expected to highly increase the profit margin for ITHs. To detect the effect of the policy, DiD approach is applied by defining two dummy variables *Policy* and *China*. Variable Policy indicates the year (2008) when the policy is implemented, and variable *China* indicates those hotels who host tourism groups from China, as follows.

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[1]Control group is categorized for those not affected by the policy; treatment group is categorized for those affected by the policy.

$$Policy \begin{cases} = 0 & befor\ policy\ (2005-2007) \\ = 1 & after\ policy\ (2008-2010) \end{cases} \qquad (2)$$

$$China \begin{cases} = 0 & host\ tourism\ groups\ from\ China \\ = 1 & not\ host\ tourism\ group\ from\ China \end{cases} \qquad (3)$$

The hotels without hosting Chinese tourism groups can be considered as the control group because their business performance would not be affected by the open market policy. Consequently, the *PM* model is developed with the following explanatory variables:

$$PM_{it} = \alpha + \delta_0 Policy_t + \beta_1 China_{it} + \delta_1 Policy_t \times China_{it} + \sum_{i=2}^{n} \beta_i (X_{it}) + u_{it} \qquad (4)$$

where X_i denotes the other observable factors affecting the profit margin; u_{it} denotes the unobservable; δ_0、 δ_1、 β_1、 β_i are coefficients. Table 3 categorizes the definition of the coefficients in DiD equation. Most importantly, the coefficient δ_1 represents the average treatment effect, which reveals the difference between the treatment group and control group through comparing the group data before and after the policy implementation.

The vector of X includes the chain operation (*Chain*), hotel scale (*Scale*), room rate (*Price*), room quality (*Rquality*), and dinning quality (*Dquality*). Chain operation has been considered as a very effective factor for hotel performance [7]. Hotels with chain participation usually benefit from the reputation of brand name, the efficient management system, as well as the cost sharing on marketing and supplies. *Chain* is a dummy variable.

$$Chain \begin{cases} = 1 & if\ hotels\ are\ chain\ operated \\ = 0 & if\ hotels\ are\ operated\ independently \end{cases} \qquad (5)$$

The variable *Scale* denotes the number of rooms managed by the hotel. If a hotel has a larger scale, the fixed cost is also higher, causing the burden on the profit margin. The room quality (*Rquality*) is defined by the ratio of the number of employees in the housekeeping department to the number of rooms. Similarly, the dinning quality (*Dquality*) is defined by the ratio of the number of employees in the food and beverage department to dinning spaces in squared feet. Higher quality may be accompanied with higher costs for human resources as well as higher price, so that the effects to the profit margin may be ambiguous.

The Empirical Results and Analysis

The empirical results are shown in Table 4. The estimates of *Policy*, *China* and the interaction term of *Policy × China* are all insignificant. Only *Chain* shows positive effect and *Rquality* shows negative effect on *PM* within 1% significance level. As can be seen, the open market policy, although tremendously increasing the number of inbound tourists to Taiwan, ITHs are clearly not benefited from the policy. The estimated value of DiD coefficient also indicates that comparing to the hotels which do not host Chinese tourist groups, ITHs which host Chinese tourist groups did not have better performance after the policy

	Treatment Group (TG) (*Chin* = 1)	Control Group (CG) (*China* = 0)	Difference b/t TG & CG (1-0)
After Policy (AP) (*Policy*=1)	$\beta_0 + \delta_0 + \beta_1 + \delta_1$	$\beta_0 + \delta_0$	$\beta_1 + \delta_1$
Before Policy (BP) (*Policy*=0)	$\beta_0 + \beta_1$	β_0	β_1
Difference b/t AP &BP (1-0)	$\delta_0 + \delta_1$	δ_0	δ_1

Table 3: The Definitions of coefficients in DiD equation.

Variable	Coefficients	T stat	P value
Policy	-0.056925	-0.84	0.401
China	0.018393	0.37	0.708
Policy × China	0.006634	0.1	0.923
Chain	0.06504**	3.52	0.001
Scale	0.000025	0.42	0.672
Price	0.000015	1.46	0.146
Rquality	-0.2047***	-4.21	0.000
Dquality	0.08573	0.71	0.481
Constant	0.08432	1.55	0.124
Sample Size	228		
R-square	0.1937		
Adjusted R-square	0.1643		
***$P < 0.01$; **$P < 0.05$; *$P < 0.1$			

Table 4: The DiD Estimates of Policy Effect on Profit Margins of ITHs.

is implemented. This information provides the managers of ITHs to reconsider their strategies on group contract or negotiation with travel agencies [8].

More importantly, these results remind the government to take a closer look on tourism policies. The open market policy can cause a crowd-out effect to tourists from other countries. Over promotion on the growth of the inbound tourists may also mislead the expectation of the local investors and cause over expansion in tourism industry. A market depending on one source of tourists too strongly also contains a high degree of uncertainty (Table 4).

Acknowledgement

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