JOHAR – Journal of Hospitality Application & Research
20 (2) 2025, 51-74
www.publishingindia.com/johar/
https://doi.org/10.21863/johar/2025.20.2.003

Submitted: 06 December, 2024
Revision: 28 May, 2025
Accepted: 03 June, 2025

DOES GREEN HOTEL CERTIFICATION IMPROVE OPERATIONAL PERFORMANCE? EVIDENCE FROM NORTH AMERICAN ECO-RATING PROGRAMS

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Abstract

This study investigates whether obtaining green hotel certification leads to improved operational performance in the hotel industry. Using panel data from 2009 to 2018 covering 143 certified hotels classified under the North American Green Leaf Program, the Canada Green Key Eco-Rating Program, and the American Green Mark Program, along with 148 non-certified hotels, the analysis applies a fixed effects panel regression approach. The empirical results indicate that green hotel certification is positively associated with key performance indicators such as occupancy rate, average daily rate (ADR), revenue per available room (RevPAR), and total operating revenue. These findings suggest that although certification may involve short-term cost increases, it can contribute to long-term operational gains. The results provide practical implications for hotel managers and policymakers who are evaluating investments in sustainability and certification initiatives.

Keywords: *Social Responsibility, Green Hotel, Operational Performance, Hotel Industry, Fixed Effect Model*

Introduction

Due to the observed increase in greenhouse gas emissions since the mid-20th century, as well as the negative impact of global warming, many developed countries have exhibited an environmental consciousness for decades. Recently, some organizations for international environmental protection, such as the International Energy Agency (IEA) (Khan & Hou, 2021), have continuously promoted this issue. This has led to many emerging countries also realizing the need for environmental protection. According to the measurable, reportable and verifiable (MRV) principles approved in the Copenhagen Accord, developed and developing contract countries have been asked to make more of an effort to manage their greenhouse gas emissions (Pereira, 2023). Hence, many governments have been devoted to enacting explicit goals, relative rules and policies to implement greenhouse gas mitigation. In order to help governments achieve their goals, IEA offers some concrete suggestions about policies or measures for carbon mitigation. For example, using the policy processes of strategic planning, information diffusion and consultative advisers enables enterprises and/or citizens to increase their awareness of the need for environmental protection (Cherepovitsyn & Rutenko, 2022). Fiscal instruments, including energy taxes, tax deductions, policy incentives and subsidies, can urge enterprises to use new or effective clear energy techniques. Establishing carbon emissions or industrial energy-use standards and regulatory instruments with specific marks for products or equipment can enhance energy efficiency and mitigation of carbon emissions; and, by means of negotiation with firms, voluntary agreement (VA) for saving energy and reducing carbon emissions has been proposed by the firms themselves (Srivastava et al., 2024). Other flexible mechanisms, such as emissions trade regulations, green certificates, clean development mechanisms (CDM) and joint implementation (JI) measures should also be considered (Babel et al., 2024).

In the past, the manufacturing industry was the primary target of efforts to improve carbon emissions and address other environmental problems. Because of rapid development in the hotel industry, many countries have recently paid attention to that industry in their efforts to reduce carbon emissions or shoulder other environmental responsibilities (Srivastava et al., 2024). In general, hotels have always been regarded as an "industry without a chimney"; in fact, carbon emissions from hotels are not as low as has generally been thought. Based on the Pollution Abatement and

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Control Expenditures Survey conducted by the Environmental Protection Administration of Taiwan in 2014, the one-week amount of carbon emission generated from a mid-size hotel is almost equivalent to the annual carbon emissions of 100 households. Hence, the need to reduce carbon emission in the hotel industry is a critical issue. For this purpose, many advanced countries have already drawn up some regulations or measures to induce the hotel industry to mitigate its carbon emissions, such as Green Hotel certification and Green Mark certification.

According to the definition of the Green Hotels Association, green hotels are environmentally-friendly properties whose managers are eager to institute programs that save water, save energy, reduce solid waste and reduce carbon emissions to help protect the Earth (Srivastava, 2024). There have been some ongoing credible certifications of green hotels, including the Audubon Green Leaf Eco-rating Program for Hotels, the Canadian Green Key Eco-rating System, the American Green Seal, the Green Key in the European Union, the Green Tourism Business Scheme (GTBS) in the UK and the Chinese Green Tourism Hotel. The rating standards to obtain each of these green hotel certifications are divided into hardware and software. The former focuses on sustainable sites, energy efficiency and water-using efficiency, whereas the later focuses on green purchasing, waste reduction and green cleaning.

The work taken to acquire green hotel certification may lead to increased hotel operating costs, which could further impact hotel performance. However, in order to acquire green certification, firms must adopt some measures to improve their environmental performance. The attempt to do so will also have a positive impact on firms such as obtaining support from customers or increasing the hotel's performance (Han et al., 2010; Asadi et al., 2020). At present, since people are requesting more social responsibility from corporations (Jana et al., 2024), the acquisition of green hotel certification will be a necessity for hotel operations in the future. However, it is still uncertain as to whether or not acquiring green hotel certification would have a positive effect on the operating performance of the hotel industry. If the empirical evidence that green hotel certification can increase hotel performance is proven, that information will provide a big incentive to firms, urging them to participate in environmental protection (Han et al., 2010; Chen, 2019).

This study aims to understand whether obtaining green hotel certification can bring actual benefits to hotels. Specifically, it is the impact of obtaining green hotel certification on operational performance indicators including occupancy rate, average room rate, revenue growth, etc., so as to serve as a basis for hotel managers to make relevant decisions refer to. The significance

of this research is to help hotel managers and policymakers understand the operational value and feasibility of green hotel certification. Especially, with the increase in global environmental awareness, green certification may become an important tool for hotel operators to adapt to market changes. In addition, the research object of this study is the North American hotel industry, and the results of the study can provide reference for other regions and further promote the transformation of the global hotel industry towards sustainable development.

The remainder of this paper is organized as follows. Section 2 presents the theoretical background and hypotheses development; in particular, the theories of corporate social responsibility and social welfare are depicted, and hypothesis ratiocination is also done. Section 3 describes the material and methods used in this study; this includes the data description and the rationale for the selection of the methodology. Section 4 describes and discusses the empirical results. The final section presents the conclusions.

Theoretical Background and Hypotheses Development

From the perspective of management theory, Pan et al. (2021) once divided past research on corporate social responsibility (CSR) into two aspects: antecedents and consequences. In antecedent research, stakeholder theory and institutional theory are mostly used; while in outcome analysis, the resource-based view (RBV) is widely used. RBV believes that organizations should integrate and utilize human, physical and organizational resources to create unique and difficult-to-imitate value, beyond the construction of competitive advantages (Barney, 1991; Nayak et al., 2022). Research also shows that the core of RBV lies in identifying, acquiring and protecting productive resources (Spender, 1996; Samadhiya & Agrawal, 2024), and enhancing corporate performance (Ahmad & Schroeder, 2003; Razzaque et al., 2024). In addition, RBV serves as an intermediary variable that helps companies proactively take environmental measures that exceed regulatory requirements (Russo & Fouts, 1997). The improvement of an organization's environmental performance is closely related to its ability to change (Judge & Elenkov, 2005). Therefore, resource commitment is crucial to CSR outcomes, and CSR strategies can improve financial performance and environmental innovation (He & Shen, 2019; Bacinello et al., 2020). Yusliza et al. (2019) pointed out that CSR can promote green human resource management (green HRM) and become an irreplaceable key resource. Based on this, RBV is suitable for exploring the relationship between CSR, green HRM and sustainable performance, and regards CSR as a resource with strategic value to help companies achieve their sustainability goals.

From an economic theory perspective, corporate operations aim to maximize benefits, yet inevitably cause pollutant emissions and consume resources, leading to carbon emissions. Historically, society has borne these external costs, resulting in deadweight loss of social welfare, affecting both social welfare and economic growth if ignored (Chen et al., 2003).

In Fig. 1, corporate carbon emissions are a negative external cost. If firms only consider private costs, their service output is QC, exceeding the socially optimal output QA. The discrepancy arises because QC ignores the external costs of carbon emissions, leading to a deadweight loss of social welfare, ΔABC. Larger service volumes or higher marginal external costs increase this deadweight loss, which negatively impacts economic growth. To address negative externalities, governments may use measures like environmental taxes (Walde & Wood, 2004), direct restrictions, subsidies, or voluntary agreements (VAs). While taxes can reduce deadweight loss, they may lead to administrative costs and inflation. Vas (Gokhale, 2021), however, encourage firms to internalize external costs without triggering inflation or added government expenses (Onofrei et al., 2020). This fosters efficient resource allocation, enabling both environmental protection and economic growth. Green Hotel certification parallels VAs, signifying a business's commitment to reducing environmental impact and meeting sustainability standards (Chen et al., 2021), resulting in a lower impact on the environment than hotels that are not certified hotels, and their service quantity will also be impacted.

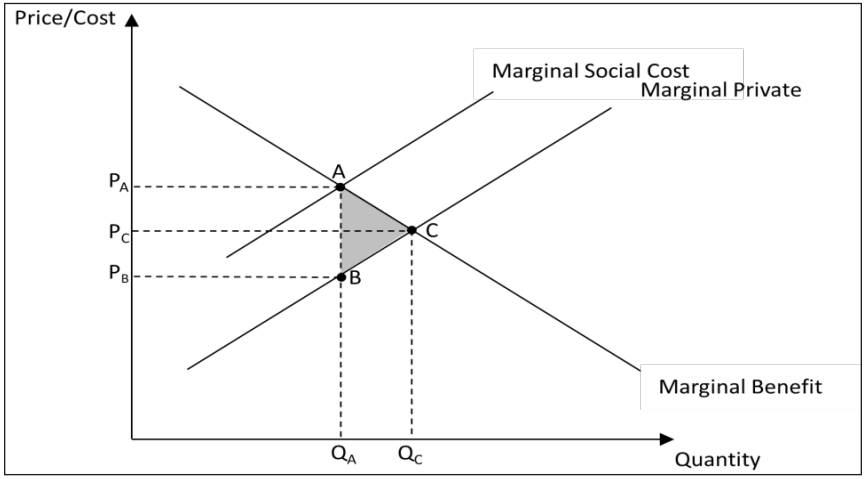

Fig. 1: The Externality from the Hotel Industry's Operating Costs

Improving environmental performance through green hotel certification increases operating costs but also brings significant internal and external benefits (Chen et al., 2021). Internally, redesigned processes can enhance production efficiency, reduce costs, and improve financial performance (Merli et al., 2019). Externally, enhanced environmental performance boosts corporate reputation and attracts stakeholder support, which can increase consumer willingness to pay higher prices, thereby raising revenues and improving operational performance. Stakeholders, especially consumers, may show preference for certified hotels (Baah et al., 2021).

Based on the above-mentioned economic theories and discussions presented in the relevant literature, the following points can be summarized: (1) acquiring green hotel certification is behaviour of internalizing external costs that result in simultaneously increasing operating costs. Because the service quantity is fixed, the hotel operators cannot reduce service quantity directly, while increasing total costs of hotel operators and further lowering operating performance and (2) if we regard the acquisition of green hotel certification as a concrete achievement of hotel companies on environmental improvement, stakeholders, consumers in special, may be more willing to consume, or to may pay higher price for accommodation, which can lead to increasing total revenue of hotel operators as well as enhancing their operation performance. In other words, the process of acquiring certification will simultaneously result in a trade-off between two forces that separately decrease and increase hotel operation performance, as shown in Fig. 2.

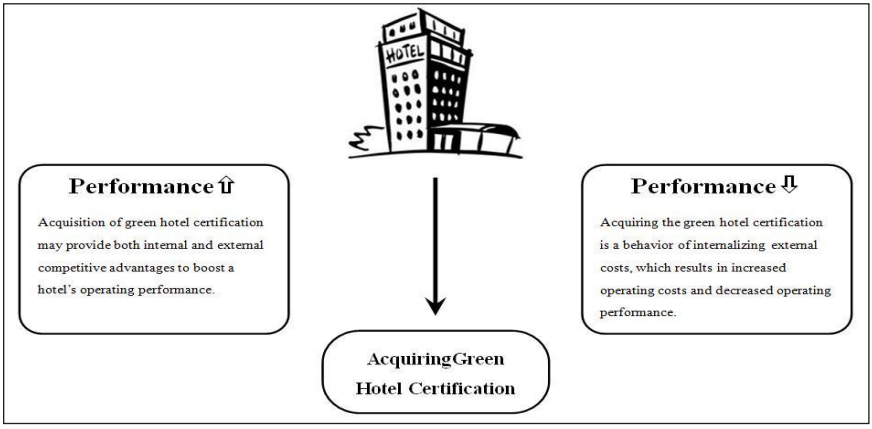

Fig. 2: Acquiring Green Hotel Certification May Affect Hotel Performance

Based on the theoretical perspectives of external cost internalization and the resource-based view, this study develops the following hypotheses to examine the relationship between green hotel certification and hotel operational performance:

Hypothesis: Obtaining green hotel certification affects hotel operational performance.

H_0: The acquisition of green hotel certification positively influences the operational performance of the hotel industry.

H_1: The acquisition of green hotel certification negatively influences the operational performance of the hotel industry.

This hypothesis structure reflects a trade-off between increased costs due to certification and enhanced revenue opportunities resulting from improved stakeholder perceptions and consumer preferences.

Methods

Data Collected

This study collects data from listed hotel companies in North America, including the United States and Canada, for analysis. There are 291 sample hotels in total, and the data period is from 2009 to 2018. The sample hotels are divided into two groups. One group includes 47 hotels certified by the North American Green Leaf Hotel Rating System, 32 hotels certified by the Canadian Green Key rating project, and 64 Hotels are certified by the U.S. Green Mark Program, bringing the total number of certified hotels to 143; the other group consists of 148 hotels without any green certification. Hotel operating performance data such as occupancy rate, revenue per available room, and average daily rate are obtained from hotel annual reports and the Datastream database. The data used to calculate Tobin's Q of the overall efficiency index, except for some data from each hotel. Some of the hotel's annual reports, such as return on assets (ROA) and accounting indicators sales growth rate (SGR), come from the Datastream database developed by Thomson Reuters.

Procedure

This study addresses the endogeneity problem in analysing the influence of green hotel certification on hotel industry performance using a two-stage estimation method. Endogeneity occurs when unobserved variables

simultaneously affect both green certification and hotel performance, leading to biased estimates with traditional OLS methods. To mitigate this, the study uses two-stage estimation, which is preferred over the instrumental variable approach due to limited data.

The First Stage: The first stage estimates the probability of hotels obtaining green certification based on corporate characteristics and surplus resources, aligning with theories like affordability and slack resources. Treating certification as a binary variable, the study applies panel logistic regression due to the pooled nature of the data, combining time-series and cross-sectional characteristics.

The Second Stage: The second stage incorporates the estimated probabilities from the first stage into a model measuring the impact of green certification on hotel performance. Indicators such as occupancy rates, revenue per available room, and average daily rates are used. Statistical tests like Kendall's tau and VIF confirm no multicollinearity among variables.

Given the panel data properties, this study adopts panel data models instead of OLS to avoid issues like serial correlation and heteroscedasticity, ensuring unbiased and consistent results. Fixed and random effect models are considered, with the choice determined through tests like the F-test, LM test, and Hausman test. Fixed effects are used if explanatory variables correlate with residuals; otherwise, random effects are selected.

Variables and Model

Before estimation, the paper first carries out two kinds of tests for the all-selected variables. At first, it is important to ensure that multicollinearity does not occur among the explanatory variables because of their mutual high correlation. For that, the covariance matrix of all explanatory variables is adopted to calculate the Kendall's tau correlation coefficients, and judging the correlation among variables. The Kendall's tau correlation coefficients do not need any assumption for variable distribution, which is different from Pearson correlation. The Spearman correlation coefficients don't also need any assumption for distribution, but the Kendall's tau correlation coefficients are not easily influenced than Spearman correlation by data's mistake and divergence. This is the reason that the Kendall's tau correlation coefficients are chosen to judge in the paper. Continuously, the variance inflation factor (VIF) is employed to examine whether there exists any collinear relation among variables, as shown in Table 1.

Table 1: Variables, Definitions, Descriptive Statistics and Data Resources

Variable	Definition	Mean	Max	Min	Var	Data Resource
Green hotel certification (GHC)	It is 1, if the hotel acquires the certification, and it is 0, if the hotel does not acquire green certification.	0.491	1.00	0.00	–	Hotel Database USA
Occupancy ratios (OCR)	The ratio of the guest rooms sold to guest rooms available for sale in year t.	0.685	0.947	0.428	0.149	Hotel Database USA
Average daily rate (ADR)	Average daily room revenue / rooms sold in year t, except house use and complimentary rooms from the denominators.	134.64	201.25	55.37	38.44	Hotel Database USA
Revenue per available room (RevPar)	Calculated by dividing a hotel's total room revenue by the total number of available rooms in year t.	92.24	166.43	41.26	21..59	Hotel Database USA
Total operating revenue (TOR)	Total operating income = Net operating income + Non-operating revenue (Interest on investments) in year t.	636.97	3,054.06	76.71	216.35	Datastream
Room rates (RRS)	Average the rate charged daily for a hotel room in year t.	236.05	459.29	125.51	62.23	Hotel Database USA
Total rooms (TRS)	Total guest rooms available for sale in year t.	304.65	865.00	95.00	151.94	Hotel Database USA
Total employees (TES)	Total employees in year t.	422.82	1,531	113.00	139.17	Datastream
Total operating costs (TOC)	Total operating costs in year t.	568.65	2,521.71	89.13	210.06	Datastream

Panel A in Table 2 displays the Kendall's tau correlation coefficients matrix among explanatory variables. The correlation coefficients are all distributed over [-0.0259, 0.2964], which means that there is no high correlation among the employed variables. Panel B in Table 2 shows the results of the VIF test for the four variables of hotel operating performance with respect to corresponding explanatory variables are all smaller than ten, which means high co-linearity does not exist.

Table 2: Kendall's Tau Correlation Matrix and VIF Test of Variables

Panel A				
	RRS	**TRS**	**TES**	**TOC**
RRS	–	–	–	–
TRS	-0.0259 (0.001)	–	–	–
TES	0.0591 (0.000)	0.2104 (0.000)	–	–
TOC	0.0160 (0.000)	0.1283 (0.000)	0.2964 (0.000)	–
Panel B				
	RRS	**TRS**	**TES**	**TOC**
VIF_OCR	4.1129	1.6489	1.8223	1.2265
VIF_ADR	7.9620	3.1263	2.1580	1.5492
VIF_ RevPar	6.8533	3.6450	2.3246	1.6188
VIF_TOR	2.3135	7.7158	3.0628	6.6044

Secondly, a unit root test is used to ensure if series is stationary to prevent from spurious regression. There are many kinds of methods for testing unit root. The most commonly used are the ADF and PP tests (Diltz & Kim, 1996; Koenker & Xiao, 2004; Tsong & Lee, 2011). This paper simultaneously adopts the two testing models in which both constant and trend was chosen for estimation. The results arranged in Table 3 show that all these series are stationary, that is to say unit roots do not exist. Thus, the difference technique isn't needed and these series would be analyzed at the level condition.

Table 3: Unit Root Test of Variables

	ADF Test		**PP Test**	
	Constant	**Trend**	**Constant**	**Trend**
OCR	-6.950***	-7.096***	-6.997***	-7.132***
ADR	-6.335***	-6.591***	-6.389***	-.6.660***
RevPar	-7.798***	-8.050***	-7.852***	-8.106***

	ADF Test		PP Test	
	Constant	**Trend**	**Constant**	**Trend**
RRS	-9.377***	-9.652***	-9.445***	-9.741***
TRS	-8.620***	-8.817***	-8.753***	-8.965***
TES	-6.855***	-7.110***	-6.934***	-7.196***
TOC	-9.490***	-9.794***	-9.602***	-9.932***

*Note: *, **, and *** denote a 10%, 5% and 1% level of statistically significant.*

After ensuring that the variable series possess stationary and there are no high correlation and co-linearity among the variables, the data analysis as below:

In the first stage, the logistic regression to estimate the probability of the acquisition of green hotel certification in theory is shown in *Equation* (1):

$$GHC_t = \alpha_0 + \alpha_1 TA_t + \alpha_2 MB_t + \alpha_3 DAR_t + \varepsilon \quad (1)$$

In *Equation* (1), GHC shows whether hotel *i* acquires green hotel certification; when GHC=1 the certification is acquired; when GHC=0 no certification is acquired. In the second stage, in order to estimate the influence of green hotel certification on hotel performance, we adopt a linear model for the analysis, as shown in *Equation* (2).

$$OP_t = \beta_0 + \beta_1 \hat{GHC}_t + \beta_2 TA_t + \beta_3 MB_t + \beta_4 DAR_t + \delta \quad (2)$$

In *Equation* (2), $\hat{GHC}$ is the theoretical probability of acquiring the green hotel certification that is obtained from Equation (1) in the first stage. The OP variable represents the indications of hotel operating performance, having guest rooms occupancy ratios, total operating revenue, revenue per available room, and average daily rate.

Finally, the robustness check is done so that the one-period lagged value replaces the current value for each variable without $\hat{GHC}$ to re-estimate the panel regression., as shown in *Equation* (3).

$$OP_t = \gamma_0 + \gamma_1 \hat{GHC}_t + \gamma_2 RRS_{t+1} + \gamma_3 TRS_{t+1} + \gamma_4 TES_{t+1} + \gamma_5 TOC_{t+1} + \omega \quad (3)$$

Results and Discussion

Empirical Results

Before estimating the coefficients of regression, this study used the F-test, LM test and the Hausman test separately to test the logistic regression mentioned in the first stage for estimating the theoretical probability of acquiring green certification and the linear and first-difference models proposed in the second stage for estimating the effect that acquiring the certification has on hotel performance. These model specification tests are conducted to determine whether ordinary least squares (OLS), fixed effects, or random effects models are most appropriate for the data. The results are presented in Table 4.

The results from the F-test, the LM test and the Hausman test all reject the null hypothesis in the logistic regression model, so the fixed effect model must be selected for the first stage to estimate the theoretical probability of acquiring green hotel certification. Afterwards, we took the probability from the fixed effect model in the first stage into the linear in the second stage, and the F-test, the LM test and the Hausman test were done again. The results of the F-test and the LM test showed that the linear model rejected the null hypothesis, which means the OLS is not fit for the models. Furthermore, the results of the Hausman test showed that the explaining variables are relative to the residual in the intercept; thus, the fixed effect model was selected.

Table 4: Test for the Selection of Estimation Method and Model

The First Stage				
				Logistic Regression
F-test				41.1142***
LM test				481.2171***
Hausman test				33.1008***
The Second Stage				
	Linear Model (OCR)	**Linear Model (ADR)**	**Logistic Regression (RevPar)**	**Linear Model (TOR)**
F-test	62.7295***	63.1652***	62.9740***	63.0366***
LM test	925.6361***	928.2110***	927.0408***	927.2370***
Hausman test	54.5720***	55.0264***	54.7669***	54.9496***

The Second Stage Estimation_ Robustness				
	Linear Model (OCR)	**Linear Model (ADR)**	**Logistic Regression (RevPar)**	**Linear Model (TOR)**
F-test	61.8812***	62.3125***	62.1227***	62.1765***
LM test	918.4702***	921.9209***	920.0746***	920.2529***
Hausman test	53.6855***	54.1268***	53.8582***	54.0491***

*Note: *, **, and *** denote a 10%, 5% and 1% level of statistical significance.*

In subsequent analysis, we controlled the fixed effect in both stages to estimate the regressions. In turn, the estimation in the first stage proceeds. The binary fixed effect model is adopted to analyze the impact of acquisition of green hotel certification on hotel operating performance. The results are shown in Table 5.

Table 5: The Effect of Hotel Operating Characteristic on Green Hotel Certification

Dependent Variable	**GHC**	
Explanatory Variables	**Coefficient**	**Standard Error**
RRS	0.049***	0.009
TRS	0.030***	0.013
TES	0.024**	0.011
TOC	0.062**	0.025
Constant	0.314***	0.080
F-value		171.238
Adjusted R^2		0.088

*Note: *, **, and *** denote a 10%, 5% and 1% level of statistical significance.*

The estimating purpose in this stage tries to avoid the endogenous problem that may occur when the main estimator proceeds in the next stage. Some outcomes value to concern in Table 5. The results show that the impacts of the hotel operating characteristic variables including room rates (RRS), total rooms (TRS), total employees (TES), and total operating costs (TOC) on the GHC variable representing whether the green hotel mark is certified are significantly positive. The significance levels range between 1% and 5%. It is found that the hotels with higher room rates and larger scales (total rooms, total employees, and total operating costs) are more inclined to strive for green

hotel certification, which is consistent with our previous proposal. Based on Affordability Theory (Schuler & Cording, 2006) and Slack Resources Theory (Waddock & Graves, 1997), environmental responsibility costs which businesses can afford would relate with corporate operating characteristics and surplus resources. Because the higher-price and larger-scale hotels can put more resources into the process internalizing the external costs, they are more possible to acquire green hotel certification than the smaller. It is seen that the empirical results have the same tendency with the theoretical foundation.

The estimation in the second stage accounts for the main estimator of this paper, which uses the fixed effect model to evaluate the impact of acquisition of green hotel certification on hotel operating performance. The results are shown in Table 6.

Table 6 shows that the variable representing green hotel certification has a statistically significant and positive effect on all performance measures, including occupancy ratio (OCR), average daily rate (ADR), revenue per available room (RevPar), and total operating revenue (TOR).

In order to further confirm whether the acquisition of green hotel certification can affect the hotel operating performance, this paper carries out an item of robustness check. The dependent variables in the model are all shifted with one lagging period and re-estimated. The results for robustness check are shown in Table 7.

There is no significant difference between the results of Table 6 and Table 7. From the results of Table 7, we can equally understand the impacts of $\hat{GHC}$ representing the acquisition of green hotel certification on occupancy ratios (OCR), average daily rate (ADR), revenue per available room (RevPer), and total operating revenue (TOR). As estimating in the robustness check, all the explanatory variables are set to lag one period except the $\hat{GHC}$ variable. The coefficients of explanatory variables in Table 7 are just a little different in magnitude from Table 6 and also all positive. In addition, their significance levels are similar with Table 6, too. Therefore, it is found that the outcomes in the second stage are stable.

Discussion

The Table 6 and Table 7 results show acquiring green hotel certification can certainly bring significantly positive influence into hotel operating performance. However, the discussion in the second section has mentioned

Table 6: The Effect of Green Hotel Certification on Hotel Industry Performance

	OCR		ADR		RevPar		TOR	
	Coef.	**S.E.**	**Coef.**	**S.E.**	**Coef.**	**S.E.**	**Coef.**	**S.E.**
GHC	0.092**	0.033	3.113***	0.962	2.436***	0.744	14.116***	4.451
RRS	-0.068***	0.018	1.852***	0.398	1.469***	0.301	7.125***	1.675
TRS	0.120*	0.067	-0.087**	0.035	-0.064**	0.026	0.284***	0.088
TES	0.141*	0.073	0.104*	0.049	0.069*	0.037	-0.066*	0.034
TOC	0.021**	0.008	0.197**	0.068	0.164**	0.051	0.159***	0.047
Cons	0.367***	0.072	62.419***	15.628	48.843***	14.944	436.730***	68.254
F		209.245***		204.142***		211.692***		201.102
Adj R^2		0.073		0.743		0.804		0.071

Notes: 1. Panel regression model with fixed effect.

2. Dependent variable in model A is return on total assets (ROA), in model B is sale growth rate (SGR), in model C is value of Tobin's Q.

*3. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.*

4. Cons = Constant, Coef= Coefficient, S.E.= Standard error.

Table 7: The Results of Robustness Test

	OCR		ADR		RevPar		TOR	
	Coef.	**S.E.**	**Coef.**	**S.E.**	**Coef.**	**S.E.**	**Coef.**	**S.E.**
GHC	0.0896**	0.0331	3.0110***	0.9205	2.3997***	0.7520	14.6928***	4.7745
RRS	-0.065***	0.0194	1.7863***	0.3790	1.4588***	0.2983	7.2219***	1.8860
TRS	0.126*	0.0695	-0.0858**	0.0342	-0.0630**	0.0247	0.2796***	0.0851
TES	0.143*	0.0746	0.1004*	0.0498	0.0682*	0.0356	-0.0632*	0.0330
TOC	0.020**	0.0084	0.1945**	0.0689	0.1610**	0.0547	0.1565***	0.0458
Constant	0.351***	0.077	63.710***	116.122	49.902***	15.810	438.281***	69.275
F		205.312***		202.723***		208.887***		200.121***
Adj R^2		0.0702		0.731		0.786		0.0703

Notes: 1. Panel regression model with fixed effect.

2. Dependent variable in model A is return on total assets (ROA), in model B is sale growth rate (SGR), in model C is value of Tobin's Q, which are lag one year's values.

*3. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. 4. Coef= Coefficient, S.E. = Standard error.*

that the acquisition of green hotel certification would have two forces to affect operating performance. The first is that the acquisition of green hotel certification is a behavior internalizing the exterior costs, which would increase operating costs. But the service quantity (total rooms) is fixed in the hotel industry, it is impossible to reduce service quantity. Thus, this behavior would make hotel operators raise total operating costs, further leading to lowering operating performance. The second force is that the acquisition of green hotel certification is regarded as a hotel operator's concrete achievement for improving environmental performance. Stakeholders, consumers in special, may have more willingness to consume, or to pay higher price for accommodation. This can lead to increasing total revenue of hotel operators as well as enhancing their operating performance. From the view of the average daily rate (ADR) variable used in the empirical analysis, the increase in ADR can partly be attributed to the increase of operating costs for acquisition of green hotel certification, because ADR is involved with costs. Thus, the hotel operators cannot help but raise room rates, also increasing ADR. Of course, it also means that tourists may be willing to pay higher room price when a hotel has obtained green hotel certification. (Merli et al., 2019) The result that the impact of occupancy ratios (OCR) is positive is consistent with the previous research of Smith and Alcorn (1991) and McWilliams and Siegel (2001), which indicates that tourists indeed raise consuming willingness because of green hotel certification. Due to raising lodging willingness and willing-to-pay price, the estimating results of revenue per available room (RevPer) and total operating revenue (TOR) are also positive significantly. Overall, the acquisition of green hotel certification truly heightens hotel operating performance as well as beneficial possibility for hotel industry.

Conclusion

Managerial Implications

For hotel managers, the process of obtaining green hotel certification will undoubtedly bring additional costs to the hotel, including the renovation of building facilities, the purchase of energy-saving equipment, personnel training and certification fees, etc. However, these investments should not be viewed as mere expenses but as a strategic investment in the hotel's long-term performance. Because the results of this study show that obtaining green hotel certification has a significant positive effect on improving hotel operating performance, hotel managers should actively strive to obtain certification. Especially as attention on global climate change issues increases, obtaining

green certification can send a clear signal to consumers, indicating that the hotel has taken specific actions in energy conservation, carbon reduction, and efficient use of resources. Not only will this appeal to environmentally conscious travelers, it will also cater to corporate travel needs, as sustainability may be an important consideration when choosing accommodation. In fact, green hotels are also expected to achieve long-term savings in operating costs. For example, through the use of energy-saving equipment, water and electricity bills will be significantly reduced; improvements in resource recycling and waste management measures can also effectively reduce operating costs. Although the investment cost is higher in the short term, hotel managers should take a long-term perspective on this investment because achieving green hotel certification is indeed beneficial to hotel operations.

Limitations of Research

This study is based on the North American hotel industry. Although it has reference value, there are also some limitations that need to be considered. First, the characteristics of the tourism and accommodation industry in the North American market are regional. For example, consumers' acceptance of green hotels, environmental awareness, and willingness to pay are relatively high. Therefore, the study results may not be directly applicable to other regions. Other regions may have different consumer behaviors and market responses due to cultural differences, economic development levels or different implementation efforts of environmental policies. Secondly, North American green hotel certification systems have specific standards and evaluation methods, and these standards may not fully reflect the environmental challenges and resource use in other regions around the world. In addition, the scale and capital structure of the hotel industry in North America are relatively mature, and large chain brands may enjoy resource and technological advantages when implementing green certification. However, small and medium-sized hotels may face greater resource constraints in the implementation of green certification in other regions, which will affect the study results.

Future Research

Based on this study, future research directions can be expanded from the following aspects. First, further cross-regional comparative research can be conducted to explore whether the impact of green hotel certification on business performance has significant regional characteristics in different

regions due to differences in culture, policies, economic development levels and environmental awareness. This will help understand the applicability of certification in global markets and the prevalence of its impact. Secondly, future research can consider refining the analysis of different types of hotels, especially the differences between small and medium-sized hotels and large chain brands. Due to differences in resource allocation and marketing strategies, green certification may have completely different impacts on these two types of hotels. In addition, the research can also delve into the differences between different levels of green certification (such as basic and advanced certification) on business performance, thereby helping operators choose appropriate certification strategies according to their own needs. Future research may incorporate more dynamic data to track performance changes over time, both before and after certification. Furthermore, the moderating effects of external market factors such as economic shocks or global pandemics can be explored to enhance the contextual understanding of green certification outcomes. These directions may be more helpful in fully revealing the strategic value of green certification in the hotel industry.

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