



# Dynamic efficiency assessment of the Chinese hotel industry<sup>☆</sup>

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## ABSTRACT

The paper introduces for the first time a totally dynamic two-stage approach to analyzing the hotel industry's technical efficiency at the sub-national level. The first stage uses data envelopment window analysis (DEWA) to assess regional hotel sectors' technical efficiency over time. Unlike previous studies, the second stage uses a dynamic Tobit model to investigate the impact of macro contextual factors on the hotel sector efficiency. The study chooses the Chinese hotel industry during the period 2001–2006 as its application setting. The findings of the investigation indicate that the Chinese hotel industry is approaching an efficient operation in general, recovering from a major dip in 2003 resulting from the Severe Acute Respiratory Syndrome (SARS) outbreak. In addition, the study introduces a novel two-dimensional efficiency-based matrix to assess the competitive advantage of different regions of the Chinese hotel sector. The paper presents strategic market implications for hoteliers, government decision-makers, and destination management organizations. The proposed methods are applicable for situations in which an exogenous event of a destabilizing impact (e.g., SARS) does occur.

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## 1. Introduction

As an economy in transition from a socialist to a market-based system, China is gradually opening its market to the world since the late 1970s. The past three decades witness the emergence of an increasingly matured Chinese hotel industry with rapid globalization and competition. The development of hotel joint ventures and cooperative management in the 1980s, the transformation of private ownership and stock ownership in the 1990s, and the recent diversification of hotel brands and types demonstrate the growth and change in the Chinese hotel industry (Yu, 2003). Zheng (2008) provides an excellent overview of the Chinese lodging industry between 1978 and 2006.

Following an earlier setback in 2003 (when the SARS outbreak occurred), both the 2008 Summer Olympics in Beijing and the 2010 World Expo in Shanghai mark the capacity of Chinese hotel industry in meeting the growing demand of domestic and international travelers. According to the classical theory of industrial organization economics, the structure of an industry and the conduct of its firms determine the industry's performance (McWilliams & Smart, 1993).

The regression and progression of the Chinese hotel industry provide an ideal application setting for a dynamic approach that focuses on productivity assessment.

In China's increasingly competitive marketplace, hotel performance measurement is not only a powerful management tool for hoteliers but also a helpful source of information for administrators responsible for regional and national tourism planning and operations. Typically, industry evaluations of the performance of the hospitality industry are based on average occupancy rates and average room rates, by revenue per available room (Wassenaar & Stafford, 1991), or by breakeven room occupancy (Wijeysinghe, 1993). Such indicators, however, only give a single dimensional snapshot of the intricate hotel industry. Anderson, Fish, Xia, and Michello (1999) point out the difficulty of drawing conclusions about the relative productivity of the hotel industry without simultaneously considering the mix and nature of services provided. Thus, hospitality researchers should pay more attention to a relatively sensitive performance evaluation method.

As the Data Envelopment Analysis (DEA) is gaining importance in analyzing relative efficiency in the hospitality and tourism industries (Barros & Dieke, 2008; Wöber, 2002), the present study employs a totally dynamic approach of DEA to assess the relative technical efficiency at the regional hotel sector level in China. DEA is a non-parametric, multi-factor, productivity analysis tool that utilizes multiple input and output measurements to evaluate a number of relevant decision making units' (DMUs) relative efficiency. For the regional hotel sector, technical efficiency refers to a comparative measure of the effectiveness with

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which evaluators use a given set of inputs, such as labor and capital, to produce a targeted set of outputs, such as revenue and room occupancy. When explicitly taking into account the mix of service outputs produced, DEA is best suited to the comparison or benchmarking of a number of similar operational units (Donthu, Hershberger, & Osmonbekov, 2005).

Despite a wide variety of DEA applications existing in various contexts such as regional development (Dinc, Haynes, & Tarimcilar, 2003), the banking industry (Luo, 2003; Ward, 2009), and the higher education industry (Hsu, Chao, & James, 2009), Wöber (2006) conducts a comprehensive literature review related to the application of DEA technique in the tourism and hospitality fields, and he concludes that only a few recent studies start to raise attention among tourism researchers (Anderson, Fok, & Scott, 2000; Chiang, Tsai, & Wang, 2004). Recently, Chen (2009) also recognizes that the performance evaluation factors in the hospitality industry are multi-dimensional in nature and can hardly be aggregated using price or cost figures, and he acknowledges the usefulness of the DEA technique in the hospitality industry. Chen (2009) proposes a modified DEA model to measure the performance of a Taiwanese hotel chain. Similarly, Botti, Briec, and Cliquet (2009) apply the DEA method to examine French hotel chains, and they conclude that no specific organization form (e.g., plural forms versus franchise and company-owned systems) is more efficient than another. Motivation for the present study comes from the fact that the majority of DEA studies in the hospitality industry are static in nature, based mainly on cross-sectional data at the individual level of hotel entities. The present study assesses the hotel industry at the aggregate level of the regional hotel sector coupled with a dynamic analysis of DEA, monitoring technical efficiency and stability behavior over time. The study also identifies the critical antecedents of technical efficiency. Previous research focuses on the micro contextual factors (Hwang & Chang, 2003; Yang & Lu, 2006), however, the influence of macro socio-economic factors needs further consideration. The present study partially fills the gap by focusing attention on the antecedents of technical efficiency at the regional hotel sector level in China.

The purposes of the present study are threefold: to explore the dynamic technical efficiency of the Chinese hotel industry at the sub-national level; to provide a strategic framework for classifying regional hotel sectors that would be instrumental in the assessment of their competitive (dis)advantage; and to examine the impact of socio-economic variables on technical efficiency scores of the Chinese hotel industry.

The current study offers a unique methodological contribution to the tourism literature. Specifically, the study employs a data envelopment window analysis (DEWA) in conjunction with a *dynamic* Tobit model (unlike previous studies that use exclusively a *static* Tobit model) to examine antecedents of DMUs' relative efficiency over time using the Chinese hotel sector at its aggregate regional level as the application setting. Based on the obtained relative efficiency measures together with their fluctuations over time, the paper extends the DEA application within the literature by introducing a novel two-dimensional efficiency-based matrix to assess the competitive advantage of different regions of the Chinese hotel sector. The designated matrix serves not only as a tool for market segmentation, but also as a thoughtful basis for strategic decision-making and performance management that would be of help to government decision-makers, hoteliers/investors, and destination management organizations (DMOs). The methods of analysis mentioned above appear appropriate as the studied period (i.e., 2001–2006) includes an exogenous event of a destabilizing impact (i.e., SARS in 2003).

## 2. Literature review

### 2.1. DEA studies in the hotel industry

The initial relative efficiency analysis of Farrell (1957) is cast in terms of a ratio formulation by Charnes, Cooper, and Rhodes (1978).

Technical efficiency comparisons can illustrate the extent of output expansions (or input reductions) available to firms of any given scale of operation from the adoption of available technology and management practices (Sun, Hone, & Doucouliagos, 1999). In the hotel sector, the level of a sector's technical efficiency is measured by its distance from the production frontier.

A growing pool of literature exists regarding technical efficiency (Lovell, 1993; Russell & Sworm, 2009). However, this section reviews only DEA studies relevant to the scope and purposes of the present study. A distinguishing feature of the DEA approach is that no priori assumption is required about the analytical form of the production function. More specifically, for each DMU, the study calculates a single relative ratio by comparing total weighted outputs to total weighted inputs for each unit without requiring any specific functional form. Wöber's (2002) book provides more details. Notably, applying the DEA technique at the spatial (national or sub-national) dimension is appropriate and represents a recent trend in the literature (Bosetti, Cassinelli, & Lanza, 2006; Hsu, Chao, & Luo, 2008). The present study focuses on technical efficiency estimation at the regional level for the Chinese hotel industry.

Table 1 identifies number of notable studies employing the DEA approach to measure efficiency in the hotel industry. The table classifies the studies as static (based on cross-sectional data) or dynamic (based on panel data) and highlights the inputs and outputs utilized in each study. Wöber's (2006) work offers an extensive literature review on DEA applications in the tourism and hospitality industry published between 1986 and 2006. Pulina, Detotto, and Paba (2010) also provide a review of notable DEA applications published between 2006 and 2009.

### 2.2. Questions unanswered in DEA literature for hospitality

As a whole, the body of literature on hotel operational efficiency leaves a number of questions unanswered. First, most DEA studies in the hospitality industry, including a recent study by Perrigot, Cliquet, and Piot-Lepetit (2009), focus on the performance of hotels at the cross-sectional level. Though the outcome may still be useful, a dynamic context sheds additional light on the trend of DMUs' relative efficiency. Trend analysis can give rise to a seemingly excessive use of resources intended to produce beneficial results in the future. As such, researchers should prefer panel data (i.e., balanced longitudinal data) over purely cross-sectional data in that they not only enable researchers to compare a DMU with its counterparts but also allow them to track an individual DMU over a period of time for movement in efficiency (Wöber, 2002).

Second, differences in efficiency derive from a host of contributory factors (Barros & Dieke, 2008). A number of studies reveal that a substantial difference exists in hotel efficiency changes due to variations such as hotel location, source of customers, and management styles (Hwang & Chang, 2003; Yang & Lu, 2006). Do other macro contextual factors (e.g., richness of local tourism resource, international attractiveness, payment levels of employees, etc.) matter? The relationships between macro socioeconomic factors and the technical efficiency of the regional hotel sector warrant further examination.

Third, given consistent economic development in China over the past three decades, surprisingly, to the best knowledge of the authors, no previous research has studied the dynamic movement in the Chinese competitive hotel industry. The present study explores a dynamic Tobit regression model to examine the antecedents of regional hotel sectors' technical efficiency in China. Conceptually, researchers could regard a hotel sector in each of China's 31 regions as a unique decision-making unit. The findings can aid government decision-makers and DMOs in improving the performance of regional hotel sectors by benchmarking themselves against regions with a similar macro contextual environment.

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