SCALE, SPECIALIZATION AND PERFORMANCE: EVIDENCE FROM THE HOTEL INDUSTRY

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ABSTRACT

I examine the impacts of specialization and of scale on property performance and chain performance of the hotel industry. I use a large sample of branded lodging companies in the United States from 2010 to 2014 for the analyses. For property performance, I investigate how a hotel company decides on franchising on properties based on its specialization and study the impacts of the combinations of franchising choice and specialization on profitability of hotel properties. I argue that a hotel company is less likely to franchise business units that are in the specialized market segment of the company since it can manage them better with specialized knowledge than franchisees with general knowledge. Consistent with the expectation, the profitability of company-managed properties is higher than franchised properties when properties are in a company's specialized market segment. I also find that the probability that a company franchises a business unit is lower when the business unit is in the brand's area of specialization. While prior research focused on the role of monitoring costs in franchising decisions, this study suggests that specialization is a strong alternative determinant of franchising decisions and the resulting organizational performance. Regarding the analysis of chain performance, I explore productivity changes of the hotel industry and identify the characteristics of leaders, followers, and laggards. Using Data Envelopment Analysis, I find that a few hotel chains led industrial productivity growth through technological progress during the period from 2010 to 2012 and that most other chains followed the improvements in the subsequent period. I find that a larger chain was more like to lead the productivity progress of the industry during the sample period.

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CHAPTER 1

INTRODUCTION

I investigate the impacts of scale and of specialization on franchising decisions and the resulting profit performance and on productivity performance in the hotel industry. Examining profit and productivity performance will help researchers and practitioners to understand how firms should deploy their management resources and whether they need to outsource management skills in order to perform better. In particular, the relation between specialization and franchising decisions is closely related to the question of the boundaries of the firm often referred to as make-or-buy in management accounting. Franchising is a common setting to test the effect of management on performance. Both company-managed and franchisee-managed business units have a similar business model and operating structure, enabling this study to focus on the impact of management on performance alleviating the problem of confounding factor. Prior literature on franchising invoke monitoring costs to explain why firms franchise. Using the setting of the hotel industry where franchising is extensive and market segmentation is well-defined, I conduct two different studies. In the first study, I focus on the impact of specialization on the profitability of company-managed properties versus franchised properties. In the second study, I examine productivity changes of the hotel industry and the impact of size and specialization on industry leaders, followers, and laggards. These studies provide evidence that specialization is a major determinant of franchising and what are its performance implications and that size or scale of chains is more closely related to productivity growth over time than specialization.

Profitability and productivity are affected by the level of specialization of firms. Firms tend to specialize in activities for which their capabilities offer a comparative advantage (Richardson 1972). Economies of specialization imply that focusing on a single or small set of activities, or capabilities, leads to a cost and revenue advantage. Specific knowledge generated through specialization is costly to transfer, and thus the performance of a business unit will be affected by whether it has specialized knowledge needed to manage the resources. Through specializing in a single or small set of activities, or capabilities, economies of specialization is achieved. Thus, a large firm that develops skills in numerous unrelated activities is less efficient than a collection of small firms each specializing on a single activity. Organization design should reflect the fact that, because knowledge is costly to produce, maintain, and use, there are economies to be achieved through specialization (Demsetz 1988). Since specialization increases productivity and hence reduces costs, firms benefit from focusing their managed activities in their areas of main business. When firms choose to operate business units outside their specialized area, delegating management to a franchisee is a less costly way to acquire business expertise than managing the unit directly.

In the meantime, prior studies explored franchising choice as a way to reduce the monitoring costs of shirking and perquisite taking behavior of salaried employee-managers. In company-managed outlets, a firm cannot induce the best efforts from its managers when management compensation is fixed since the interests between managers (agents) and firms (principals) conflicts. Therefore, firms need to pay monitoring costs to make sure that managers are performing in the firms' best interests. However, firms do not need to directly monitor franchisee-managed outlets as frequently as company-managed units. A hotel company bears only a fraction of the cost of perquisite-taking by the manager since the company does not collect the residual profits and only receives franchising fees based on revenues. Franchisees' incomes are based directly on how well they manage and on how much they earn from operations. This compensation scheme discourages shirking and perquisite taking by managers of franchised properties, especially when the owners are the managers (Jensen and Meckling 1976). The managers' self-motivation induced by ownership of residual claims can substitute monitoring systems and reduces agency costs (Brickley and Dark 1987; Fama and Jensen 1983; Lafontaine 1992).

Specialization also can play a role in productive efficiency and its change over time. I also consider the impact of the economies of scale, which imply that operating at a larger scale have cost advantage, on productivity. Scale economies is achieved by not only reduction in unit costs but also organizational capabilities learned through mass operations. Evaluating the efficiency of profit production of firms need to examine cost efficiency and the ability of the firm to generate revenues separately (Porter 1985). Production frontier analysis using a nonparametric estimation methodology based on data envelopment analysis (DEA) can help to evaluate overall efficiency in both sources of profitability. The Malmquist analysis adopted by DEA approach provides a way to determine how much of each firm's productivity change is due to frontier shift and how much is due to its efficiency change. Specialization provides a knowledge base that can fertilize innovative ideas, thereby helping the initiation of technical progress. Also, a larger scale of production can bear greater risks to undertake organizational innovations (Damanpour 1991). This theoretical argument can be testable by examining the association between specialization and the classification of technological leaders, followers, and laggards (Porter 1983) identified with the DEA methodology.

To investigate the impact of specialization on franchising and performance this paper analyzes the operating statements of more than 5,000 hotel properties from 142 brands across the U.S. during the period 2010 to 2014. A lodging company's specialization is measured as the degree of the company's concentration in one market segment. I investigate the impact of the fit between market specialization and franchising on the operating profitability of lodging units. I examine whether the profitability of company-managed properties is higher when a property is in its specialized market segment compared to when it is not. Similarly, I also examine whether the profits of properties out of the hotel company's specialized market segment are higher under franchisee management than under company management. In addition, I investigate whether market specialization has a large effect on the propensity of a hotel company to franchisee a particular property. I find that the profitability of company-managed properties is higher than franchised properties when they are in the specialized market segment of the company. Conversely, I find that the profitability of franchised properties is higher than company managed properties when a property is out of a company's specialized market segment. Also, I find that a hotel company is less likely to franchise properties that are within its specialized market.

With the same data, I aggregate property-level revenues, costs, sizes into chain-level information to measure collective performance of the brands in order to examine productivity change in the hotel industry. There are 98 hotel chains operating in the U.S. market, whose data was continuously available for the entire sample period. I use a two-stage approach in this study. In the first stage, I estimate productivity changes and to decompose it into technical changes and relative efficiency changes using DEA approach. In the second stage, I run ordered logit regression to estimate the impact of chain characteristics on productivity performance. This two-stage approach yields statistically consistent estimators for the regression coefficients (Banker and Natarajan 2008). I find that nine among ninety-eight chains led industrial productivity growth through technological progress during the period from 2010 to 2012. I find that it is not specialization but size of a chain that is significantly related to technological leadership based on the characteristics of the productivity progress of the hotel industry during the sample period.

Franchising has a great bearing of management accounting research on the delegation of decision rights and the provision of incentives (Campbell et al. 2009). Monitoring costs based on agency theory has been the center of this line of research. I focus on documenting the cost-saving effect of specialization and comparing the explanatory power of specialization with that of monitoring costs in franchising choice. Thus, this research further our understanding of the role of the less known specialized knowledge theory than monitoring cost theory (Jensen and Meckling 1976; Jensen and Meckling 2009) in organizational design.

I organize the rest of the chapters as follows. In Chapter 2, I review the literature on franchising decisions and productivity changes and discuss the theory of economies of specialization and of scale to develop my hypotheses. In Chapter 3, I describe the data and the sample selection and outline the measurement of specialization of the hotel companies used throughout my empirical analyses. In Chapter 4, I examine the effects of specialization on profitability and franchising choices. In Chapter 5, I examine the effects of scale on productivity changes and industry leadership of chains. In Chapter 6, I conclude and suggest implications for future research.

CHAPTER 2

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Franchising Decisions

2.1.1 Economies of Specialization

By focusing on a few tasks, economies of specialization result in an increase in productivity. Specialization leads to increasing productivity because of the efficiency gains that results from the accumulation of knowledge, both as human capital and technology (Becker and Murphy 1992; Romer 1987; Rosen 1983; Yang and Borland 1991). Adam Smith's discussion of the role of specialization in his first chapter of the Wealth of Nations precedes formal economic research on economies of specialization. The work identifies improved dexterity and innovation as sources of economies of specialization. Similar to the processing of flax in the tale of The Three Spinners, in Smith's example of the pin factory, workers specialize on different operations that are needed to make a nail, such as mending, forging, or sharpening a pin. These workers in turn developed specialized skills that improved productivity. Specialized workers can more easily innovate or improve operations than generalized workers whose minds are immersed in a variety of tasks. Studies in economics illustrate that specialization can save costs associated with transmitting knowledge from a specialized worker to another worker (Rosen 1983). In addition, greater specialization enables workers to absorb knowledge more easily (Becker and Murphy 1992) and creates more knowledge through learning by doing (Yang and Borland 1991; Borland and Yang 1992).

This collective learning becomes the basis of competitive advantage provided it is difficult for competitors to imitate. Accumulated tacit knowledge and interpersonal relationships cannot be imitated because of their causal ambiguity (Collis 1994; King and Zeithaml 2001; Wright, Dunford, and Snell 2001). Organizing around firms' specialization improves the efficiency of investments in their knowledge building and exploits economies of scale and scope. The strategy and finance literatures related to specialization document empirical evidence that reveals that unrelated diversification reduces productivity of both total corporate performance and division performance (Huckman and Zinner 2008; Schoar 2002). In addition, the auditing literature finds that auditor industry specialization increases audit quality (DeFond and Zhang 2014).

The notion of comparative advantages produced by specialization is closely related to the core competence framework (Prahalad and Hamel 1990; Lei, Hitt, and Bettis 1996) and resource-based view in the strategic management literature. The core competency perspective originates from an article by Richardson (1972) that introduces 'capabilities' (Williamson 1999). The article emphasizes the importance of knowledge, experience, and skills as firm resources, extending the discussion of the resource-based view of Penrose (1959) that views firm resources as the possible source of competitive advantage. In the article, she expresses the view that firms compete using their specialized capabilities and that this approach results in a comparative advantage (Richardson 1972: 888):

> "What concerns us here is the fact that organisations will tend to specialise in activities for which their capabilities offer some comparative advantage; these activities will, in other words, generally be similar in the sense in which I have defined the term although they may nevertheless lead the firm into a variety of

> markets and a variety of product lines. Under capitalism, this degree of specialisation will come about through competition."

The central proposition of the core competencies literature is that firms should focus on their core products and develop core competences to sustain success in a long run. Prahalad and Hamel (1990) speak of core competence as the collective learning in the organization about how to organize work and deliver value. This collective learning becomes the basis of competitive advantage provided it is difficult for competitors to imitate. Accumulated tacit knowledge and interpersonal relationships cannot be imitated because of their causal ambiguity (Collis 1994; King and Zeithaml 2001; Wright, Dunford, and Snell 2001). Trademarks are an example of a core competence since intellectual property rights are based on intangible assets of reputation and skills including know-how and culture, which cannot be traded easily (Hall 1992). Organizing around firms' chosen core competence areas improves the efficiency of investments in their competence building and exploits economies of scale and scope. The strategy and finance literatures related to core competences document empirical evidence that reveals that unrelated diversification reduces productivity of both total corporate performance and division performance (Huckman and Zinner 2008; Schoar 2002). In addition, the auditing literature finds that specialization increases audit quality (DeFond and Zhang 2014).

Economies of specialization is also linked to the resource-based view (RBV) of the firm (Barney 1991, 1996; Conner 1991; Conner and Prahalad 1996; Peteraf (1993); Rumelt 1984; Wernerfelt 1984). The resource-based view shares the proposition of core competences but applies to a broader range of resources than knowledge (Kraaijenbrink, Spender, and Groen 2010). It proposes that firms should accumulate valuable, rare, inimitable and nonsubstitutable (VRIN) resources to sustain a competitive advantage.

2.1.2 The Monitoring of Franchise Organizations

Franchising is a useful setting for understanding the role of specialization in determining the boundaries of the firm. Franchising is a popular form of organizational design choice for branded chains that desired to have business units in multiple markets. Through this business arrangement, franchisees are granted the right to do business using the brand names and the operating methods of franchisors in exchange for upfront and ongoing fees (James G. Combs et al. 2011; Lafontaine and Slade 2007). Franchisees enjoy a proven business format, rather than starting a business from scratch, while franchisors benefit from the local market expertise of, and financing of franchisees. Because there are advantages to both sides of this relationship, franchising has spread to small businesses in most sectors of the economy (IFA Educational Foundation 2016).

In a franchise arrangement, although franchisors have some control over certain decisions to protect the quality of their brand, they delegate day-to-day operations of franchised business units to franchisees. Typical franchise contracts have provisions for training and auditing franchised units to ensure franchisees' compliance with the chains (Brickley and Dark 1987; Norton 1988; Rubin 1978). To protect their brand, hotel companies establish high standards of operations and enforce the standards through franchising contractual terms. Franchisors may have significant control of some standard operating procedures, design of physical layout, and advertising. For instance, most franchisors charge their franchisees for national advertising expenses, thus some expenditures are out of the franchisees' control (Desai 1997). They also have the authority to monitor the activities of franchised properties, such as site inspections and revenue recognition. However, franchisors delegate daily operations of the local outlets to franchisees and are not closely involved in the management decisions of franchised outlets (Rubin 1978). The franchisors' scope of control is limited especially related to pricing, promotions, and new product introductions of their franchised outlets (Lafontaine 1999).

Prior studies explored franchising mainly as a method to reduce the monitoring costs of shirking and perquisite taking behavior of salaried employee-managers (see e.g., Combs & Ketchen, 1999; Kosová & Sertsios, 2018; Perryman & Combs, 2012; Shane, 1996). In company-managed outlets, a firm cannot induce the best efforts from its managers when management compensation is fixed since the interests between managers (agents) and firms (principals) conflicts. Therefore, brands incur monitoring costs to ensure that managers are performing in the firms' best interests. However, firms do not need to monitor franchisee-managed outlets as frequently or rigorously as company-managed units. A branded company bears only a fraction of the cost of perquisite-taking by the franchisee manager since the branded company does not collect the residual profits and only receives franchising fees based on revenues. This compensation scheme discourages shirking and perquisite taking by managers of franchised properties, especially when the owners are the managers (Jensen and Meckling 1976). The managers' self-motivation induced by ownership of residual claims can substitute monitoring systems and reduces agency costs (Brickley and Dark 1987; Fama and Jensen 1983; Lafontaine 1992).

2.1.3 Specialization and the Boundary of the Firm

Demsetz (1988) points out that economies of specialization should be a factor to consider in the vertical integration decision of firms since specialization saves on the costs of accumulating and transferring knowledge. He expands the scope of Smith's three source of economies of specialization, which are improved dexterity, switching costs, and innovation, by introducing the knowledge derived from specialization. When a firm needs to use and internalize the knowledge outside of its area of specialization, it can purchase the expertise or products from another specialized firm which saves money and the time it takes to transfer and internalize knowledge through educating and learning. These knowledge-related costs are separate from monitoring costs that arise from moral hazard, shirking, and opportunism. Overall, he provides a framework for why firms should consider concentrating resources in the area of its specialized knowledge and relying on markets for knowledge outside its area of expertise.

Conner and Prahalad (1996) develop a theory of the firm assuming no opportunistic behavior. They argue that organizing within a firm is preferred to market contracting when the firm provides more valuable knowledge than the market. Within a firm the manager can use her superior knowledge to direct employees who can best perform their tasks with the specialized knowledge. In a market contract, the buyer acquires specialized knowledge from the seller of the specialized knowledge. Since the buyer's judgment is limited to the domain of his experience, he may not recognize the value of the action suggested by the seller and might not follow it. Importantly, such knowledge-based costs can be independent of monitoring costs. It is similar to the view that organization failures related to the allocation of talent and miscommunication due to bounded rationality happen even when all agents have the same objective (Garicano and Rayo 2016). The aspects of specialized knowledge that one cannot use until he or she fully understands them, e.g. tacit knowledge, determine the value of keeping specialized knowledge within organizations.

2.1.4 Specialization, Monitoring Costs and Franchising

I argue that brands have certain competitive advantages managing properties within their area of expertise. In the hotel industry, hotel companies/brands can invest in and maintain a labor pool specialized to their brands at lower costs than independent operator can. Large hotel companies, or brands, through their scale have developed a cost-effective infrastructure to attract, develop and retain human capital (Canina et al. 2018). Because the branded company manages numerous business units over a large geographic area, the branded company provides a rich environment for employee learning and for the development of best practices. The brand also can offer its employees attractive career growth opportunities, developmental resources and training opportunities. When a hotel closes, the employees can be redeployed to another location of the brand. Therefore, it has some advantages in attracting and developing human capital over an independent business unit. Moreover, these employees are supported with well-developed systems and procedures to apply their knowledge given the circumstances and needs of an individual property. While franchising provides some codified processes, it cannot provide the tacit knowledge that comes with the employees of the branded company. In addition, when top management oversees the deployment of the corporate strategy, capital and talent can be allocated more efficiently across business units (Prahalad and Hamel 1990). Since business units compete with each other, a business unit manager is unwilling to lend skills and resources voluntarily. Unique specialized knowledge developed by a business unit cannot be easily discovered by and disseminated to other business units unless the unit is managed by the company.

However, there are benefits of franchising when properties having little bearing on a hotel company's specialization. Franchised properties have a greater autonomy in operational decision rights and can easily adapt to local market conditions. Franchising agreements leverage the entrepreneurial skills and superior local market knowledge supplied by franchisees (Bradach 1997; Prendergast 2002; Sorenson and Sørensen 2001). For example, Kalnins and Mayer (2004) examined 2,500 restaurants in Texas and find that local market experience of franchisees reduces failure, complementing locally accumulated experience of franchisors. However, franchisees (independent operator) can provide relatively general knowledge in the area due to their small pool of resources and lack of incentives to develop specialization since they cannot utilize such knowledge in other business locations as intensively as hotel company can. Yet, franchisees can manage properties better in the area that the franchisor lacks specialization. Thus, managerial control by franchisees is more valuable to non-core business properties since franchisors have less knowledge to operate these properties.

Organizational structure should fit the environment and business strategy to perform effectively (Alfred Dupont. Chandler 1962; Rumelt 1974; Drazin and Van de Ven 1985; Van de Ven and Drazin 1985). I argue that there are specific operating benefits based on franchising choice, and the size of the benefits of each franchising organizational form is likely contingent on the specific circumstances facing the firm and operating unit (James

G. Combs et al. 2011). Research on franchisee performance being contingent on strategy is largely absent from the literature. An exception is Yin and Zajac (2004), which focus on the impact of the relation between complexity of strategy and franchising organizational form on performance. They find that franchisee management leads to better sales growth when operations are more complex. I conjecture that brand management is more profitable for properties that are in the area of the firm's specialization, but that franchisee control is more profitable for those properties where the brand/franchisor lacks specialization. Thus, I hypothesize:

> ***H1a:*** *Profit of a property in the specialized area of the hotel company is higher when the property is managed by the brand than when it is managed by a franchisee.*
>
> ***H1b:*** *Profit of a property out of the specialized area of the hotel company is higher when the property is managed by a franchisee than when it is managed by the brand.*

I argue that company/brand management is preferred for the business units in the company's area of specialization. This is because the value created by specialization is higher when the specialized knowledge is integrated within the firm rather than transferred (purchased) from other firms (Demsetz 1988; Grant 1996). Since transferring franchisors' specialized knowledge to franchisees is less efficient than using their knowledge and operating the units themselves, franchising is less likely for the units in the specialized area of the company. When shirking and perquisite-taking behavior is severe, monitoring costs-based explanation predicts franchisee control. However, I argue that the economies of specialization can counteract the costs from shirking and perquisite-taking behavior and predict company management for the properties in the specialized area of the company. Similarly, I argue that economies of specialization predict franchisee management when a business unit is out of the specialized area of the company because of the value created from a franchisee's superior local knowledge. Therefore, I expect a negative relationship between franchising and the franchisor's area of specialization. Following the assumption that fit between organizational design choice and context is the result of a natural selection process that leaves only the best-performing organizations (Van de Ven and Drazin 1985), I hypothesize:

> ***H2:*** *Hotel companies are less likely to franchise properties in their area of specialization than properties out of their area of specialization.*

2.2 Production Efficiency and Productivity Change

2.2.1 Productivity Evaluation Using Data Envelopment Analysis

Productivity performance of firms evaluates the amount of outputs generated given input consumption or the amount of inputs required given output production. A firm's production efficiency can be measured by the distance from the industry's efficient frontier. Firms in the industry will vary in their output and input mix. The efficient production frontier represents the maximum attainable amount of outputs corresponding to a given amount of inputs or the minimum attainable amount of inputs corresponding to a given amount of outputs. The efficient production frontier is estimated from the best practice firms' production mixes, and the distance between each firm's actual output or input and the efficient production frontier determines each firm's relative efficiency compared to the most efficient ones. When there is a single output and a single input, productivity is merely their ratio. However, when there are multiple inputs or outputs, it is uneasy to determine input-output correspondence. Data Envelopment Analysis (DEA) is a popular approach to estimate production frontier with multiple inputs and outputs (R. D. Banker, Charnes, and Cooper 1984; Charnes, Cooper, and Rhodes 1978).

Input and output mix vary not only by firms but also over time. Productivity change between two consecutive periods can be measured by the Malmquist productivity index (Rajiv D. Banker, Chang, and Natarajan 2005). The Malmquist productivity index indicates that productivity change is decomposed into two components: technical change and relative efficiency change. First, technical change measures productivity changes due to frontier shift over time. The firm's actual output of the subsequent period is compared to the efficient production frontier of the base period and of the subsequent period. The percentage change in two efficiency DEA scores is technical change. Second, relative efficiency change measures productivity changes due to its efficiency change. The firm's actual output of the subsequent period is compared to the efficient production frontier of the subsequent period. Also, the firm's actual output of the base period is compared to the efficient production frontier of the base period. The percentage change in production efficiency between two periods is called as relative efficiency change.

2.2.2 Economies of Scale

Economies of scale means the reduction in the unit cost when producing or distributing more operating units (Alfred D. Chandler 1990). Operating at a larger scale make it possible to allocate fixed costs to more operating units, lowering the unit cost. Like manufacturing firms, service firms can achieve economies of scale. The economies of scale depend on not only physical facilities but also organizational capabilities such as knowledge, skill, and experience. In addition to its cost advantage, scale economies exist in cumulative learning on improving product and process through research and development. For instance, organizational capabilities cumulated through exploiting economies of scale can be applied to expand markets (Alfred D Chandler 1992). Hotel chains generate economies of scale by standardizing services, advertising, reservations, operating procedures, equipment, and even buildings (Ingram and Baum 1997).

2.2.3 Size, Specialization and Productivity Change

Industry leaders, followers, and laggards can be identified through technical change of the industry. Porter (1983) classified technological leaders and followers. He defines technological leaders as firms that first invest in new technological innovations and most sophisticated applications in a group of direct competitors. He also defines technological followers as firms that are aware of new developments in technology but will adopt them after others make the first move. In addition, there might be laggards that hesitate in their technological investments either due to lack of resources or risk aversion, which are not classified as either leader or followers by Porter.

Economies of scale suggest that more technology progress is feasible in a larger firm (Porter 1985; Alfred D Chandler 1992). The range of technology is broad and not restricted to manufacturing activities. Improving the procedures for personnel can be considered as technology progress (Porter 1985). Innovation activity in the hotel industry is mainly based on improving human capital skills and abilities (Orfila-Sintes, Crespí-Cladera, and Martínez-Ros 2005). Big hotel chains have more capital and ability to afford IT projects, which is capital intensive. E-marketing through social media has been more important in the hotel business in 2010s, and big chains were able to more information on social media (Cobanoglu et al. 2013; Law, Buhalis, and Cobanoglu 2014).

Economics of specialization suggest that higher productivity is achieved through specialization. However, it is empirical question how specialization plays a role in productivity change. Specialization provides a knowledge base that can fertilize innovative ideas (Damanpour 1991). But the specialization of the firm's does not indicate whether management have a positive attitude towards the adoption of new technology. Implementation of innovation might be more important than initiation of innovation. Specialization does not guarantee greater resources to tolerate the potential loss of failure in technological development and adaptation.

H3*: Hotel chains with larger size are more likely to be industry leaders rather than followers and to be followers than laggards.*

H4*: Hotel chains with higher specialization are more likely to be industry leaders rather than followers and to be followers than laggards.*

CHAPTER 3

DATA AND SAMPLE

3.1 Data

I use the data of the hotel industry to empirically test my hypotheses. I obtained annual information on property-level financial and operational performance for lodging units collected and complied by CBRE Hotels. This operating unit of CBRE is a consulting and research provider for the lodging industry. The original dataset is unbalanced panel of 6,900 hotel unique property observations located in the United States for years 2010-2014.

The dataset provides detailed cost and profit information at the property level as well as revenues, unlike many studies of franchising which tend to be limited to information on revenues. Therefore, most prior studies that examined franchising decisions could not examine how the decision affects overall financial performance. This setting in the hotel industry offers several advantages. While properties tend to have different operating procedures, most lodging properties follow a uniform system of financial reporting (USALI 2015). This insures that revenue and expense measurement across properties is similar regardless of ownership or operating structure. The industry also provides a powerful setting to measure and test the links between franchising and specialization, as the value of the brand is critical to a chain's survival. Franchising is extensive in this industry, and hotel franchising contracts are well developed and standardized. Moreover, the duration of franchising contract is typically longer than my sample period, so the setting reduces concern that results are affected by possible simultaneous relationship between franchising choice and performance.

I supplemented the property level information by collecting demographic information for local markets of the hotel properties from the 2010 U.S. Census. In particular, the location characteristics that I collected include information on population, household size, per capita income, age, and ethnicity. I also collected annual information on overall lodging revenue for each principal market in the U.S to control for differences across geographic areas.

3.2 Sample Description

I constructed two samples, one in property-level and the other in chain-level. First, I performed several steps to clean the data. I deleted observations missing information about their market segment, property type, or location type. Then, observations are eliminated for missing information on operating costs, total revenue, or occupied room nights. I also excluded the observations of properties that changed brand, market segment, or property type since such changes can affect the franchising status and the profitability. Next, I excluded the hotel properties that changed their franchising status during the five-year sample period. I also excluded the hotel properties affiliated with foreign hotel companies. Matching the demographic information to the hotel dataset resulted in the loss of 172 properties. Finally, I excluded the property-year observations that experienced an operating loss or had missing information by expense category. The final sample has 5,318 unique properties and 18,693 property-year observations. Table 1 summarizes the number of observations and the number of unique properties deleted in the property-level sample.

To estimate productivity change in the hotel industry, I aggregate property-level revenues, costs, sizes into chain-level information to measure collective performance of the brands. I chose a set of 98 hotel chains operating in the U.S. market, whose data was continuously available for the entire sample period.

Table 1
Sample Selection

Step	**Number of properties**	**Number of property-year observations**
Properties from PKF 2010-2014 data	6,900	24,383
Delete observations with missing data on market segments, property types, location type. Delete observations with non-positive value of operating costs, total revenue, or occupied room nights	6,864	24,291
Drop observations with any change of brand, segment, property type	6,187	21,336
Drop observations with any change of franchising status	6,036	20,740
Drop observations that are operated by foreign hotel companies	5,536	19,507
Drop observations with missing information for the number of competitors, per capita income, population, age, ethnicity, or household size in the zip code	5,364	18,811
Drop observations with an operating loss	5,328	18,727
Drop observations if missing detailed information of operating expenses by category	**5,318**	**18,693**

3.3 Measure of Specialization

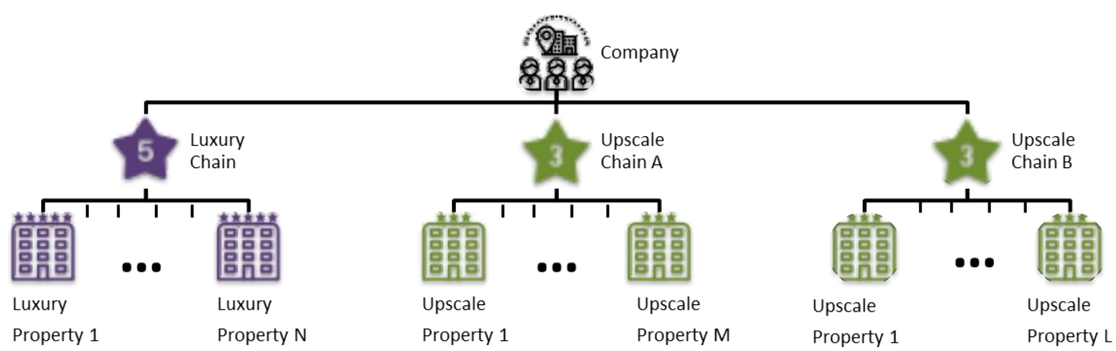
Similar to the auditing research that has used an auditor's portfolio share in a particular industry as a measure of specialization (Neal and Riley 2004), I measure the specialization of a company by the degree of its concentration in one market segment. Specializing in a market segment should be an efficient way to utilize the knowledge built by the brand, since each market segment requires different strategic positioning and operational know-how. There are six market segments provided by Smith Travel Research (STR). STR classifies the market segment of hotel chains into luxury, upper upscale, upscale, upper midscale, midscale, and economy. According to this classification system, all the properties affiliated with a chain are identified as operating in one of the six market segments.

The specialization of a hotel company in each market segment is measured by the proportion of the number of its properties within its principal market segment (%MarketSegment). Since specialization occurs when a company focuses operations on only a few tasks, the company has a specialized market segment only when the majority of its properties operate in the single market segment. To capture whether a company focuses on a single market segment, I measure specialization using a dummy variable and used the third quartile of %MarketSegment in the sample of all property-years, which is 0.70, as the threshold. When %MarketSegment is greater than 0.70, I classify the company as specialized in that market segment. Using the proportion of 0.70 as the threshold is also consistent with the classification of related and unrelated businesses suggested by Rumelt (1974; 1982). When a hotel property is in a market segment having %MarketSegment greater than 0.70, the property is classified as in the area of specialization of the brand (*InSpecialization*=1 and *OutSpecialization*=0). Following this classification, approximately 25 percent of property-year observations in the sample are classified as *InSpecialization*.

It is important to recognize that this measure of specialization is based on the market segment composition of a company and it does not vary within a chain. Illustration 1 illustrates one structure of a hotel company. A hotel company has one or more chains. Each chain is positioned in a market segment, and its properties comply with the brand's policy and operate in the market segment. Like the hotel company in the illustration having two chains in the upscale segment, some hotel companies have multiple chains in a market segment. The company accumulates common knowledge in serving the market segment from multiple chains in that segment. If the hotel company in the illustration has more than 70% of its properties in the upscale segment (70% < (M+L)/(N+M+L)), it is specialized in the upscale segment and not in the luxury segment. Therefore, all properties in the upscale chain A and the upscale chain B are in the company's specialized market segment.

Illustration 1
Specialization in the Market Segments

This illustration shows the structure of the hotel company. A hotel company has one or more hotel chains. Each chain targets one market segment, thus all hotel properties of a chain are in the same market segment. I determine whether the company specializes in a market segment by the degree to which its properties are concentrated in one market segment. For example, below I present a company with three chains, two in the upscale and one in luxury market. When the majority of a company's properties are upscale (i.e., if (M + L) / (N + M + L) > 70%), I determine that the company specializes in managing upscale properties. In this instance, all upscale properties of chain A and chain B are in area of the company's specialization, while all other properties are out of the company's area of specialization.



CHAPTER 4

EMPIRICAL RESEARCH FOR FRANCHISING DECISIONS

4.1 Research Design for Franchising Decisions

4.1.1 Normative Analysis

To investigate whether the fit between specialization and franchising impacts a property's profitability, I run the following model using linear regression on the sample of properties *i* for year *t*:

$$
\begin{aligned}
&Revnue_{it}\ , Cost_{it}\ or\ Profit_{it} \\
&\qquad = b_0 Constant + b_1 OutSpecialization_i * Company\text{-}managed_i \\
&\qquad + b_2 OutSpecialization_i\ *\ Franchised_i + b_3 InSpecialization_i \\
&\qquad *\ Company\text{-}managed_i + b_4 \log(NRoom_{it}) \\
&\qquad + \sum_{j=1}^{5} a_j MarketSegment_{ij} + \sum_{k=1}^{6} c_k PropertyType_{ik} \\
&\qquad + \sum_{l=1}^{5} d_l Location_{il} + b_5 Restaurant_{it} + b_6 \log(Population_i) \\
&\qquad + b_7 \log(PerCapitaIncome_i) + b_8 MarketRevPAR_{it} + YearFE
\end{aligned}
$$

I examine three dependent variables: total revenue per available room (*TRevPAR*), total operating expenses per available room (*OpexPAR*), and operating profit per available room (*ProfitPAR*). The variables are log-transformed to adjust for right-skewness. All financial numbers are deflated by GDP deflator to adjust the inflation. Scaling financial numbers by the size of a hotel, e.g. room revenue per available room (RevPAR), is a widely used method to measure performance in the hotel industry. I evaluate the total revenue from all departments including sales of food and beverage and of other operational services such as parking facilities and laundry scaled by the size of a hotel. I define operating expenses as the sum of departmental expenses, administrative and general expenses, marketing expenses less franchise fees, maintenance expenses, utility expenses, and management fees. I exclude franchise fees from the analysis of operating expenses as I am interested in determining who can operate a property more profitably. Including franchise fees in operating expenses biases profits of franchisee-managed properties downwards.[i]

My variables of interest concern the fit between franchising and specialization denoted by *OutSpecialization*Company-managed, OutSpecialization*Franchised,* and *InSpecialization* Company-managed*. *Franchised* equals one for franchised properties and zero for company-owned properties. *Company-managed* equals zero for franchised properties and one for company-managed. I predict that a chain will manage operations better than a franchisee when the property is in the area of the company's specialization. Accordingly, I expect *InSpecialization*Company-managed* to be positive in the profit model. I also predict that franchisees will manage operations better than the chain (franchisor) when the property is out of the company's area of specialization. Thus, I expect *OutSpecialization*Franchised* to be positive in the profit model. I do not have a prediction on *OutSpecialization*Company-managed.*

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[i] One thought is that management fees should be bundled with franchise fees in the company-managed properties since a hotel company holds both contracts and may misallocate costs. However, excluding management fees from cost analysis will be controversial because management fees are costs paid to hire professional operators who will execute daily hotel operations and thus function similarly to management.

I control for a number of hotel characteristics. The size of the property is measured by the number of hotel rooms (*NRoom*). The model will include the indicator variables of the market segments, the property types, and the location types. There are seven property types: conference center, convention hotel, extended stay hotel, full-service hotel, limited-service hotel, resort hotel, and suite hotel. Conference center is defined as a hotel that generates 60 percent or more of total occupancy by conferences and offers a full-package plan, which provides guest rooms, meals, and full-service conference rooms along with skilled staff trained to serve meeting planners and attendees. Convention hotel provides facilities and guest services for large group such as association meetings and trade shows. These hotels are large: they have typically more than 400 guest rooms and big banquet space. They should equip space design and function flexible to the needs of different large meetings. They often need to cooperate with other convention hotels and convention centers to hold citywide conventions and trade shows. Extended stay hotels are the properties specialized for guest stays of five nights or more. These hotels usually offer more residential equipment and amenities in their guest rooms than standard hotel rooms. A full-service hotel is defined as a lodging facility which provides a wide variety of facilities and amenities, food and beverage outlets, meeting rooms, and recreational activities. A limited-service hotel provides a small set of facilities and amenities compared to a full-service hotel and does not operate food and beverage service for sale. A resort hotel should contain special recreational facilities and typically locates in a suburban or isolated rural location. Finally, a suite hotel is a hotel in which all guest rooms have separate sleeping and living areas.

There are six location types: suburban, city, airport, highway, resort, and rural. I control for whether the property has on-site restaurants since it indicates additional source of revenue and costs. In addition, I control for local market characteristics. I use population and income at the zip-code level. More importantly, I control for market demand for hotel accommodations by including the overall market revenue per room for 50 markets supplied by data provider. Year fixed effects are also included for unobserved events that affect the lodging industry.

4.1.2 Predictive Analysis

I also examine the impact of specialization on the choice to franchise by estimating the probability of franchising for each hotel property. Accordingly, I set the dependent variable of a logit regression model as a binary variable that equals to 1 for franchised properties and to 0 for chain-managed properties and specify the following equation:

$$
\begin{aligned}
&Pr(Franchised_i) \\
&\quad = f(b_0 Constant + b_1 InSpecialization_i + b_2 \, log(NRoom_i) \\
&\quad + b_3 \, log(DistanceToHQ_i) + b_4 NHotel\_ZipChain_i \\
&\quad + b_5 OtherFranchised_i + b_6 Highway_i + b_7 Rural_i)
\end{aligned}
$$

where f(x) is the cumulative distribution function of the logistic distribution. My variable of interests in this model is *InSpecialization.* I expect *InSpecialization* to be negatively associated with a property’s likelihood of franchising.

I include a number of additional explanatory variables that are identified in the literature as affecting the decision to franchise. Consistent with the prior literature, I use the number of rooms of a property (*NRoom*) to control for the effect of outlet size. According to the review paper of Lafontaine and Slade (2007), empirical studies generally find size is negatively related to franchising, and that the difficulty of financing increases with outlet size. Kehoe (1996) studied hotels and finds that the number of hotel rooms is negatively associated with the likelihood of franchising. I control for the effect of monitoring costs using distance to headquarters (*DistanceToHQ),* the number of same-chain hotels in the zip code area of a property (*NHotels_ZipChain*), locations along highways (*Highway*) and non-resort rural areas (*Rural*). Chains inspect their properties to monitor whether operational standards are met. For properties far from headquarters, delegating control rights to franchisees with high-powered incentives becomes attractive since the costs of monitoring increases (Brickley and Dark 1987). The literature has been emphasized that the distance to headquarter especially well represents monitoring costs of franchisee's activities for the hotel industry (Kosová and Sertsios 2018; Freedman and Kosova 2014). Unlike retail or restaurants industry, the hotel industry relies on on-site monitoring because remote monitoring using technology like video recording disturb the privacy of the guests. Hotel companies commonly use on-site visits by inspectors pretending as monitoring device according to interviews with industry practitioners and anecdotal evidence. The number of same-chain hotels in the zip code area of a property (*NHotels_ZipChain*) captures the level of property concentration, which lowers the cost of monitoring by the chain (Kehoe 1996). Thus, I expect this variable to be negatively related to the likelihood of franchising. Properties in locations along highways (*Highway*) and in non-resort rural areas (*Rural*) are less concentrated and are likely to have stochastic demands, making it harder to monitor (Brickley and Dark 1987; Norton 1988). Based on prior research results, I expect highway and rural properties to be positively related to the propensity to franchise.

To control for the possibly of unobservable franchising costs in a geographic area, I include the number of other franchised properties, other than the property's affiliated chain, in its zip code area (*Other_Franchised*). I predict this variable to be positive. Additionally, I control for market segment, location and property types. As was mentioned above in the discussion of the model for normative analysis, the effect of specialization is unidentifiable in the chain fixed effects model since the measure of specialization does not vary within a chain.

Summary statistics for the final sample are provided in Table 2. 48 percent of the sample observations are franchised (*Franchised*), and 24 percent of the sample observations are in the brand's specialized market (*InSpecialization*). On average, a hotel company has 55 percent of its properties in a market segment *(%MarketSegment*). Table 3 reports the number of observations by specialization and franchising status at the property level and at the property-year level observations. Note that Panel B of Table 3 provides more accurate information of the distribution of franchising and specialization at the property level. This is because the property-year panel is unbalanced. Since I excluded the properties that changed franchising status during the sample period from the analysis, each property is either franchisee-managed or company-managed. In other words, 3,012 hotel properties, which take 57 percent (=/5,318) of the total number of properties, are franchisee-managed while there are 8,948 property-year observations of franchisee-managed properties. There are few observations (n=228) for properties that are both franchised and in the specialized area of the chain. On the contrary, the number of observations for properties that are both company-managed and in the specialized area of the chain is much larger to be 4,223. This preliminary finding is consistent with the expectation that hotel companies prefer company management to franchisee management for properties in their specialized market segments.

Table 2
Summary Statistics of Hotel Property Variables

The table reports summary statistics for the property-year observations. 5,318 hotel properties are included in the sample, and the total number of property-year observations is 18,693. The sample period ranges from 2010 to 2014. All variables are defined in Appendix A.

VARIABLES	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
Franchised	0.479	0.500	0	0	0	1	1
InSpecialization	0.238	0.426	0	0	0	0	1
%MarketSegment	0.550	0.293	0.013	0.328	0.565	0.695	1.000
log(NRoom)	5.048	0.608	3.296	4.644	4.868	5.347	7.967
log(Population)	10.056	0.832	1.946	9.738	10.252	10.567	11.528
log(PerCapitaIncome)	10.410	0.444	8.707	10.112	10.411	10.679	12.143
log(NCompetitor)	3.446	1.332	0.000	2.485	3.829	4.533	5.352
log(DistanceToHQ)	6.363	1.211	0.000	5.950	6.560	7.100	8.511
NHotels_ZipChain	1.075	0.344	1	1	1	1	8
Other_Franchised	2.117	2.504	0	0	1	3	18

Table 3
Number of Observations by Specialization and Franchising Status

The table reports summary statistics for the property-year observations. 5,318 hotel properties are included in the sample. The sample period ranges from 2010 to 2014. All variables are defined in Appendix A.

Panel A. Number of the property-year observations

Number of property-year observations	Company-managed	Franchised	Total
OutSpecialization	5,522	8,720	14,242
InSpecialization	4,223	228	4,451
Total	9,745	8,948	18,693

Panel B. Number of the properties

Number of properties	Company-managed	Franchised	Total
OutSpecialization	1,391	2,902	4,293
InSpecialization	915	110	1,025
Total	2,306	3,012	5,318

4.2 Empirical Results

4.2.1 Normative Analysis: Impact of Specialization and Franchising on Performance

Table 4 reports the results of the regression specifications for the effects of fit between specialization and franchising choice on revenue, cost, and profit[ii]. Column (1) reports the coefficients of the profit model. In Table 4, the t-test of the positive and significant coefficient on *InSpecialization * Company-managed* ($\beta_3 = 0.163$) in Column (1) indicates that it is significantly larger than the estimated coefficient of *InSpecialization*Franchised.* The result suggests that the hotel properties in the specialized market segment earn 17.7% (= $e^{\beta 3} - 1$) higher operating profit on average when managed by the brand than managed by the franchisee, holding other things being equal. I find that this result is consistent with H1a. Similarly, the estimated coefficient of *OutSpecialization * Franchised* ($\beta_2 = 0.194$) is significantly larger than that of *OutSpecialization * Company-managed* ($\beta_1 = 0.093$). The difference of the magnitudes of two coefficients suggests that the hotel properties in the market segment in which their brands' company are not specialized earn 11.7% higher (= $e^{\beta 2} - e^{\beta 1} \approx \beta_2 - \beta_1$) operating profit on average when managed by the franchisees than managed by the hotel companies, holding other things being equal. I find that this result is consistent with H1b. Collectively, I find that the chain manages properties better when the company has specialized knowledge. Also, I find that franchisees manage properties better when the

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[ii] The two-tailed t-tests are based on standard errors clustered at the property level. When I ran the seemingly unrelated regression (SUR) with the clustered errors assumption, I find that the changes in the standard errors are very minor and the statistical significance of the SUR estimation are same with the OLS estimation reported in this paper.

company does not have specialized knowledge. Thus, the findings provide evidence of the fit between specialization and franchising.

I provide additional analyses on revenues and costs in Column (2) and Column (3). In Table 4, Column (2), I report the results of the analysis on revenues. I find that revenues are higher in franchised properties than company-managed properties. The estimated coefficient of *InSpecialization*Company-managed* (β_3 = - 0.083) is significantly negative, suggesting relatively negative effects on profits compared to the base level of *InSpecialization*Franchised.* Also, the estimated coefficient of *OutSpecialization* Company-managed* (β_1 = - 0.044) is smaller than the estimated coefficient of *OutSpecialization * Franchised* (β_2 = - 0.021) at a significance level of 5 percent. In Table 4, Column (3), I report results of the analysis on operating expenses. The estimated coefficient of *InSpecialization*Company-managed* (β_3 = - 0.273) is significantly smaller than the other interaction variables between specialization and franchising. This result suggests that cost savings are the largest in those brand managed properties in the specialized market segment of the hotel company. Franchisee management results in slightly higher revenues than brand managed.

I control for other variables related to monitoring and other franchising costs in Table 5. Since these variables affect the decision to franchise choice and indirectly affect performance through the choice of organizational form, I do not have predictions for these variables. The relative magnitudes and the significance of *OutSpecialization * Company-managed*, *OutSpecialization * Franchised*, and *InSpecialization * Company-managed* are robust to the additional control variables.

Table 4
The Effects of Fit between Franchising and Specialization on Profit, Revenue, and Cost

This table examines the effects of fit between franchising and specialization on profit, revenue, and cost. I cluster standard errors at the property level since a property's characteristics are unchanging and model errors for a property are correlated. Standard errors are shown in parentheses. ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A. InSpecialization x Franchised is excluded in the model and is set for the base level. Also, Luxury Segment is excluded in the model and is set for the base level market segment.

VARIABLES	Parameter	(1) log(ProfitPAR)	(2) log(TRevPAR)	(3) log(OpexPAR)
OutSpecialization x Company-managed	β_1	0.093	-0.044	-0.114^{***}
		(0.0674)	(0.0438)	(0.0415)
OutSpecialization x Franchised	β_2	0.194^{***}	-0.020	-0.152^{***}
		(0.0674)	(0.0438)	(0.0414)
InSpecialization x Company-managed	β_3	0.163^{**}	-0.083^{**}	-0.267^{***}
		(0.0651)	(0.0414)	(0.0375)
log(NRoom)		0.057^{***}	0.069^{***}	0.0658^{***}
		(0.0208)	(0.0133)	(0.0135)
Upper Upscale		-0.250^{***}	-0.488^{***}	-0.585^{***}
		(0.0423)	(0.0278)	(0.0315)
Upscale		-0.372^{***}	-0.801^{***}	-1.035^{***}
		(0.0437)	(0.0291)	(0.0327)
Upper Midscale		-0.710^{***}	-0.988^{***}	-1.136^{***}
		(0.0502)	(0.0326)	(0.0365)
Midscale		-1.076^{***}	-1.345^{***}	-1.457^{***}
		(0.0540)	(0.0345)	(0.0381)
Economy		-1.100^{***}	-1.607^{***}	-1.937^{***}
		(0.0605)	(0.0380)	(0.0417)

Table 4, continued

Restaurant		0.184^{***}	0.121^{***}	0.074^{***}
		(0.0401)	(0.0266)	(0.0268)
log(Population)		0.002	-0.006	-0.010^{**}
		(0.0084)	(0.0048)	(0.0044)
log(PerCapitaIncome)		0.183^{***}	0.134^{***}	0.101^{***}
		(0.0148)	(0.0095)	(0.0093)
MarketRevPAR		0.494^{***}	0.382^{***}	0.275^{***}
		(0.0209)	(0.0138)	(0.0130)
Constant		-0.486^{**}	1.841^{***}	2.375^{***}
		(0.217)	(0.137)	(0.137)
Year FE		Yes	Yes	Yes
Property Type FE		Yes	Yes	Yes
Location Type FE		Yes	Yes	Yes
Observations		18,693	18,693	18,693
Adjusted R-squared		0.515	0.822	0.887
Test				
H0: $\beta_1 = \beta_2$	F-statistic	42.83	6.13	17.75
	P-value	< 0.01	0.013	< 0.01
H0: $\beta_1 = \beta_3$	F-statistic	3.91	3.56	45.99
	P-value	0.048	0.059	< 0.01
H0: $\beta_2 = \beta_3$	F-statistic	0.79	8.96	25.49
	P-value	0.375	< 0.01	< 0.01

Table 5
The Effects of Fit between Franchising and Specialization on Profit, Revenue, and Cost after Controlling for Monitoring Costs

I estimate profit, revenue, and cost models on fit between franchising and specialization controlling for variables used to explain monitoring costs for property. Standard errors clustered at the property level are shown in parentheses. ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A. InSpecialization x Franchised is excluded in the model and is set for the base level. Also, Luxury Segment is excluded in the model and is set for the base level of market segment.

VARIABLES	(1) log(ProfitPAR)	(2) log(TRevPAR)	(3) log(OpexPAR)
OutSpecialization x Company-managed	0.078	-0.052	-0.110***
	(0.0691)	(0.0439)	(0.0423)
OutSpecialization x Franchised	0.176**	-0.028	-0.147***
	(0.0691)	(0.0439)	(0.0423)
InSpecialization x Company-managed	0.155**	-0.083**	-0.261***
	(0.0661)	(0.0413)	(0.0384)
log(NRoom)	0.053**	0.070***	0.070***
	(0.0207)	(0.0133)	(0.0134)
log(DistanceToHQ)	0.019***	0.002	-0.013***
	(0.0047)	(0.0031)	(0.0030)
NHotels_ZipChain	-0.010	-0.028**	-0.028**
	(0.0185)	(0.0137)	(0.0131)
Other_Franchised	0.006**	-0.001	-0.004**
	(0.0027)	(0.0017)	(0.0016)
Upper Upscale	-0.244***	-0.488***	-0.589***
	(0.0423)	(0.0277)	(0.0310)
Upscale	-0.367***	-0.797***	-1.035***
	(0.0437)	(0.0290)	(0.0324)
Upper Midscale	-0.705***	-0.985***	-1.137***
	(0.0503)	(0.0326)	(0.0362)

Table 5, continued

Midscale	-1.074***	-1.347***	-1.461***
	(0.0541)	(0.0343)	(0.0374)
Economy	-1.101***	-1.604***	-1.933***
	(0.0603)	(0.0380)	(0.0412)
Restaurant	0.182***	0.119***	0.075***
	(0.0402)	(0.0267)	(0.0267)
log(Population)	0.000	-0.006	-0.009**
	(0.0084)	(0.0048)	(0.0044)
log(PerCapitaIncome)	0.186***	0.137***	0.099***
	(0.0150)	(0.0097)	(0.0095)
MarketRevPAR	0.498***	0.382***	0.274***
	(0.0209)	(0.0139)	(0.0131)
Constant	-0.613***	1.825***	2.480***
	(0.2248)	(0.1420)	(0.1396)
Year FE	Yes	Yes	Yes
Property Type FE	Yes	Yes	Yes
Location Type FE	Yes	Yes	Yes
Observations	18,693	18,693	18,693
Adjusted R-squared	0.517	0.822	0.888

4.2.2 Predictive Analysis: The Effect of Specialization on the Franchising Choice

Table 6 reports the estimation results of the logit regression that examines the hypothesis addressing the relation between specialization and franchising. I report standard errors clustered by chain. In Column (1), the traditional control variables of franchising choices are used to predict the propensity to franchise. The results of the control variables are generally consistent with prior literature (e.g., Brickley and Dark 1987; Lafontaine and Slade 2007). Large properties (*NRoom*) are less likely to be franchised. Distance to headquarters (*DistanceToHQ*) is positive as expected, but I find the estimated coefficient is insignificant. It is possible that the effect of monitoring difficulties caused by geographic distance to headquarters is captured partially by hotel location types of *Highway* or *Rural (Non-Resort)* and the fact that many brands have relocated to the nation's capital over the past two decades. Rural locations that are lowly populated capture the notion of geographic dispersion that increases the cost of monitoring. The estimated coefficient of the properties in rural locations (*Rural/Non-Resort*) is positive and significant at 1 percent level, consistent with the prediction that higher monitoring costs lead to more franchising. The number of properties in the same zip code affiliated to the chain of the property (*Nhotels_ZipChain*), which is a proxy for lower monitoring costs, is negatively associated with the likelihood of franchising and significant. Lastly, the number of franchised properties in the same zip code affiliated to other chains than the chain of a property (*OtherFranchised*) is positive and significant at the 5 percent level, consistent with the expectation of more franchising demand in the local area.

Table 6

Results of Logit Regressions of the Relation between Franchising and Specialization

The models are estimated using logit regression with clustered standard errors at the chain level. Standard errors are shown in parentheses. ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A.

	Pred. Sign	(1) Franchised	(2) Franchised	(3) Franchised
InSpecialization	-		-2.854***	-3.421***
			(0.6578)	(0.6831)
log(Nroom)	-	-0.823***		-1.301***
		(0.2787)		(0.2049)
log(DistanceToHQ)	+	0.048		0.035
		(0.0517)		(0.0463)
Nhotels_ZipChain	-	-1.402***		-0.574***
		(0.4803)		(0.1959)
Other_Franchised	+	0.044**		0.013
		(0.0203)		(0.0157)
Highway	+	0.566*		1.238***
		(0.3442)		(0.2708)
Rural(Non-Resort)	+	0.692***		0.928***
		(0.2232)		(0.2060)
Constant		5.443***	0.735***	7.694***
		(1.3857)	(0.1988)	(1.2534)
Pseudo R-squared		0.071	0.161	0.262
Observations		5,318	5,318	5,318

Column (2) of Table 6 specifies a base model with *InSpecialization*. The estimated coefficient of *InSpecialization* is significantly negative, supporting the hypothesis that companies are more likely to franchise properties outside their area of specialization. In Column (3), the traditional control variables of franchising choice are added to the base model. The estimated coefficient of *InSpecialization* remains significantly negative after controlling for the proxies of monitoring costs. Notably, from Column (3) it is evident that the strength of the relation between many of the monitoring variables and franchising choice increases once specialization is included. The pseudo R-squared of the base model in Column (2) is 16.1 percent, which is larger than 7.1 percent of the predictive model based the consideration on monitoring costs in Column (1). This indicates that area of specialization alone explains more variation in franchising than all of the monitoring cost variables. This suggests that specialization is an important determinant of franchising decisions.

In Table 7, I present classification tables reporting the proportion of properties whose predicted franchising choice is matched to the actual franchising choice. Based on the estimated models used in Table 6, I classify observations whose predicted probability of franchising is greater than the actual proportion of franchising (56.6%) as predicted to be franchised, and company-managed otherwise. The proportion of the matched properties is 71.8 percent in the model (2) and 59.1 percent in the model (1). The inclusion of the predictors used in the model (1) together with *InSpecialization* increases the proportion of the matched properties by 1.9 percent over specialization alone.

Table 7

Number of Properties by Predicted and Actual Franchising Choice

This table presents the number of properties by predicted and actual franchising choice. The predictive models are estimated using the logit regression in Table 6. I classified the observations whose predicted probability of franchising is greater than the actual proportion of franchising (56.6%) as predicted to be franchised, and company-managed otherwise. All variables are defined in Appendix A.

$$\text{Model (1)}: Pr(Franchised_i) = f(b_0 Constant + b_2\, log(NCompetitor_i) + b_3\, log(NRoom_i) + b_4\, log(DistanceToHQ_i) + b_5 NHotel\_ZipChain_i + b_6 OtherFranchised_i + b_7 Rural_i)$$

$$\text{Model (2)}: Pr(Franchised_i) = f(b_0 Constant + b_1 InSpecialization_i)$$

$$\text{Model (3)}: Pr(Franchised_i) = f(b_0 Constant + b_1 InSpecialization_i + b_2\, log(NCompetitor_i) + b_3\, log(NRoom_i) + b_4\, log(DistanceToHQ_i) + b_5 NHotel\_ZipChain_i + b_6 OtherFranchised_i + b_7 Rural_i)$$

Model (1)	**N.Obs.**	**Predicted**	
	Actual	Company-managed	Franchised
	Company-managed	1,104 (20.8%)	1,202 (22.6%)
	Franchised	974 (18.3%)	2,038 (38.3%)
	Proportion of matched obs.		59.1%

Model (2)	**N.Obs.**	**Predicted**	
	Actual	Company-managed	Franchised
	Company-managed	915 (17.2%)	1,391 (26.2%)
	Franchised	110 (2.1%)	2,902 (54.6%)
	Proportion of matched obs.		71.8%

Model (3)	**N.Obs.**	**Predicted**	
	Actual	Company-managed	Franchised
	Company-managed	1,502 (28.2%)	804 (15.1%)
	Franchised	597 (11.2%)	2,415 (45.4%)
	Proportion of matched obs.		73.7%

Null Hypothesis	**McNemar's test statistic**	**p-value**
p(matched obs.)$_{Model(1)}$ = p(matched obs.)$_{Model(2)}$	Chi-square(1) = 181.3	<0.01
p(matched obs.)$_{Model(2)}$ = p(matched obs.)$_{Model(3)}$	Chi-square(1) = 9.3	<0.01

The McNemar's Chi-Square test compares the proportion of the matched properties between two models. I find that the accuracy of specialization model (71.8%) is significantly higher than accuracy of monitoring cost model (59.1%) at 1 percent (Chi-squared (1) = 181.3). I also find that the inclusion of the predictors used in the model (1) together with *InSpecialization* as shown in the model (3) increases the proportion of the matched properties by 1.9 percent, significant at 1 percent (Chi-squared (1) = 9.3). The results corroborate the finding that specialization is likely one of the determinants of franchising.

Table 8 reports the results of the predictive model specification controlling for the variables used to estimate properties' profitability: restaurant operation (*Restaurant*), demographic characteristics of local market (*log(Population)* and *log(PerCapitaIncome)*) and local market average revenue per available rooms (*MarketRevPAR*). Also, I also report the results after controlling for market segments, property types, and location types in Column (3)-(4). I find that the negative effect of specialization on franchising choice is robust to the inclusion of those additional control variables. Based on the results reported in Column (4), the change in probability of franchising when *InSpecialization* goes from 0 to 1 decreases 62 percent, and the marginal effect is significant at 1 percent level. The marginal effects of statistically significant variables proxying for monitoring costs are also economically significant. 10 percent increase in Nroom leads to 2.8 percent decrease in franchising probability (p-value < 0.01). When there is one more hotel in the same zip code (*Nhotels_ZipChain*), franchising likelihood decrease by 10 percent (p-value = 0.029). Compared to city center hotels, hotels located near highway are 16 percent more likely to be franchised (p-value < 0.01), and hotels in non-resort rural area are 12 percent more likely to be franchised (p-value = 0.02). Overall, the results imply the strong effects of specialization, which cannot be captured by the monitoring cost variables commonly used in prior literature, on determining franchising choice.

Table 8
Logit Regressions of the Relation between Franchising and Specialization after Controlling for Hotel Characteristics

The models are estimated using logit regression with clustered standard errors at the chain level. Standard errors are shown in parentheses. ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A.

	Pred. Sign	(1) Franchised	(2) Franchised	(3) Franchised	(4) Franchised
lnSpecialization	-		-3.552***		-3.127***
			(0.6982)		(0.7239)
Restaurant	?	0.658	-0.264	-0.647	-0.802*
		(0.6002)	(0.5254)	(0.4551)	(0.4637)
log(Population)	?	-0.054	-0.008	0.003	0.020
		(0.0519)	(0.0534)	(0.0485)	(0.0512)
log(PerCapitaIncome)	?	-0.105	-0.300***	-0.145	-0.193
		(0.1568)	(0.1145)	(0.1211)	(0.1203)
MarketRevPAR	?	-0.658***	-0.698***	-0.780***	-0.739***
		(0.1535)	(0.1598)	(0.1624)	(0.1620)
log(Nroom)	-	-1.130***	-1.061***	-1.129***	-1.158***
		(0.3005)	(0.3233)	(0.2822)	(0.2854)
log(DistanceToHQ)	+	0.047	0.019	0.046	0.036
		(0.0557)	(0.0482)	(0.0446)	(0.0489)
Nhotels_ZipChain	-	-1.321***	-0.507**	-0.701***	-0.413**
		(0.4458)	(0.2083)	(0.2087)	(0.1911)
Other_Franchised	+	0.050**	0.016	0.026*	0.017
		(0.0209)	(0.0155)	(0.0148)	(0.0146)
Highway	+	0.502	1.140***	0.682***	0.771***
		(0.3230)	(0.2727)	(0.2064)	(0.2442)
Rural/Non-Resort	+	0.627***	0.866***	0.599***	0.553**
		(0.2251)	(0.2130)	(0.2306)	(0.2600)

Table 8, continued

Upper Upscale			2.446***	2.512***
			(0.5544)	(0.5758)
Upscale			1.948***	1.865***
			(0.6463)	(0.6758)
Upper Midscale			3.217***	2.954***
			(0.6555)	(0.6673)
Midscale			-0.590	1.113
			(0.8994)	(0.8242)
Economy			-0.510	1.761
			(1.0652)	(1.0926)
Constant	11.075***	12.908***	10.250***	10.920***
	(2.3032)	(2.3269)	(2.0357)	(2.1084)
Property Type FE	No	No	Yes	Yes
Location Type FE	No	No	Yes	Yes
Pseudo R-squared	0.090	0.273	0.288	0.339
Observations	5,318	5,318	5,318	5,318

4.2.3 Robustness Checks

Rooms departmental revenues as the main operation of hotels

In untabulated analyses, I re-estimate the profit, revenue and cost models using only room department revenues and costs. Excluding the food and beverage department, and other operation departments, addresses the concern that the results of the normative analysis are subject to the noise that not all hotel properties operate food and beverage services or have other operational departments such as casinos. This modification does not affect the findings. Similar to the findings on total revenue, I find that rooms departmental revenues are significantly higher in franchised properties than in brand-managed properties. Also, room operating expenses are the lowest in the properties that are both brand-managed and in the specialized market segment.

Continuous measure of specialization

In Table 9, I use the proportion of properties that belong to the same market segment within the hotel company (*%MarketSegment*) as an alternative measure of specialization. I interact this continuous measure of specialization with franchising choice and expect the coefficient of the interaction variable to be positive in the cost model since cost savings is identified as the driver of economies of specialization in the main analysis. I find that operating costs per available room of a property decreases by 2.78% for a 10% increase of the concentration of the market segment within the company, and this finding statistically significant at 1%. Consistent with my expectation, I also find that *Franchised x %MarketSegment* is positive and significant. This finding suggest that the cost saving advantage of specialization is reduced by 28.1% (= $e^{0.248} - 1$) when a property by a franchisee. Overall, this analysis provides evidence that hotel companies' specialization benefits comes from cost-savings and that franchisee management cannot fully exploit the specialized knowledge of the company, consistent with the main analysis.

Table 9
Regression Results of Profit on Franchising and Specialization using Continuous Measure of Specialization

This table examines the effects of franchising and specialization on profit, revenue, and cost. I use the proportion of properties belong to the same market segment within the hotel company (%MarketSegment) as an alternative measure of specialization of the company in operating properties in that market segment. I cluster standard errors at the property level since a property's characteristics are unchanging and model errors for a property are correlated. Standard errors are shown in parentheses. ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A. Also, Luxury Segment is excluded in the model and is set for the base level of market segment.

	(1) log(ProfitPAR)	(2) log(TRevPAR)	(3) log(OpexPAR)
%MarketSegment	0.062	-0.123***	-0.278***
	(0.0460)	(0.0263)	(0.0281)
Franchised	0.122***	-0.038*	-0.150***
	(0.0350)	(0.0204)	(0.0195)
Franchised x %MarketSegment	-0.104	0.107***	0.248***
	(0.0654)	(0.0374)	(0.0362)
Upper Upscale	-0.247***	-0.445***	-0.511***
	(0.0439)	(0.0275)	(0.0313)
Upscale	-0.408***	-0.788***	-0.974***
	(0.0458)	(0.0287)	(0.0326)
Upper Midscale	-0.740***	-0.987***	-1.100***
	(0.0503)	(0.0315)	(0.0350)
Midscale	-1.095***	-1.321***	-1.405***
	(0.0552)	(0.0344)	(0.0385)
Economy	-1.125***	-1.580***	-1.880***
	(0.0623)	(0.0373)	(0.0413)
Restaurant	0.185***	0.124***	0.075***
	(0.0401)	(0.0269)	(0.0272)

Table 9, continued

log(Population)	0.000	-0.009*	-0.013***
	(0.00846)	(0.00484)	(0.00443)
log(PerCapitaIncome)	0.183***	0.136***	0.105***
	(0.0147)	(0.00951)	(0.00944)
MarketRevPAR	0.500***	0.391***	0.286***
	(0.0208)	(0.0137)	(0.0129)
Constant	-0.112	2.142***	2.597***
	(0.191)	(0.119)	(0.121)
Year FE	Yes	Yes	Yes
Property Type FE	Yes	Yes	Yes
Location Type FE	Yes	Yes	Yes
Observations	18,693	18,693	18,693
Adjusted R-squared	0.513	0.821	0.887

Alternative approach to test contingency fit

In Table 10, I use the residual from the predictive model for the normative analysis (Drazin and Van de Ven 1985). Specifically, I use the combined model reported in Column 3 of Table 6 to predict the optimal franchising choice. The absolute residuals of the predictive model are computed as the deviations from the optimal choice and are used as a measure of misfit. I expect the misfit to be negatively related to profit. I find that *Misfit* is negative and significant at the 1 percent level.

Table 10
Regression Results of Profit on Fit between Franchising and Specialization Measured by the Residuals of the Predictive Model

This table examines the effects of fit between franchising and specialization on profit, revenue, and cost. I cluster standard errors at the property level since a property's characteristics are unchanging and model errors for a property are correlated. Standard errors are shown in parentheses. ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A. Also, Luxury Segment is excluded in the model and is set for the base level of market segment.

	(1) log(ProfitPAR)	(2) log(TRevPAR)	(3) log(OpexPAR)
MisFit	-0.226***	-0.049***	0.093***
	(0.0309)	(0.0186)	(0.0172)
log(NRoom)	0.051**	0.063***	0.060***
	(0.0202)	(0.0131)	(0.0133)
Upper Upscale	-0.218***	-0.477***	-0.590***
	(0.0422)	(0.0277)	(0.0308)
Upscale	-0.335***	-0.789***	-1.041***
	(0.0442)	(0.0294)	(0.0324)
Upper Midscale	-0.667***	-0.970***	-1.130***
	(0.0498)	(0.0323)	(0.0355)
Midscale	-1.070***	-1.372***	-1.524***
	(0.0505)	(0.0332)	(0.0366)
Economy	-1.124***	-1.658***	-2.033***
	(0.0502)	(0.0328)	(0.0352)
Restaurant	0.206***	0.129***	0.073***
	(0.0403)	(0.0270)	(0.0273)
log(Population)	0.002	-0.007	-0.011**
	(0.0082)	(0.0048)	(0.0045)
log(PerCapitaIncome)	0.182***	0.135***	0.104***
	(0.0148)	(0.0095)	(0.0094)

Table 10, continued

MarketRevPAR	0.488***	0.382***	0.280***
	(0.0210)	(0.0139)	(0.0130)
Constant	-0.221	1.834***	2.188***
	(0.2056)	(0.1288)	(0.1310)
Year FE	Yes	Yes	Yes
Property Type FE	Yes	Yes	Yes
Location Type FE	Yes	Yes	Yes
Observations	18,693	18,693	18,693
Adjusted R-squared	0.516	0.821	0.884

CHAPTER 5

EMPIRICAL RESEARCH FOR EFFICIENCY GAIN

5.1 Research Design for Technical Efficiency Analysis

I use a two-stage approach in this study. In the first stage, I use a data envelopment analysis (DEA) to estimate productivity changes and to decompose it into technical changes and relative efficiency changes. In the second stage, I use ordered logit regression to estimate the impact of chain characteristics on productivity performance. This two-stage approach yields statistically consistent estimators for the regression coefficients (Rajiv D. Banker and Natarajan 2008).

In the first stage, I measure the productivity, technical, and relative efficiency changes between two consecutive years following the nonparametric estimation procedures using the DEA model of Banker et al. (2005). I estimate the inefficiency values based on the BCC (R. D. Banker, Charnes, and Cooper 1984) model. I denote the efficiency score of firm *j*'s period *t* (base period) input-output vector relative to the year *t* (base year) production possibility set as θ_{jt}^{t} (θ_{j0}^{0}). Consistent with prior literature that used DEA for hotel sector (Barros 2005), output-oriented model, which calculates the efficiency in maximizing output given fixed amounts of inputs, is used since hotel properties are fixed assets and it is difficult to adjust the input such as the number of rooms. The following linear optimization program is used to estimate the inefficiency values[iii]:

$$\widehat{\theta_{jt}^{t}} = \arg\max\left\{\hat{\theta}\,\middle|\sum_{k=1}^{N}\lambda_{kt}^{t}\,\boldsymbol{y}_{kt} \geq \hat{\theta}\,\boldsymbol{y}_{jt};\ \sum_{k=1}^{N}\lambda_{kt}^{t}\,\boldsymbol{x}_{kt} \leq \boldsymbol{x}_{jt};\ \sum_{k=1}^{N}\lambda_{kt}^{t} = 1;\ \lambda_{kt}^{t} \geq 0\ \ \forall k = 1,\cdots,N\right\}$$

, where $(\boldsymbol{x}_{kt}, \boldsymbol{y}_{kt})$ is input-output vector of k[th] firm.

Similarly, I denote the inefficiency score of firm *i*'s period *t* input-output vector relative to the base year production possibility set as θ_{jt}^{0}. The following linear optimization program is used to estimate the inefficiency value:

$$\widehat{\theta_{jt}^{0}} = \arg\max\left\{\hat{\theta}\,\middle|\sum_{k=1}^{N}\lambda_{k0}^{0}\,\boldsymbol{y}_{k0} \geq \hat{\theta}\,\boldsymbol{y}_{jt};\ \sum_{k=1}^{N}\lambda_{k0}^{0}\,\boldsymbol{x}_{k0} \leq \boldsymbol{x}_{jt};\ \sum_{k=1}^{N}\lambda_{k0}^{0} = 1;\ \lambda_{k0}^{0} \geq 0\ \forall k = 1,\cdots,N\right\}$$

, where $(\boldsymbol{x}_{kt}, \boldsymbol{y}_{kt})$ is input-output vector of k[th] firm.

I define one output as sales revenue and four inputs as labor costs, fixed asset and maintenance costs, other operating costs, and the number of available room nights. Using revenue as output and relevant costs as inputs is consistent with prior literature that examined the production function of the hotel industry(Anderson et al. 1999; Botti, Briec,

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[iii] Inefficiency scores range from one to infinity. The inefficiency scores of the most efficient chains are one. Efficiency scores can be obtained by taking the reciprocal of inefficiency scores, ranging from zero to one. Efficiency scores are reported in the following section for the empirical results since they are easier to interpret and report than inefficiency scores due to the length of the range.

and Cliquet 2009). Revenues and costs are scaled by the GDP price deflator to control for inflation. Since the efficiency of the input-output mix of year *t* is evaluated in the production possibility set of the base year 0, inflation adjustment is necessary to make the financial numbers of year *t* comparable to the monetary value of the base year.

Productivity change (*PC*), technical change (*TC*), and relative efficiency change (R*C*) of a hotel chain *j* are estimated using the following log ratios:

$$\widehat{PC_J} = ln\frac{\widehat{\theta_{J0}^0}}{\widehat{\theta_{Jt}^0}};\ \widehat{TC_J} = ln\frac{\widehat{\theta_{Jt}^t}}{\widehat{\theta_{Jt}^0}};\ \widehat{RC_J} = ln\frac{\widehat{\theta_{J0}^0}}{\widehat{\theta_{Jt}^t}}$$

Productivity change consists of two components, which are technical change and relative efficiency change. Technical change indicates how much of each hotel chain's productivity change is attributed to production frontier shift. Relative efficiency change indicates how much of how much of each hotel chain's productivity change is attributed to its efficiency change.

In the second stage, I conduct an ordered logit regression to identify characteristics of industry leaders, followers, and laggards using the productivity change estimated in the first stage. Consistent with the theoretical definition of technological leader of industry (Porter 1983), I define industry leaders as the chains that pushed the production frontier upward and lead technical progress of the industry. I identify the years that had significantly positive production progress achieved by technical progress, and the chains that had positive technical progress and was on the frontier in such the year are classified as leaders. Followers are the chains that catch up the technical progress in the subsequent years with improving their relative efficiency. I find the year that had significant growth in relative efficiency on average following the technical progress of the industry last year and classify the chains that were not most efficient in the previous year and had positive relative efficiency change in the year as followers. Some chains might be lagged to the technical progress and fail to improve their relative efficiency in the following years, which are named as laggards. Accordingly, the remaining chains that do not meet the criteria of either leader or follower are classified as laggards.

I estimate the following ordered logit regression model:

$$g(Pr(Efficiency\ Groups\ <\ i\,|\boldsymbol{X})\ =\ b_0 Constant + b_1 InSpecialization_i$$
$$+ b_2 CompanySize + b_3 ChainSize + b_4 PropertySize$$
$$+ \sum_{j=1}^{5} a_j MarketSegment_{ij} + b_5 HHI\_PropertyType$$
$$+ b_6 HHI\_LocationType + b_7 FranchisingRate$$

I assign the value of *Efficiency Group* as 1 if the hotel chain is classified as laggard, 2 for follower, and 3 for leader. To proxy for specialization, I use a dummy variable, *InSpecialization,* which is 1 when a hotel chain is in a market segment having the proportion of the number of the parent hotel company's properties within the chain's principal market segment greater than 0.70 and 0 otherwise, consistent with the measure of specialization at the property level. This dummy variable addresses the concern that the hotel company does not specialize in a market segment when its market concentration is not sufficiently high. A positive sign of the coefficient of *InSpecialization* will support the argument that specialization leads to technological change through innovation.

To test the effects of size on productivity change characteristics of hotel chains, I measure the size of the chains using factor analysis[iv]. To control for other size characteristics at the company level and the property level, I included fifteen variables related to company, chain, and property characteristics in the factor analysis. After identifying principal component factors, I rotate the factors to ease the interpretations of the factors by making them uncorrelated to each other. Five variables are used to capture the size of hotel chain in terms of total chain resources and market competitiveness (Dang, Li, and Yang 2018): *Chain_Number of Properties, Chain_Available Room, Chain_Occupied Room, Chain_ Revenue, and Chain_SegmentShare*. *Chain_Number of Properties* is the number of properties affiliated to the chain. *Chain_Available Room* is the sum of available room nights of the chain, which captures the size per property multiplied by the number of properties. *Chain_Occupied Room* is the sum of occupied room nights of the chain, which captures the total number of customers. *Chain_ Revenue* is total sales revenues of the chain, which measures the market competitiveness aspects of size of the chain. Lastly, *Chain_SegmentShare* is the market share of the chain in the market segment based on total sales revenues. Six variables are used to capture the size of hotel company: *Company_Number of Properties, Company_Available Room, Company_Occupied Room, Company_ Revenue, Company_Market Share,* and *N_Brand*. *Company_Number of Properties* is the number of properties affiliated to the hotel company. *Company_Available Room* is the number of available room nights of the

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[iv] The top two components are retained because they generated eigenvalues greater than 1, which is the common rule in principal component analysis. I named as ChainSize and CompanySize based on the results reported in Table14.

company. *Company_Occupied Room* is the number of occupied room nights of the company. *Company_ Revenue* is total sales revenues of the company. *Company_Market Share* is the company's portion of total sales revenues within the entire market observed in the sample. In addition to these variables, I also consider the variable that capture the size unique at the company level: *N_Brand* . *N_Brand* is the number of the chains (brands) that the hotel company has. Four variables are used to capture the size of the average property of the chain: *Property_Available Room*, *Property_Occupied Room*, *Property_ Revenue*, and *Property_Labor Cost*. *Property_Available Room* is the average of available room nights among the properties of the hotel chain. *Property_Occupied Room* is the average number of occupied room nights among the properties of the hotel chain. *Property_ Revenue* is the average of total sales revenues among the properties of the hotel chain. Lastly, *Property_Labor Cost* is the average of total labor costs among the properties of the hotel chain. This variable is used to proxy for the average number of employees working at the chain's property.

I control for other chain characteristics that might affect the industry leadership of the chain. First, I control for the degree of diversification in property or location types of the chain based on the Herfindahl index. Hotel property types and location types can be classified by distinctive facility and service features to serve their targeted clientele (Sturman et al. 2011; see page 257-258). *HHI_PropertyType* is the sum of the squares of the proportions of each property types within the chain. There are seven property types: conference center, convention hotel, extended stay hotel, full-service hotel, limited-service hotel, resort hotel, and suite hotel. *HHI_LocationType* is the sum of the squares of the proportions of each location types within the chain. There are six location types: suburban, city, airport, highway, resort, and rural. Diversified property types or location types allow a chain to have more various operational experiences which may stimulate innovation or deter productivity. Thus, I do not make a directional expectation on these variables. Second, I control for franchising rates. *FranchisingRate* is measured by the proportion of franchisee-managed properties within a chain. Franchisees have local experience that may be not possessed by the hotel company and may contribute to the chain's innovation through its autonomy. Prior literature on franchising documented the evidence that having franchised units in addition to company-managed units improve the survival and the performance of the chains (Kalnins and Mayer 2004; Bradach 1997; Botti, Briec, and Cliquet 2009). Third, I control for market segment of hotel chains[v]. Market segment is the most important characteristics of hotel chains which might be related to the efficiency of the chains. Market segment represents the chain's strategic positioning. Luxury chains pursue the differentiation strategy, and economy pursue cost leadership strategy since their customers are price-sensitive and are less sensitive to quality. A chain's market segment also captures the level of profit margins in general.

[v] Property types might be another contextual factor of hotel chains' unique characteristics. However, market segments precede to the importance of property types since property types are determined by the chain's market segments. For instance, conference and convention center hotels are available only for upscale or upper upscale hotels due to the nature of the events requiring special training and services. Thus, I also controlled for the proportion of the affiliated properties classified as each property type among seven categories within a chain (*%PropertyType*) and the proportion of the affiliated properties classified as each location type among seven categories within a chain (*%LocationType)*. The results are robust to the inclusion of these variables. In the main model, I do not include them due to limitation on the degree of freedom in the small sample size like in this study.

There are six market segments: luxury, upper upscale, upscale, upper midscale, midscale, and economy. Economy segment is the base level, and five dummy variables for higher market segments are included in the model.

5.2 Empirical Results

5.2.1 Productivity Change, Technical Change, and Relative Efficiency Change

Table 11 reports the descriptive statistics of the distribution of relative efficiency scores of the hotel chains between 2010 and 2014 estimated in the first stage. The efficiency scores indicate the chain's relative production efficiency of the year compared to the production frontier of the year. The mean productive efficiency of the hotel chains varies between 83.3% and 86.9% by year. There is some preliminary evidence that the gap between most efficient chains and inefficient chains grows between 2010 and 2012 and reduces between 2012 and 2014 as the mean relative efficiency decreases till 2012 and then recovers in the following years.

Table 11
Descriptive Statistics on Relative Efficiency Scores of Hotel Chains

DEA estimations are based on the BCC model. The efficiency scores are estimated by year.

Year	N	Mean	Std Dev	Minimum	Lower Quartile	Median	Upper Quartile	Maximum
2010	98	0.869	0.126	0.476	0.778	0.883	1.000	1.000
2011	98	0.867	0.119	0.577	0.783	0.878	0.983	1.000
2012	98	0.833	0.141	0.520	0.722	0.853	0.977	1.000
2013	98	0.839	0.136	0.461	0.734	0.855	0.965	1.000
2014	98	0.866	0.146	0.368	0.755	0.912	0.997	1.000

Table 12 reports the average productivity change, technical change, and relative efficiency change for each year and provides the test results of their statistical significance, and Figure 1 shows the plots of the changes graphically. The average productivity of major hotel chains grew by 11.3% between 2010 and 2014. This overall productivity growth was led by significant technical progress from 2010 to 2012 followed by an improvement in relative efficiency between 2013 and 2014. To be specific, the hotel industry experienced technical progress of 4.2 % between 2010 and 2011 and 8.6% between 2011 and 2012, which are significant at the 1 percent level. During the same period, relative efficiency decreased on average by 4.4 % between 2011 and 2012. In the following year between 2013 and 2014, the industry experienced significant improvement in relative efficiency by 3.0%. The findings suggest that significant productivity improvement between 2010 and 2012 was entirely due to significant technical progress led by leading hotel chains while other chains could not catch up the technological improvement immediately resulting into lowered relative efficiency on average. The significant improvement in relative efficiency in the subsequent year between 2013 and 2014 indicates that many hotel chains that were not on the production frontier in the previous periods caught up the technological improvement of the leading chains that did not make further technological progress in the year.

Table 12
Tests for Productivity Change, Technical Change, and Relative Efficiency Change of the Hotel Chains between 2010 and 2014

The p values are for testing whether productivity, technical change, or relative efficiency change is significantly different from zero. ∗ significant at the 10% level; ∗∗ significant at the 5% level; ∗∗∗ significant at the 1% level for two-sided hypothesis tests.

Period from-to	Mean Productivity Change	Mean Technical Change	Mean Relative Efficiency Change
2010-2011	0.041***	0.042***	-0.001
	(<0.01)	(<0.01)	(0.88)
2011-2012	0.042***	0.086***	-0.044***
	(<0.01)	(<0.01)	(<0.01)
2012-2013	0.008	0.000	0.007
	(0.44)	(0.91)	(0.44)
2013-2014	0.034***	0.005	0.030**
	(<0.01)	(0.60)	(0.02)
2010-2014	**0.113*** **	**0.121*** **	**-0.009**
	(<0.01)	**(<0.01)**	**(0.55)**

Figure 1
Plots of Productivity Change, Technical Change, and Relative Efficiency Change of Hotel Chains between 2010 and 2014

Mean values of productivity change, technical change, and relative efficiency change are plotted on the graph. The numbers and the statistical significance of the changes are showed in Table 12.

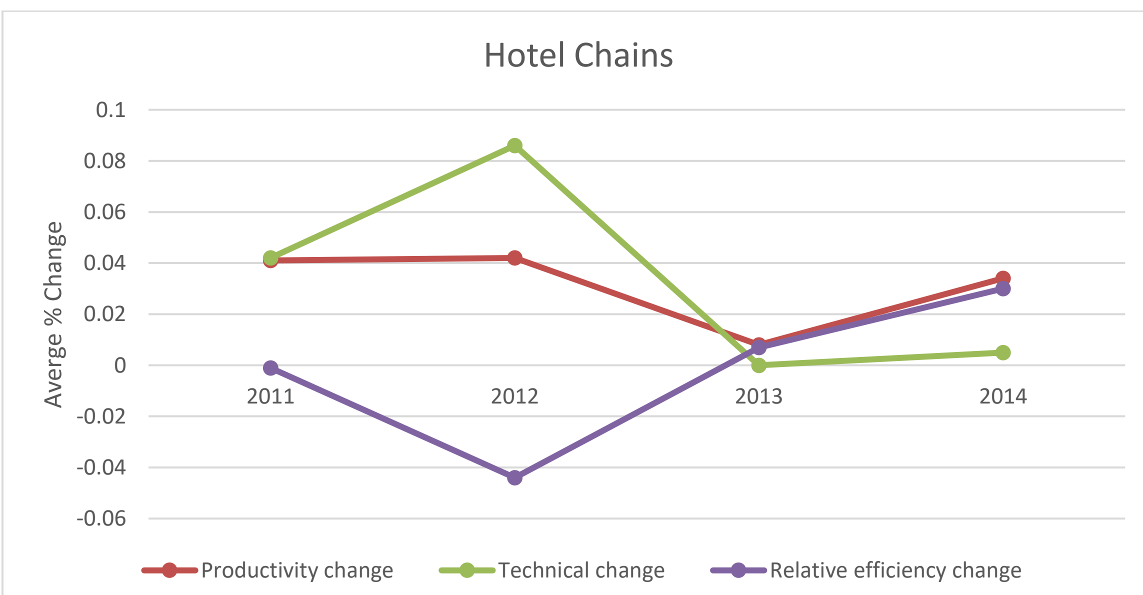

Illustration 2 demonstrates the relation between the efficiency group consisting of leaders, followers, and laggards and the production frontier shift. The production frontier shifted upward from 2010 to 2012, supported by the evidence of significant technical progress during the period. The most efficient chains which are on the production frontier of 2011 and of 2012 are classified as industry leaders. To be specific, there are eight leading chains that were the best practice shown on the frontier both in 2011 and in 2012. There are nineteen chains that were on the production frontier in 2011 and had positive technical progress between 2010 and 2011. Among the nineteen chains, only eight chains pushed the production frontier upward additionally between 2011 and 2012, and there is no chain that were not on the production frontier between 2010 and 2011 but improved its technology and became on the production frontier between 2011 and 2012. The year between 2011 and 2012 is critical to identify the industry leaders since it is the time that industry-leading chains made significant technical progress that most chains failed to catch up, which is supported by the negative mean relative efficiency change. I ensure that the leaders stayed on or very close to the production frontier in the following years. Laggards are the hotel chains that were not best-practice decision making units (DMUs) during the period from 2010 to 2012 and did not make significant relative efficiency improvement from 2010 to 2014, shown below the production frontier line. Their distances to the production frontier in 2014 are farther than 2010. I find that 41 hotel chains are classified as laggards. Followers are the rest of the chains. They caught up with the technological improvements of the leaders. There are 49 hotel chains that meet the condition of followers. Panel A of Table 13 summarizes the frequency by the efficiency group named as leaders, followers, and laggards.

In Panel B, Table 13, I summarize the mean efficiency score of the chains by efficiency group and year. The pattern of higher efficiency for leaders than followers and for followers than laggards corroborates the classification method of leaders, followers, and laggards. The mean efficiency scores of leaders are almost one for all five years, which is higher at least by 8 percent than those of followers. The results indicate that the leaders who led the big technical change between 2010 and 2012 were the most efficient chains throughout the sample period. Please note that other chains that became most efficient in the latter periods. They are classified as followers. The mean efficiency scores of followers and laggards in 2010 are 0.857 and 0.859, respectively, suggesting no significant difference in their performance in the initial year. However, the trend of the mean efficiency scores is quite different between them. The laggards' mean efficiency score decreases to 0.793 in 2012 while the followers' mean efficiency score decreases to only 0.840 in 2012. In 2014, while the followers' mean efficiency score grew to 0.919, indicating that they caught up the progress of the leaders, the laggards' mean efficiency score was not improved and remained at 0.777. The difference in efficiency between followers and laggards gets as time goes, consistent with the definition of followers and laggards.

Illustration 2
Shift of Production Frontier and Efficiency Group

This illustration shows the relation between the efficiency group consisting of leaders, followers, and laggards and the production frontier shift. Leaders are the hotel chains pushing the production frontier upward in 2011 and 2012. Followers are the chains catching up the new best practice production function by improving their relative efficiency in the following years. The remainders are laggards, which left behind without significant relative efficiency improvement till 2014 compared to its performance in 2010.

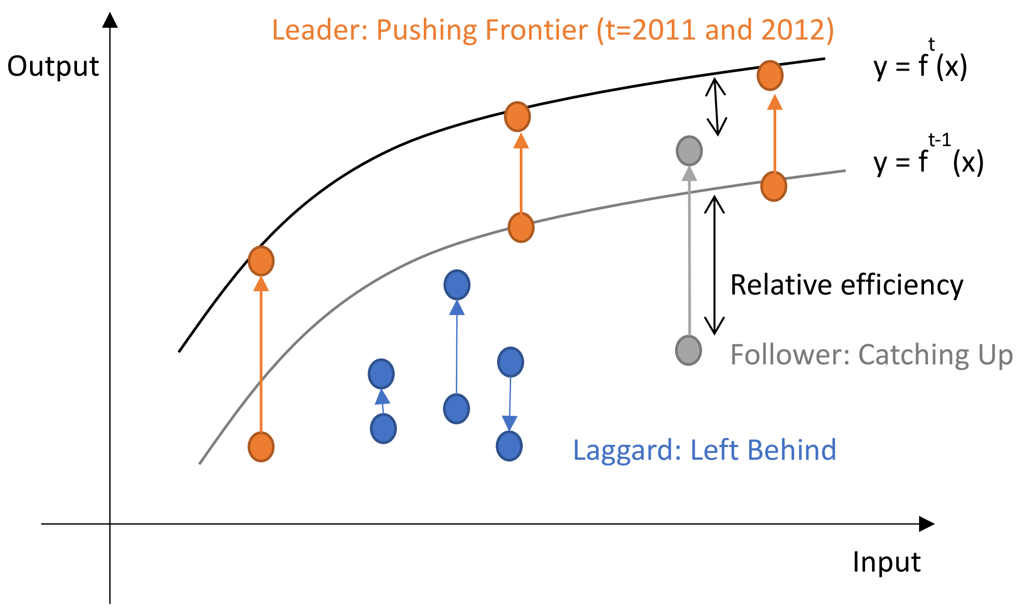

Table 13
Frequency and DEA Estimators of Efficiency Group

Panel A. Frequency Table

Level	Efficiency Group	Description	Number of Chains
1	**Laggards**	Left Behind	41
2	**Followers**	Catching Up	49
3	**Leaders**	Pushing Frontier	8
	Total		98

Leaders are the hotel chains pushing the production frontier upward in 2011 and 2012. Followers are the chains catching up the new best practice production function by improving their relative efficiency in the following years. The remainders are laggards, which left behind without significant relative efficiency improvement till 2014 compared to its performance in 2010.

Panel B. Mean DEA Efficiency Score

Year	Laggard	Follower	Leader
2010	0.859	0.857	1.000
2011	0.838	0.869	1.000
2012	0.793	0.840	1.000
2013	0.773	0.867	1.000
2014	0.777	0.919	0.999

DEA estimations are based on the BCC model. The efficiency scores are estimated by year.

5.2.2 Determinants of Leaders, Followers, and Laggards

To test whether size of chains is associated with the productivity change of the hotel industry, I explore multiple measures of size. In Panel A of Table 14, I report summary statistics of seven size factors. All variables except *N_Brand* are skewed to the right, suggesting that there are big-size chains and companies. On average, each chain has about 70.4 hotel properties[vi]. Also, each company has about 8.9 brands (chains) and 579.5 hotel properties in total, on average.

Panel B of Table 14 show the results of factor analysis to identify three broad constructs of size used in my subsequent analysis. The factor analysis based on the principal component factors method extracted three factors[vii]. I rotated the three factors, resulting in uncorrelated components to ease the interpretations. To be considered significantly important onto each factor, the variables should have a rotated factor loading greater than 0.7 following the common rule of thumb. I characterize the first factor as *CompanySize* because it loads on the six company size characteristics significantly greater than other size characteristics at the chain level and the property level. Similarly, I characterize the second factor as *ChainSize* because it loads on the five chain size characteristics significantly and the third factor as *PropertySize* because it loads on the four property size characteristics significantly. The loading of the second

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[vi] Note that the number of hotel properties per chain might be lower than the actual number since the data used in this study is collected through survey. However, the number of properties included in the collected data is representative of the actual distribution of chain size.

[vii] The three components are kept before rotation since their eigenvalues are 6.641, 3.708, and 3.035, respectively, greater than 1 which is the rule of thumb.

Table 14
Descriptive Statistics of Size Factor for Factor Analysis

Panel A. Summary Statistics of Size Variables

The sample consists of 98 chains.

	Mean	Std. Dev.	Q1	Median	Q3
Number of Brands	8.9	5.3	3.0	11.0	14.0
Company_Number of Properties	579.5	645.1	78.0	313.0	1295.0
Company_Available Room (in thousands)	29,051	31,162	2,832	20,417	71,312
Company_Occupied Room (in thousands)	20,824	22,616	1,723	14,036	52,027
Company_Revenue (in millions)	3,868.5	4,165.6	196.4	1,956.3	9,566.8
Company_MarketShare (in percentage)	8.7	9.3	0.4	4.4	21.4
Chain_Number of Properties	70.4	111.0	8.0	19.0	94.0
Chain_Available Room (in thousands)	3,378	5,188	311	1,096	3,562
Chain_Occupied Room (in thousands)	2,390	3,728	219	734	2,611
Chain_Revenue (in millions)	456.3	733.9	31.4	133.2	645.7
Chain_SegmentShare (in percentage)	6.1	10.8	0.6	2.3	7.8
Property_Available Room (in thousands)	59	52	25	42	73
Property_Occupied Room (in thousands)	42	36	17	27	54
Property_Revenue (in millions)	10.9	13.7	1.6	4.3	15.1
Property_Labor Cost (in millions)	4.0	5.3	0.4	1.6	6.3

Panel B. Rotated Factor Loadings from Factor Analysis

Bold values represent rotated factor loadings with an absolute value greater than 0.7.

	Factor1 Company Size	**Factor2 Chain Size**	**Factor3 Property Size**
Company_Occupied Room	**0.977**	0.175	0.056
Company_Available Room	**0.976**	0.177	0.053
Company_Revenue	**0.970**	0.145	0.121
Company_MarketShare	**0.970**	0.145	0.121
Company_Number of Properties	**0.941**	0.201	-0.031
Number of Brands	**0.820**	-0.026	-0.081
Chain_Available Room	0.221	**0.950**	0.100
Chain_Occupied Room	0.233	**0.945**	0.108
Chain_Number of Properties	0.191	**0.880**	-0.252
Chain_SegmentShare	-0.013	**0.829**	-0.065
Chain_Revenue	0.203	**0.756**	0.390
Property_Occupied Room	0.079	0.095	**0.954**
Property_Revenue	0.067	-0.016	**0.953**
Property_Labor Cost	0.017	-0.037	**0.944**
Property_Available Room	0.054	0.081	**0.928**

factor (*ChainSize*) on *Chain_Available Room* is 0.950, which is the highest among the five size variables at the chain level. And the loading of the second factor (*ChainSize*) on *Chain_Revenue* is 0.756, which is the lowest among the five size variables at the chain level. While I included the size variables at the chain level as well as the company level and the property level in the factor analysis, I find that the results of the factor analysis support that only the five variables I expected to be related to the latent measure of chain size are strongly correlated with the second factor (*ChainSize*).

In Table 15, I report the results of the second stage regression using ordered logit model to examine the impacts of size and specialization on three production efficiency groups of the hotel industry: leaders, followers, and laggards. The difference between two threshold parameters, *Cut-off 1* and *Cut-off 2*, is significant at the 1% level (chi2(1) = 47.88), supportive of dividing the sample into three ordered categories as leaders, followers, and laggards[viii]. The degree of specialization of hotel chains is measured by *InSepcialization*. I find that specialization is not significantly associated with production efficiency groups of the hotel industry. Thus, I interpret the results as market segment specialization of hotel chains is not a significant factor of the positive productivity change of the hotel industry during 2010 and 2014. For the size factors, the size of hotel chains (*ChainSize*) has significant and positive effects on the production efficiency groups. For a one unit increase in *ChainSize*, the log odds of being leader versus the combined category of follower and laggard will be increased by 0.689. Likewise, for a one unit increase in *ChainSize*, the log odds of being the combined category of leader and follower versus laggard will be increased by 0. 689. More precisely, in the untabulated results, I computed the marginal effects of *ChainSize* to conclude whether an increase in *ChainSize* raises or lower the likelihood of being followers since the probability for the middle category can either increase or decrease by the marginal effect.

[viii] The threshold parameters are nuisance parameters, which are required for the estimation but are not informative about the regression relationship. Thus, their standalone statistical significance and magnitudes are not interpreted in most applications of ordered logit regression model (Greene and Hensher 2010, 123).

Table 15
Results of Ordered Logit Regression of Efficiency Group on Size and Specialization

This table examines the effects of size and specialization of chains on their efficiency changes. Ordered logit regression model is used to estimate for ordinal dependent variable, Efficiency Group. Efficiency Group has three levels: Leaders (3), Followers (2), and Laggards (1). ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A.

	Efficiency Group
lnSpecialization	-0.895
	(0.7219)
CompanySize	0.116
	(0.2793)
ChainSize	0.689***
	(0.2561)
PropertySize	0.108
	(0.3236)
HHI_PropertyType	0.829
	(1.2924)
HHI_LocationType	-0.998
	(1.4753)
FranchisingRate	-0.199
	(0.7913)
Upper Upscale	-0.229
	(0.7017)
Upscale	-1.828**
	(0.8431)
Upper Midscale	-2.096**
	(0.9764)
Midscale	-2.508***
	(0.9553)
Economy	-1.501
	(1.1030)
Cut-off 1	-1.819
	(1.1651)
Cut-off 2	1.712
	(1.1676)
Pseudo R-squared	0.164
N	98

The marginal effects of *ChainSize* are positive and significant for the categories of followers and leaders at the 5 percent level and the 1 percent level, respectively. To be specific, one standard deviation of ChainSize increases the probability of being followers by 8.5 percent (p-value = 0.01) and the probability of being leaders by 4.5 percent (p-value = 0.01) while decreases the probability of being laggards by 13.0 percent (p-value < 0.01). On the other hand, the coefficient for the size of hotel company to which the chain is affiliated (*CompanySize*) and the coefficient for the average size of the chain's properties are statistically insignificant. Also, some individual market segments have significant relationship with the classification of leader, follower, and laggard, but there is no clear pattern, for instance, indicating that a lower tier chain is less likely to be the industry production efficiency leader. For instance, the coefficient of *Economy* is insignificant, indicating that economy chains do not differ with luxury chains in terms of their likelihood of being leaders, followers, and laggards.

The results suggest that the larger the size of the chain holding all other variables constant, the better the industry leadership of the chain, consistent with my hypothesis. Also, company-level size and property-level size do not have significant impacts on the industry leadership, suggesting that there were no additional benefits of scale at the company level or property level in improving production technology or relative efficiency of individual chains. In untabulated analysis, I additionally controlled for the proportion of the affiliated properties classified as each property type among seven categories within a chain (*%PropertyType*) and the proportion of the affiliated properties classified as each location type among seven categories within a chain *%LocationType)*[ix].

The significant positive relation between *ChainSize* and *Efficiency Group* is robust to the inclusion of these variables.

In addition, I examine whether chains' technical efficiency is also influenced by the size or the specialization of chains. In the preliminary analysis of the sample mean comparison reported in Panel B of Table 13, I find the positive relationship between the efficiency scores and the industry leadership. However, note that this is entirely empirically observed, and there is no reason to expect that more efficient chains improve productivity in the subsequent periods. Table 16 shows the results of OLS regression of efficiency scores on chain size and other factors of efficiency gain characteristics summarized by the industry leadership. Efficiency scores of the five years of records that are used to identify leader, follower, and laggard are regressed for the pooled sample, and I used clustered standard errors by chain to test significance of estimated coefficients. Similar to the results of the analysis of ordered logit regression shown in Table 15, *ChainSize* is positive and significant in explaining the efficiency scores. Meanwhile, the estimated coefficient of *InSpecializationt*[x] is insignificant, consistent with the results of

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[ix] The McFadden's pseudo R-squared of this model with the additional control variables increases to 0.225. The pseudo R-squared is based on log-likelihood ratio of the estimated model to the benchmark model and does not measure a proportion of variation explained. Thus, the pseudo R-squared is not analogous to R-squared of OLS regression. Values between 0.2 and 0.4 for the pseudo R-squared represent excellent fit and are equivalent to 0.7 to 0.9 for a linear function (Louviere, Hensher, and Swait 2000, 55).

[x] I also used the alternative variable of specialization, *InSpecialization*, and the findings are robust to the alternative model specification. In addition, the results are robust to including *%PropertyType* and *%LocationType* as the additional control variables.

the analysis of leader, follower, and laggard categories. Among the control variables, *CompanySize* is positive and significant at the 1 percent level. I interpret this result as the efficiency of a chain would be higher if the chain's company is larger, but its efficiency gain is not significantly affected by the size of the company. Operating a larger resource measured by the size could be beneficial to innovate the chain's technology only when the resource is relevant to the chain since each chain has unique brand identity and positioning that cannot be directly applied to other chains of the same company without modifications. The estimated coefficients of *PropertySize, HHI_PropertyType, HHI_LocationType,* and *FranchisingRate* are insignificant in the OLS regression. Unlike in the ordered logit regression of leader, follower, and laggard categories, all the estimated coefficients of market segments are significant in the regression of efficiency scores. Holding other variables constant, luxury chains are more efficient on average than chains of a lower market segment. Overall, the results corroborate the findings of the significant positive relationship between the size of hotel chain and the industry leadership.

Table 16
Results of OLS Regression of Efficiency Scores

This table examines the effects of size and specialization of chains on technical efficiency scores estimated by DEA. Standard errors clustered by company are reported in parentheses. ***, **, * indicates significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed t-tests). All variables are defined in Appendix A.

	Efficiency
InSpecialization	0.057
	(0.0385)
CompanySize	0.060***
	(0.0119)
ChainSize	0.067***
	(0.0107)
PropertySize	0.024
	(0.0179)
HHI_PropertyType	0.074
	(0.0542)
HHI_LocationType	-0.038
	(0.0921)
FranchisingRate	-0.013
	(0.0511)
Upper Upscale	-0.175***
	(0.0524)
Upscale	-0.212***
	(0.0542)
Upper Midscale	-0.126**
	(0.0542)
Midscale	-0.137***
	(0.0521)
Economy	-0.113***
	(0.0332)
Constant	-0.105
	(0.0661)
Adjusted R2	0.482
N	490

CHAPTER 6

CONCLUSION

I conduct two separate studies to investigate the impact of specialization on franchising choice and profitability and the impact of scale on industry leader, follower, and laggard based on productivity changes. Using data from over 5,000 properties of hotel brands operating in the United States, I analyze profitability of hotel properties and productivity changes of hotel chains.

In the first study, I examine whether specialization affects franchising choice and profitability. I measure specialization as the degree of the company's concentration in a single market segment. Empirically I demonstrate that a hotel company is less likely to franchise properties that are within its specialized market. Moreover, I find that the profitability of company-managed properties is higher than franchised properties when they are in the specialized market segment of the company. Conversely, I find that the profitability of franchised properties is higher than company managed properties when a property is out of a company's specialized market segment. Thus, the economics of specialization appears to be an important contributor to the decision to franchise. This study contributes to the managerial accounting literature on organization design by examining the impact of specialization on choice of organizational form.

In the second study, I estimated productivity change, technological shifts and relative efficiency improvements in the hotel industry during the period from 2010 to 2014 using the nonparametric estimation procedures based on DEA. I propose a measure of industry leaders, followers, and laggards based on the estimated two components of productivity changes. There was a significant technical progress in the hotel industry between 2010 and 2012 led by industry leading chains and that followers, more than half of hotel chains, caught up with the technological shift during the next year. I find that a larger chain is more likely to be have led productivity growth of the hotel industry. This study provides an approach to classify technological leader, follower, laggard of an industry in a systematic way. Also, complementing with the first study, it suggests that although specialization improves profitability when managed by hotel company, it may not improve production efficiency.

My dissertation provides implications for future research. First, the research on franchise performance can be benefited by considering the costs of transferring specific knowledge created by specialization in addition to costs of monitoring. There is limited evidence on franchise earnings performance due to data availability of unit operational outcomes to which franchisors often do not have access, and the results of sales revenues comparison between franchised units and company-managed units are mixed (e.g., Kosová, Lafontaine, and Perrigot 2013). My dissertation contributes to the literature by identifying previously omitted factor in the effects of franchising decisions on performance. The mixed findings on the effects of franchising on performance will be better understood by reexamining the question with the measurement of specialization. Also, future research may advance the empirical methodology by addressing the possibility that franchisors choose to manage properties expected to be highly profitable themselves. Changes of franchising choice may be a way to identify the relation between franchising choice and profitability, for instance. Since the empirical setting of the hotel industry used in my dissertation has only few observations that experienced the changes in franchising choices, I do not explore this question in my dissertation. However, it will be interesting to check a possible simultaneous relation between franchising choice and profitability in a different setting where the changes of organizational form are more frequent and flexible. Second, the proposed measure of technological leaders, followers, and laggards can be applied to explore research questions related to industry-specific changes. For example, researchers can examine whether leaders really introduced a new technology first and the technology was adopted popularly later by followers if such information is available. In my dissertation, I could not conduct such tests since the names of the chains were not revealed. Also, while I analyzed the period of technical progress on average, it will be interesting to examine the relation between leaders, follower, and laggards and technical regress.

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APPENDIX

VARIABLE DEFINITION

Variable Name	**Description**
Dependent variable	
TRevPAR	Total revenue per available room-nights; deflated using GDP growth.
OpexPAR	(Departmental expenses + administrative and general expenses + marketing expenses + maintenance expenses + utility expenses + management fees – franchise fees) per available room-nights; deflated using GDP growth.
ProfitPAR	TRevPAR-OpexPAR
Efficiency Group	Three groups of hotel chains ordered by their characteristics of productivity changes
Leaders	Chains that were on the best practice production frontier and had positive technical change between 2010 and 2011 or between 2011 and 2012
Followers	Chains that had positive relative efficiency change between 2012 and 2013 and were under the production frontier in the earlier period.
Laggards	Chains that were under the production period throughout the sample period and did not have positive relative efficiency change between 2012 and 2013.
Test variable	
ChainSize	Size of chain measured by the first component of PCA based on number of properties affiliated to the chain, number of available room nights, number of occupied room nights, sales revenues, and market shares.
CompanySize	Size of company measured by the second component of PCA based on number of brands (chains) and number of properties affiliated to the company

%MktSegment	The proportion of the number of the parent hotel company's properties within the chain's principal market segment
InSpecialization	A binary variable that equals to 1 for the chain in the specialized market segment of the company and 0 otherwise.
OutSpecialization	A binary variable that equals to 1 for properties out of the specialized market segment of the company and 0 otherwise.
Franchised	A binary variable that equals to 1 for franchised properties and to 0 for company-owned properties
Company-managed	A binary variable that equals to 0 for franchised properties and to 1 for company-owned properties
Control variable	
MarketSegment	Indicator variable for the chain's market segment
Luxury	A binary variable that equals to 1 for luxury segment chains and to 0 otherwise (the base category)
Upper Upscale	A binary variable that equals to 1 for upper upscale segment chains and to 0 otherwise
Upscale	A binary variable that equals to 1 for upscale segment chains and to 0 otherwise
Upper Midscale	A binary variable that equals to 1 for upper midscale segment chains and to 0 otherwise
Midscale	A binary variable that equals to 1 for midscale segment chains and to 0 otherwise
Economy	A binary variable that equals to 1 for economy segment chains and to 0 otherwise
HHI_PropertyType	The sum of the squares of the proportions of each property types within the chain.
HHI_LocationType	The sum of the squares of the proportions of each location types within the chain.
NRoom	Number of hotel rooms of the property

DistanceToHQ	Distance in miles between the property and the chain headquarter
Nhotels_ZipChain	Number of same-chain properties in the zip code (properties that are operated by the same chain with which the property is affiliated)
OtherFranchised	Number of franchised properties, except those in the chain, in the property's zip code.
PropertyType	Indicator variable for whether the property is classified as the hotel property type
Limited-Service Hotel	A binary variable that equals to 1 for limited-service hotel and to 0 otherwise (the base category)
Conference Center	A binary variable that equals to 1 for conference center hotel and to 0 otherwise
Convention Hotel	A binary variable that equals to 1 for convention hotel and to 0 otherwise
Extended Stay Hotel	A binary variable that equals to 1 for extended-stay hotel and to 0 otherwise
Full-Service Hotel	A binary variable that equals to 1 for full-service hotel and to 0 otherwise
Resort Hotel	A binary variable that equals to 1 for resort hotel and to 0 otherwise
Suite Hotel	A binary variable that equals to 1 for suite hotel and to 0 otherwise
Location	Indicator variable for whether the property is in the location category
Suburban	A binary variable that equals to 1 for suburban area and to 0 otherwise (the base category)
Airport	A binary variable that equals to 1 for airport area and to 0 otherwise
City Center	A binary variable that equals to 1 for city center area and to 0 otherwise

Highway	A binary variable that equals to 1 for highway area and to 0 otherwise
Resort	A binary variable that equals to 1 for resort area and to 0 otherwise
Rural/Non-Resort	A binary variable that equals to 1 for rural and non-resort area and to 0 otherwise
PerCapitaIncome	Per capita income in the local market of the property
Race	The percentage of white population in the local market of the property
Age	The median age of the population in the local market of the property
Population	The number of inhabitants in the local market of the property
HouseholdSize	The average number of people in households in the local market of the property
MarketRevPAR	Local market room revenue per available room for the market the property operates in.