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The Effect of Chain Size and Customer Type on Company Survival: Evidence from Multi-Unit Restaurants

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Abstract

It is commonly believed that economies of scale in branding, operation, and learning provide large chains? dominance in the retailing industry. Anecdotal and systematic evidence, however, show large retail chains do not necessarily outgrow and outperform small retailers. Our paper reconciles these observations by proposing the notion of discriminant alignment of organizations and the market a retailing establishment situated in. Specifically, we posit that relative to small chains, large chains perform better in markets where customer tastes are similar but perform worse in local (and relatively heterogeneous) markets since they are less able to vary operations across geography. Using a sample of restaurant chains in the San Francisco Bay Area, we find that on the one hand, establishments affiliated with larger chains enjoy longer survival overall and particularly markets frequented by non-local, transient customers. On the other hand, establishments in smaller restaurant chains survive longer in markets where local, repeat customers are the more likely patrons. We also find some evidence that operator?s ability and intra-brand competition matter in an establishment?s survival. We draw theoretical and managerial implications from our analysis.

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It is commonly believed that economies of scale in branding, operation, and learning provide large chains' dominance in the retailing industry. Anecdotal and systematic evidence, however, show large retail chains do not necessarily outgrow and outperform small retailers. Our paper reconciles these observations by proposing the notion of discriminant alignment of organizations and the market a retailing establishment situated in. Specifically, we posit that relative to small chains, large chains perform better in markets where customer tastes are similar but perform worse in local (and relatively heterogeneous) markets since they are less able to vary operations across geography. Using a sample of restaurant chains in the San Francisco Bay Area, we find that on the one hand, establishments affiliated with larger chains enjoy longer survival overall and particularly markets frequented by non-local, transient customers. On the other hand, establishments in smaller restaurant chains survive longer in markets where local, repeat customers are the more likely patrons. We also find some evidence that operator's ability and intra-brand competition matter in an establishment's survival. We draw theoretical and managerial implications from our analysis.

Key words: Competitive Strategy, Retail Strategy, Retail Chains, Restaurants, Location Choice, Repeat Customers, Transient Customers, Survival Analysis.

INTRODUCTION

Both the popular press and researchers in strategy have observed that large chains remain the dominant organizational form among retailers, restaurants, hotels, and gas stations. In particular, studies have shown that large chains demonstrate impressive growth rates both in the United States and other countries (e.g., Bradach 1998; Dant, Weaven, and Baker 2013). The key characteristic of retail chains is their uniform requirement in, or standardization of, operations such as product offering, architectural plan, equipment, operational procedures, store layout, and branding. This standardization in turn seems to create several competitive advantages for the establishments operated under large chain organizations: (1) consistent images and low search cost for consumers; (2) economies of scale and hence lower cost in raising capital, purchasing, production, distribution, and marketing; and (3) enhanced internal knowledge learning and transfer (e.g., Cave and Murphy 1976; Darr, Argote, and Epple 1995; Ingram and Baum 1997; Kaufmann and Eroglu 1999). In line with this line of thinking, some empirical work on retail chains has found a positive relationship between larger size and better performance (e.g., Ingram and Baum 1997; Shane and Foo 1999; Sorensen and Sorensen 2001).

However, even casual observation also gives the impression that many retail chains with few units co-exist with large chains in various markets, and do not necessarily look like weak underdogs. For example, Domino's Pizza, which was founded in 1960, operates one of the largest pizza chains in the world and has 4980 stores in the United States as of 2014. On the other hand, Amici's East Coast Pizza, which only owns thirteen units but competes with Domino's across markets in the San Francisco Bay Area, has survived for almost three decades. Indeed, if one looks at online customer reviews, Amici's always receive higher scores than

Domino's wherever both chains operate.[1] Similarly, a systematic evaluation of chain growth in the U.S. and the U.K. used by Blair and Lafontaine (2005, pp.20-34) also shows that the growth of franchise chains (a major form of chain organizations) does not supersede that of the overall economy in recent decades. Still other studies find that the size of a chain has no statistically significant effect on performance (Azoulay and Shane 2001; Berthelemy 2008).

The observation that large chains may not always dominate smaller ones in all markets suggests that the three benefits of the "scale" factors mentioned above may also generate competitive disadvantages. As such, understanding under what circumstances larger chains underperform smaller ones is an important and under-examined topic. One concern for large chains may be their reduced flexibility in adapting their operations and offerings to local customers (e.g., Brickley and Dark 1987; Brickley 1999; Kaufmann and Eroglu 1999).[2] This would imply that units affiliated with larger chains may perform worse than those affiliated with smaller chains in markets where local customers are the main potential patrons. While the positive effect of size on the performance of chain organizations is noted in prior empirical studies (e.g., Ingram 1996; Shane and Foo 1999; Sorensen and Sorensen 2001), the relative performance of large versus small chains in markets with different types of customers has not been empirically examined.

Using a sample of multi-unit restaurants spanning from 1990-2008 in the San Francisco Bay Area, we analyze the competitive (dis)advantages of individual establishments from restaurant chains of various sizes (Kacker et al. 2014). We define and operationalize the concept

[1] Company data were assessed through company websites (www.dominosbiz.com and www.amicis.com), and online reviews were viewed on Yelp.com, on November 7, 2014.

[2] Another frequently mentioned issue regarding chains is potential horizontal externality or free-riding among establishments. See, for example, Brickley and Dark (1987), Dant and Schul (1992), and Blair and Lafontaine (2005, pp.246-249). Horizontal externality is not our analysis but we control for it in our regressions. See sections on Data and Empirical Method and Results for details.

of a chain organization by its ownership rather than a sharing brand, because ownership ultimately defines the "boundary of the firm" and hence provides direct control and authority over its subsidies (Williamson 1986; Grossman and Hart 1986; Aghion, Bloom, and Reenen 2013).[3] In this paper, we empirically test how the survival of over 1100 establishment is affected by both the size of the restaurant chain it belongs to and the character of proximate customers. On the one hand, similar to most prior work, we find establishments belonging to larger chains are associated with longer survival. On the other hand, we do not find a significant relationship between survival and the likelihood of attracting local (versus non-local) customers. Most important of all, our analysis finds robust evidence that an increase in the size of a restaurant chain increases the survival of a related establishment in markets where customers are more likely to be non-local, transient customers, but decreases the survival of establishments in markets where customers are more likely to be local and repeat patrons.

To isolate the effect of chain size and local market character separate from other possible explanations on survival, we address location, the decision on chain size, and other factors that may also affect survival by controlling for measures on pedestrian traffic, inter-chain and intra-chain competition, population and income in an establishment's neighborhood, operator's ability, and chain's experience of operating branches. In some regressions, we further include dummy variables for location (county), industry (SIC code), and establishment headquarters to control for various fixed effects. We find our negative survival result of larger chains operated in local

[3] Franchising businesses emphasize the concept of a sharing brand. Nevertheless, studies in franchising often distinguish between company-owned and franchised units. A franchisee is a residual claimant whose incentives are very different from employee managers of company-owned establishments (Jensen and Meckling 1976; Brickley and Dark 1987). That leads to important differences in terms of control and authority to direct activities across the two types of organizations (e.g., Bradach 1997; Argote and Darr 2001; Michaels 2002; Kalnins and Mayer 2006). This shows the critical importance of ownership even when consumers only recognize the same brand across different types of units in a franchise system.

markets with repeat customers is robust and statistically significant, across both our estimation methods of semi-parametric and parametric models and subsamples with different survival rates.

We view our study as contributing to the literature on firm performance by emphasizing "discriminating alignment" between organizational governance and transaction characteristics (Williamson 1996, p.46). In our case, we emphasize the "alignment" between the number of establishments under a single ownership and the kind of customers around the neighborhood those establishments are likely to serve, corresponding to the notion of organization-transaction alignment. Specifically, our theoretical perspective and empirical analysis underscore the importance of the interaction effect of – and thus the fit between – organizational size and the nature of the customers on firm performance (such as survival). Moreover, by finding such interaction effect, our study has important managerial implications by establishing a stylized yet nuanced fact about market strategy for increasingly important chain organizations in the retail and service sectors. Specifically, we demonstrate the strategic benefit – in terms of survival – of smaller chains located in markets where local residents are likely to be their repeat patrons.

This paper is organized as follows. In the next section, we summarize the theoretical perspectives and empirical research on chain organizations in retail and franchising businesses and generate our hypotheses. Then we describe our sample of the multi-unit restaurants and the supplementary data generated by geographic information software (GIS) and collected from the U.S. Census Bureau. Afterward, we present our results for our data. We finally conclude.

CHAIN ORGANIZATIONS AND NATURE OF CUSTOMERS IN RETAIL BUSINESS

Scholars have long noted the rise of retail organizations that have many affiliated establishments (e.g., Ingram and Baum 1997, p.69; Bradach 1998, pp.1-5; Basker, Klimek, and Van 2012; Dant,

Weaven, and Baker 2013). Indeed, chains are now a pervasive form of organizing for retail businesses such as hotels, restaurants, and other goods and services and as such are an integral part of consumers' daily lives. The literature on chain organizations is large and has focused on the following areas: (1) the determinants of organizational forms in terms of company versus franchised establishments (e.g., Brickley and Dark 1987; Lafontaine 1992; Lafontaine and Kaufmann 1994; Fladmoe-Lindquist and Jacque 1995; Dant et al. 1996; Michael 1996; Dant and Kaufmann 2003; Lafontaine and Shaw 2005); (2) the effect of the two organizational forms on firm performance, conflicts, or survival (e.g., Dant and Schul 1992; Ingram 1996; Shane 1996; Ingram and Baum 1997; Michael 2000; Sorensen and Sorensen 2001; Kalnins and Mayer 2006; Srinivasan 2006; Michael and Combs 2008; Kosova and Lafontaine 2010; Antia, Zheng, and Frazier 2013); (3) choice of contractual terms and marketing mix (Brickley 1999; Lal 1990; Agrawal and Lal 1995; Mathewson and Winter 1995; Lafontaine and Shaw 1996; Michaels 2002; Shane 2001; Shane, Shankar, and Aravindakshan 2006); (4) resource management and internal knowledge transfer (Darr, Argote, and Epple 1995; Greve 1996; Foster, Haltiwanger, and Krizan 2006; Combs, Ketchen, and Hoover 2004); and lastly (5) the detrimental effect of geographic distance between a subsidiary and its headquarter – as a proxy for the difficulty of monitoring and supervision – on performance and survival (Rubin 1978; Landier, Nair, and Wulf 2009; Kalnins & Lafontaine 2014; see also Ghemawat 2001).

However, our focal analysis on the interaction of organization size and the character of the local context on firm performance, which is lacking in the literature on retail chains. In the following, we will review prior work and generate hypotheses, in sequence, on how chain size, the nature of their likely patrons, and the two factors interact to affect firm performance in terms of survival.

Chain Size

Regarding the role of size, a few studies find a positive correlation between chain size in various sectors and performance – of the chain as a whole or of individual establishments – in terms of system growth or survival (e.g., Ingram 1996; Ingram and Baum 1997; Shane 1996, 1998, 2001; Shane and Foo 1999; Sorensen and Sorensen 2001). These findings, together with the general perception mentioned above, may suggest that large-scale chains are a superior retail format because of their economies of scale in product development, marketing, finance, and operations. Indeed, Brickley and Dark (1991) and Shane (1998, 2001) show that larger chains adopting the right mix of contractual terms reduce agency problems (e.g., free-riding, monitoring cost, holdup) and other operation costs. Ingram (1996), Ingram and Baum (1997), and Kaufmann and Eroglu (1999) emphasize the benefit of resources and economies of scale in branding and operations. Shane and Foo (1999) find that chains of a larger size maintain great cognitive legitimacy (i.e., are more visible, more prestigious, and more resourceful). Moreover, Darr, Argote, and Epple (1995) and Greve (1996) show that the network and communication developed under single ownership enhance knowledge transfer among the units operated under the same ownership. Bradach (1997) and Kaufmann and Eroglu (1999) also find enhanced knowledge transfer and innovation stemming from franchised units and spreading throughout the franchise system.

However, the impression that large chains always dominate retail and service sectors seems to be controversial. Citing data from the U.S. and the U.K., Blair and Lafontaine (2005, pp.20-34) find that growth of franchise chains from 1970s to early 2000s is at most similar to that of the overall economy. As we mentioned in the introduction, casual observations also reveal that small, local retail chains compete across markets with large national chains, and do not necessarily perform worse in terms of survival and quality reviewed by their patrons. This

anecdotal evidence is consistent with Azoulay and Shane (2001) and Berthelemy (2008), who have shown that the size of chains has neither a statistically significant effect on survival nor on the returns of their subsidiaries.

The literature has attributed the main drawback of large chain organizations to two factors: (i) free riding, or horizontal externality, of services, product quality, and advertising efforts among subsidiaries, and (ii) stifling adaptation to heterogeneous local markets. Free riding refers to the phenomenon where the operator of an establishment which maximizes its own profit has the incentive to lower quality and advertising efforts to save cost by taking advantage of the efforts incurred by other affiliated establishments (Brickley and Dark 1987; Bradach 1998; Blair and Lafontaine 2005, Chapters 4 and 9). The more units in a chain there are, the less important the focal unit's costly effort to the whole chain is, and hence the higher the incentive to shirk (Blair and Lafontaine 2005, p.123). As such, large chains often have to use various mechanisms such as hybrid governance, performance clauses, monitoring, and threat of termination to reduce the extent of such behavior (Bergen, Dutta, and Walker 1992; Dant and Schul 1992; Scott and Shane 2001; Blain and Lafontaine 2005, Chapter 5). At the same time, the hidden costs of uniformity and economies of scale in large chains post challenges to adapt operations to heterogeneous micro-markets (Mathewson and Winter 1985; Dnes 1996; Kaufmann and Eroglu 1999). It is true that enhanced operations and innovative ideas can be generated through individual units' efforts. But accepting, standardizing, and implementing these innovations system-wide may create tension and result in unsatisfactory offerings for some markets.[4] Given the ambiguous a priori prediction of the effects of size and the inconclusive

[4] Recent studies have also explicitly looked at determinants of chain size. Shane, Shankar, and Aravindakshan (2006) find smaller entry and maintenance fees (i.e., franchise fees, royalty rates, and upfront investment) help to grow young franchise systems, whereas Macker et al. (2014) find that, in addition to fees, franchisor's adoption of rigorous product development and qualification processes, flexible expansion agreements, and a higher franchising

empirical findings, we summarize the relationship between chain size and survival in the following hypotheses:

Hypothesis 1a. The greater the number of establishments under the same chain, ceteris paribus, the longer an establishment's survival is.

Hypothesis 1b. The greater the number of establishments under the same chain, ceteris paribus, the shorter an establishment's survival is.

Transient and Repeat Customers

The characteristics of the customers to whom an establishment caters can directly affect a subsidiary's performance as well. Regarding patrons who frequent chains, the seminal work by Brickley and Dark (1987) distinguishes two kind of customers. "Transient customers" travel to, and thus only stay temporarily at, a locale so will be unlikely to repeat their patronage to a given establishment, regardless of their experience. As such, an establishment within a chain that mainly caters to transient customers is more likely to free ride on the quality of products and services. In doing so, shirking saves cost for the focal establishment but the harm is shared among other units belonging to the same chain. In other words, an establishment serving transient customers has less incentive to uphold the quality of products and services desired by headquarters. As a result, the owner of the chain has to incur higher monitoring and enforcement costs on these units to overcome such "horizontal externality" to ensure performance.

"Repeat customers," on the other hand, are local residents who are close to a given establishment, which in turn makes them potential repeat patrons. It is well-known that people are constrained by time and space on where they shop; thus an establishment is more likely to attract and serve customers within its immediate neighborhood (McCann 2013, pp.74-85). For

scope all lead to the growth of the number of establishments. But these studies do not look at the effect of size on performance.

example, Iacono, Krizek and El-Geneidy (2008) find that consumers will only walk up to two miles from where they live – or stay – to shop or go to a restaurant. Different from transient customers, both the likelihood of future interactions and favorable purchase experience by local customers facilitate the formation of relational ties, trust, and commitment (Festinger, Schachter, and Back 1950; Morgan and Hunt 1994; Oliver 1999; Liu-Thompkins and Tam 2013). Moreover, invoking the notion of self-enforcing relationships in repeated interactions from classic economics (Telser 1980; Gibbons 1992, pp.82-112), theories suggest that the imposition of the "shadow of the future" from repeat business "internalizes" an establishment's incentives to provide quality products and services that fit the preference of its customers. All of these factors reduce the undesired agency costs implicated for a branch located in a market with repeat patronage. Therefore, we have the following testable hypothesis:

Hypothesis 2. Establishments located in a market that consists of local, repeat customers, ceteris paribus, survive longer than establishments surrounded by non-local, transient customers.

Note that the ceteris paribus condition includes that keeping the size of a chain constant in empirical analysis.

The Interaction Effect of Size and Markets with Different Types of Customers

A discriminant fit between organizational form and the nature of customers in the proximate environment enhances performance and survival of retail chains (e.g., Sorensen and Sorensen 2001; Kalnins and Mayer 2006; Srinivasan 2006; Michael and Combs 2008). Indeed, scholars have long emphasized the importance of the alignment of channel organizations and customers as an integral part of a company's marketing strategy (Kotler and Kelly 2012). The inconclusive observations and empirical findings on the effect of size on survival and performance beg the question whether the size of a retail chain has more nuanced effects. We posit that the notion of

"discriminating alignment" – or the fit – between chain size and the nature of their patrons is the key to identify the competitive (dis)advantages of large versus small chains.

In particular, the requirement of standardization in marketing and operations enables systemic but not necessarily local adaptations (Bradach 1996; Blair and Lafontaine 2005; Dant et al. 2013). Large chains do allow their units to adapt somewhat to local tastes. However, maintaining uniformity system-wide and thus a chain's identity remains the ultimate importance (Bradach 1998); otherwise, the chain risks losing economies of scale as its key competitive advantage. As such, the optimal strategy for a large chain is to have individual establishments target similar customers in its coverage.

Based on this logic, Brickley and Dark (1987) have suggested that targeting transient customers should be the strength of, for instance, large restaurant chains. This is particular reasonable for transient customers such as travelers because the same "cohort" often visit almost identical sites. Indeed, anecdotal evidence from highly-rated travel guidebooks almost always mention and recommend the same set of sites within a particular area to their readers. For instance, in the San Francisco Bay Area, Frommer's, Lonely Planet, and Fodor's recommend identical towns that are worthwhile to visit, except that Frommer's also recommends an additional one (see Table 1). As such, large chains can target a same subset of transient customers over geography to extend their competitive advantage in scale and uniformity.

<INSERT TABLE 1 ABOUT HERE>

On the other hand, consumers self-sort into residential areas where similar others also live, creating neighbors with similar preferences yet, different concentrations of preferences across neighborhoods (Wang, Fry, Cohn, Dockterman 2008). For instance, in the city of San Francisco, ethnicity and hence culinary taste vary tremendously across its 19 zip codes (U.S.

Census 1990), even though the city has only a geographic size of 47 square miles (See Figure 1 for an illustration). Compared to small chains, the requirement for a high degree of uniformity renders larger chains at a competitive disadvantage as they attempt to cater to all these heterogeneous "micro-preferences" across neighborhoods. Taking these arguments together, we have the following hypothesis regarding the interaction effect of chain size and customer types:

Hypothesis 3. In a market that consists of local, repeat customers, (non-local, transient customers, respectively), an establishment affiliated with a company operating fewer (more) units has longer survival.

<INSERT FIGURE 1 ABOUT HERE>

Having established our theory and generated corresponding hypotheses, we go on to describe our data and empirical method in the next section.

DATA & METHOD

To examine how survival is affected by the size of a chain and the type of customers an establishment is likely to serve, we investigate the survival of establishments of restaurant chains located in seven California counties over a period of 18 years. We use the National Establishment Time-Series (NETS) Data (1990-2008) to observe establishments in the seven counties that constitute the two largest metropolitan statistical areas (MSAs) in the San Francisco Bay Area: the San Francisco-Oakland Hayward MSA and San Jose Sunnyvale Santa Clara MSA. This area's diversity in restaurant types, company size, and demographics provide substantial data variations. In addition to the eating-places sectors that our data heavily rely on, a wide variety of industries such as accommodations, tourism, technology firms, financial services, agriculture, arts, and media and entertainment also occupy an important presence in the region.

Studying the survival of restaurants in the Bay Area thus bears similarities to industries and metropolitan areas across the U.S. and other developed nations, making this context potentially generalizable.

The NETS data originate from annual snapshots of establishments from the Dun's Marketing Information files. The data include the D-U-N-S number (a unique identifier for each establishment within a firm), location (city, county, and metropolitan region); founding and dissolution dates; SIC code; establishment size (number of employees), and similar, relevant headquarters data (location, SIC code, size). We use information on eating establishments according to SIC code (ethnic food restaurants, fast food, lunchrooms, family restaurants, pizza places, seafood restaurants, cafes and diners). Our data also include important information about the Paydex score for each establishment, which reflects the promptness of their payments to creditors. This information allows us to proxy for – thus control for – operator's ability. After dropping observations with missing data (such as founding date) or those establishments that have moved, our analysis covers 1139 establishments, belonging to 594 chains.

Dependent Variable. The Survival of an individual restaurant, or the establishment, is the dependent variable of our analysis. Specifically, it is the establishment's time to failure. It is worthwhile to note that we exclude from our data moves or sales, which we see as distinct from the concept of dissolution used in our analysis. There are a total of 214 failures in our sample. See Table 2 for the summary statistics for it and other variables used in our analysis below. See Table 3 for pairwise correlations of all variables used in our analysis.

<INSERT TABLE 2 AND TABLE 3 ABOUT HERE>

We test our hypotheses on over 5070 establishment-year observations. In keeping with standard practice, we code an indicator variable for every year that a firm operates as 0, until the

year of exit, which we code as 1. We estimate the failure rate, $h(t)$ using the instantaneous rate of failure, or the hazard rate. In particular, we specify the failure rate of an establishment as:

$$h_j(t) = \lim_{\Delta t \to 0} [\frac{Pr(t, t+\Delta t|t)}{\Delta t}] \quad (1)$$

where $Pr(t, t + \Delta t|t)$ is the probability of failure in the interval $[t, t + \Delta]$ given that establishment j is still active at time t. We parameterize the conditional hazard rate as:

$$h_j(t) = h_0(t)\exp(\mathbf{x_j}\boldsymbol{\beta_x}) \quad (2)$$

where $h_0(t)$ is the baseline hazard, $\mathbf{x_j}$ is a vector of covariates, and $\boldsymbol{\beta}$ is a vector of coefficients. In (2), we assume proportional hazard, i.e., the effect of a unit increase in a covariate is multiplicative with respect to the hazard or failure rate; thus $h_0(t)$ only depends on time and is factored out in the conditional hazard rate $h_j(t|\mathbf{x_j}, \boldsymbol{\beta_x})$. The lower the hazard rate means the higher the probability of survival (namely "Survival") in a given time interval. The mean Survival in our sample is 10.06 years, with a range of two to 65 years.

We use both parametric and semi-parametric survival models to estimate (2). For the former, we use the more efficient but less flexible, parametric Weibull regressions (Cameron and Trivedi 2005, pp.584-585). Afterward, to check the robustness of our specifications, we use the more flexible yet less efficient, semi-parametric Cox models in which $h_0(t)$ depends only on time. We further test the property of proportional hazard to ensure this assumption in (2) holds in our estimations (Cameron and Trivedi 2005, p.591; Cleves, Gould, and Gutierrez 2010).

Main Explanatory Variables. Chain size is the number of affiliated establishments that report to the same topmost establishment, or their headquarters[5]. In other words, we measure chain size as the number of other establishments within the same chain of restaurants. To wit, this

[5] Similar to establishments, headquarters are tracked using their unique D-U-N-S number. For every establishment, the NETS data includes an annual record of the D-U-N-S number of the headquarters, which is the topmost domestic establishment in the "family tree."

measure equals 1 for a two-unit restaurant chain. The number captures the extent of shared brand since larger magnitudes coincide with greater spread of locations with shared brands and increased brand exposure to consumers.

Hotel concentration. We do not have a direct measure on the number of repeat or transient customers in the market that an establishment operates. Instead we use the number of hotels located in a two-mile radius of each establishment as a proxy for market types (Iacono, Krizek and El-Geneidy 2008). It is reasonable to assume that the more hotels are located within the neighborhood, the more likely the establishment resides in a market with transient customers. In our regressions, we take the inverse of this number as the measure for how likely the establishment faces local, repeat customers.

Other Variables. In addition to the main variables, we use as well as construct several other variables.

Operator's ability. To measure the ability of the establishment owner or manager, we include the Dunn and Bradstreet Paydex Score ("*Operator's ability*"). This 100 point indexing system measures trade experiences reported to Dunn and Bradstreet. A Paydex Score of 80 indicates that a business pays its bills on time. Clearly, operator's ability affects survival and all aspects of an establishment's operations. As such, this is a very important control variable to ensure unbiased estimates that prior studies looking at survival do not include.

Chain Age. The age of a chain reflects the experience, accumulated skill, and business knowledge of an entrepreneur and hence may have impact on its business and performance (e.g., Lafontaine and Shaw 2014).

Inter-chain competition. To measure local market competition from non-affiliated establishments, we calculate an annual Thiessen polygon for every restaurant establishment. Using

the spatial analysis software ArcGIS, we draw the boundaries of the polygon halfway between the focal establishment and each of the proximate establishments, to define an as-the-crow-flies annual measure of the market area or territory of each establishment. Large polygons indicate little, local competition whereas small polygons suggest intense competition. In our calculation of this variable, we use the population – not just our sample[6] – of restaurant establishments (including independents and chains) in NETS data base but exclude all potentially complementary eateries: concessionaires, dessert places, ice cream parlors and yogurt shops. Figure 2 shows an example around the area of Palo Alto downtown and Stanford University. As the figure shows for the year of 2008, the size of the Thiessen polygons are small along the University Avenue where the downtown is and parts of Route 82, which is a major commercial street. These are areas where restaurants are highly concentrated.

<INSERT FIGURE 2 ABOUT HERE>

Intra-chain competition. To control for the effect of free-riding of affiliated establishments in the same chain, we construct the variable by calculating the number of affiliated units located in the same zip code. Again, we use the population of restaurant establishments in the NETS data to calculate this variable.

Pedestrian traffic. To control for the intensity of pedestrian activity and traffic, we aggregate the number of financial and real estate institutions within a 2-mile radius. These institutions are mostly located in central business districts and areas with high commercial activities. One would expect that pedestrian activity increases customer demand to an establishment's business and survival.

[6] Our sample is much smaller than the population in the NETS data because (i) the former only includes establishments in chains and (ii) there are many missing data in important control variables such *Operator's ability*.

We also include two variables on socio-economic demographics: per capita income ("Income") and population ("Population") of the establishment's zip code from the 1990 U.S. Census. The earlier demographic data are pre-determined and hence may help to alleviate any potential endogeneity issues (Kalnins and Lafontaine 2014). Moreover, after the 1990 Census, the U.S. Census Bureau shifted to zip code tabulation areas (which are different than zip codes) for tabulating summary statistics making it almost impossible to integrate later demographic data with our GIS data.

Lastly, in some of our regressions, we control for fixed effects by including dummy variables on county, 6-digit SIC codes, and chain headquarters. County dummies are for the seven San Francisco Bay Area counties covered by our data. Industry codes include one each for the following categories: Eating places (581200), Ethnic Food restaurants (581201), Fast Food restaurants (581203), Cafeterias (581204), Family Restaurants (581205), Pizza restaurants (581206), Seafood Restaurants (581207), Steak and Barbeque Restaurants (581208) and Eating places not elsewhere classified (such as Buffets and Cafés) (581299). Chain headquarters dummies serve an important function to control for company-specific factors such as long-term positioning, branding, and resources and capabilities, which in turn alleviate omitted-variable biases to our estimates.

EMPIRICAL RESULTS

Before turning to our regression analysis, we first show examples of the locations of restaurant establishments and hotels and how they overlap. As examples, Figures 3a and 3b show that, respectively, restaurants and hotels are more densely located in the northeast part of San Francisco's commercial and tourist districts. Many of the restaurants in these areas may face a lot of transient customers. However, if one overlays these two figures, they show that there are some

restaurants located in residential districts in the southwest parts of the city where they are more likely to have local and repeat customers.

<INSERT FIGURE 3a and 3b ABOUT HERE>

To get a sense of restaurant survival, we plot Kaplan-Meier estimates. Figure 4 shows on the vertical axis the proportion of establishments started that are still in operation after a stated number of years in the horizontal axis. The figure shows some steady failure rate in the first twenty years of operations but the rate seems to decrease as establishments survive after that period.

<INSERT FIGURE 4 ABOUT HERE>

Tables 4 and 5 show our regressions results for Weibull and Cox models respectively. In each table, we first regress hazard rate on Chain size, (1/Hotel concentration), and two socio-economic demographic variables, Population and Income, in column 1. Recall that Hotel concentration measures the likelihood of an establishment's having transient customers and thus its inverse measures the likelihood of getting local, repeat customers. Column 3 adds *Operator's* ability, Competition, Intra-chain competition, Chain age, and Pedestrian traffic. In columns 2 and 4, we replicate columns 1 and 3 respectively, but also include fixed effects on seven counties, nine 6-digit SICs, and 594 headquarters. The signs of Chain size and (1/Hotel concentration) provides evidence, of the lack of it, re our Hypotheses 1 and 2. Columns 5 to 8 mirrors columns 1 to 4 but include the interaction term between Chain size and (1/Hotel concentration). The sign of the interaction term tests our main prediction, Hypothesis 3.

<INSERT TABLES 4 AND 5 ABOUT HERE>

On the effects of main variables, columns 1 to 4 in Table 4 show the coefficient of Chain size shows a robust negative sign, although including the various fixed effects in columns 2 and 4 reduces the precision of the estimates and renders them statistically insignificant. The magnitude of the coefficients – and thus their economic significance – nevertheless seems to be large. For instance, the coefficient of -0.44 in column 4 means that the hazard ratio is exp(-0.44), or 0.65; that is, an increase of one establishment in restaurant chains decreases the hazard (failure) rate of that establishment by about 35%. Overall, the negative coefficients of Chain size imply that an establishment in a larger chain correlates with longer survival than one in a smaller one, providing support to Hypothesis 1a. Our result collaborates with many prior empirical studies in which larger chains are associated with better survival and performance (e.g., Ingram 1996; Shane and Foo 1999; Shane 2001; Sorensen and Sorensen 2001). Together, this implies that relative to potential problems of free riding and lack of adaptation, the benefits of economies of scale play a dominant role in an establishment's survival in restaurant chains.

On the other hand, columns 1 to 4 show that the coefficients of (1/Hotel concentration) are highly insignificant and its sign changes when various fixed effects are included. This means that the likelihood of facing repeat customers in an establishment's neighborhood has little correlation with and thus little effect on its survival. As such, we do not find support for Hypothesis 2. A possible explanation is that chains may be able to reduce agency problems such as free riding and adverse customer services by monitoring, incentives, and contractual provisions (Brickley and Dark 1991; Shane 1998, 2001).

On other variables, the two demographic variables, Population and Income, are mostly uncorrelated with survival. Column 3 shows, and as one expects, that *Operator's ability* and Chain age, the proxies for the ability and experience of restaurants, have statistically significant

and negative coefficients. Specifically, the magnitude of *Operator's ability* means that each increase in one point of Paydex score is associated with approximately 2% (= 1 – exp(-0.02)) increase of survival. Similarly, each year of additional experience of the chain increases survival by 4%. Column 3 also shows that more densely located sibling establishments are associated with higher failure rate, consistent with the rationale that more intense intra-brand competition hurts establishment's survival. Specifically, the magnitude of the coefficient (0.35) on Intra-brand competition implies a 43% of failure rate for each additional unit located in the same zip code as the focal one. The coefficients of Inter-chain competition and Pedestrian traffic are both negative but are not significant. Finally, when we introduce fixed effects in column 4, they absorb some of the effects of *Operator's ability*, Chain age, and Intra-brand competition and make the first two statistically insignificant. This makes sense since the former two variables should be highly correlated with headquarter dummies which proxy for chain-specific factors such as human resources practices and long-term positioning.

We now turn to the result of our main prediction, Hypothesis 3. Columns 5 to 8 show a robust, consistent result that the coefficient of interaction term of Chain size and (1/Hotel concentration) is negative. That is, larger chains have a positive correlation with hazard (failure) rate in areas where local, repeat customers are the more likely patrons. In the most comprehensive model in column 8, the estimate is 3.50. This means an increase in one establishment reduces the marginal effect of repeat customers on survival by more than 33 (=exp(3.50)) folds. In sum, the statistically significant results across the four specifications support Hypothesis 3 and show the importance of "discriminant alignment" of chain size and the market to which a chain's establishment serves.

Lastly, inclusion of the interaction term produces qualitatively similar results on other variables and hence does not warrant repeating our discussion.

Robustness Check

Although Weibull regressions as a parametric method are more efficient in their estimates, we conduct additional analysis as a robust check and specification test using the more flexible semi-parameter Cox models (Cleves, et al. 2010). Table 5 shows the results. The main results are qualitative similar to those in Table 4: (i) Chain size is negatively associated with hazard (failure) rate; (ii) (1/Hotel concentration) show little effect; (iii) the interaction term between the two show consistent and robust positive correlations with hazard rate. Therefore, our data support Hypotheses 1a and 3, but not Hypotheses 1b and 2.

The effect of population and income levels is similar the results above: both have insignificant associations with survival. *Operator's ability* correlates with higher survival but Chain age is associated with lower survival when various fixed effects are introduced in columns 4 and 8. Again, high correlations between chain age and some headquarter dummies may give rise to this seemingly unexpected result. At the bottom panel of Table 5, we show the results of the specification test on proportional hazard, which underlies both the Cox and Weibull models Cleves, Gould, and Gutierrez 2010). None of the chi-squared statistics is statistically significant, which shows that the null hypothesis of proportional hazard cannot be rejected.

Establishments may take some time to get familiar with operations and market environment before their performance becomes stabilized. As a robustness check, we try different analysis time, for instance by removing the first five years. We find similar results. We also use log(Chain size) and its interaction term with (1/Hotel concentration) in our Weibull regressions. Again, similar results on the interaction term but the coefficients are significant only at a one-tail test. Finally, we

implement Gamma regressions which show robust results as well for Tables 4 and 5. Tests of Gamma's nested models (Cleves, et al. 2010, pp.278-281) in our data rejects both lognormal and exponential regressions but cannot reject Weibull.[7] All these specification and robustness checks provide us confidence about our two approaches and are available upon request.

Yet given the limitation of data, for instance the lacking of satisfactory instrumental variables for location (with respect to customer type), chain size, and their interaction term, we view our analysis as establishing correlations instead of causality. Nevertheless, by controlling for ability, experience, and chain fixed effects, and the consistent results across specifications, we have alleviated some concerns of endogeneity and find robust correlations among variables re our main Hypothesis 3.

CONCLUSIONS

Despite considerable interest in and empirical studies on the size of retail organizations and its effect on performance and survival, the evidence is inconclusive. The economies of scale in resources and operations provide large chains competitive advantage in markets where consumers have similar tastes. However, uniformity requirement and system-wide standardization can hinder adapting operations to local markets where customer tastes vary across geography. On the other hand, small chains lack economics of scale and have fewer resources but can be more agile to adjust to local environments.

This paper investigates the role of chain size and the nature of the customers and their interactions in the survival of restaurant establishments. Using a sample of over 1100 establishments operated in the San Francisco Bay Area and affiliated by about 600 restaurant chains, we test the main effects of chain size and the nature of customers (that is, repeat versus

[7]

transient) in the neighborhood of an establishment and the interaction effect of the two factors on establishment survival. Our data show that chain size is positively correlated with survival while whether the proximate market is characterized by transient or repeat customers has little effect. Most importance of all, we find strong evidence that establishments belonging to larger chains correlate with shorter survival durations in markets where local, repeat customers are likely patrons.

We base our theoretical argument on the notion of discriminant alignment of organizational form and market environment. Our nuanced finding on the comparative (dis)advantages of being large versus small implies that chain organizations should locate their establishments by creating fit with the environment. Even though establishments in larger chains overall have a longer survival, being judicious about the fit with the type of customers they are likely to serve further enhance survival. At the same time, our analysis illustrates the benefits of small operators by locating in markets where local, repeat customers are likely patrons. We view these results have important strategic values to chain organizations.

We conclude by discussing some limitations of our study. First, our data set in a major urban area. Although our sample exhibits large variations in restaurant types, company size, and demographics and bear similarities to industries and metropolitan areas, we caution our readers to generalize our findings to rural settings and to undeveloped economies. Second, we view our results mostly establish correlations but not causality among survival, chain size, and customer types. Future studies should take advantage natural experiments such as change of government policy, to obtain causality inferences.

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Figure 1: Ethnic composition of all 19 zip codes in San Francisco in 1990

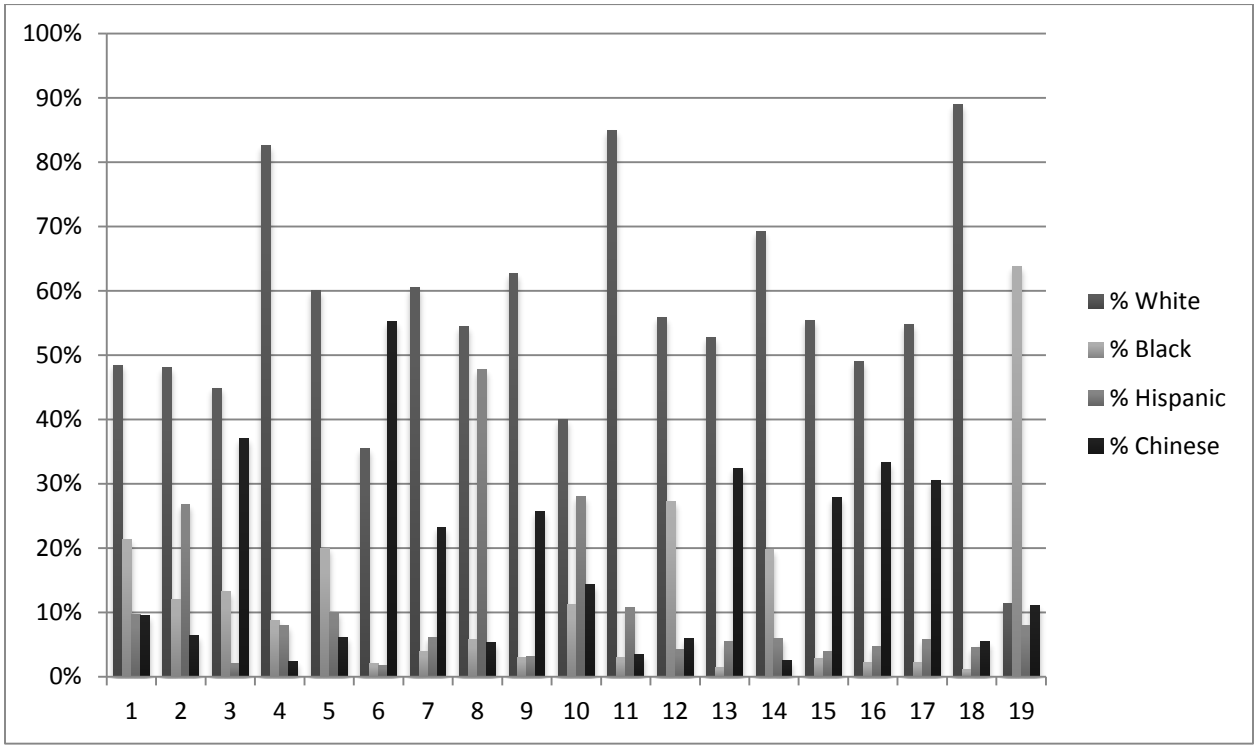

Figure 2: Theissen polygons representing market competition in Palo Alto in 2008

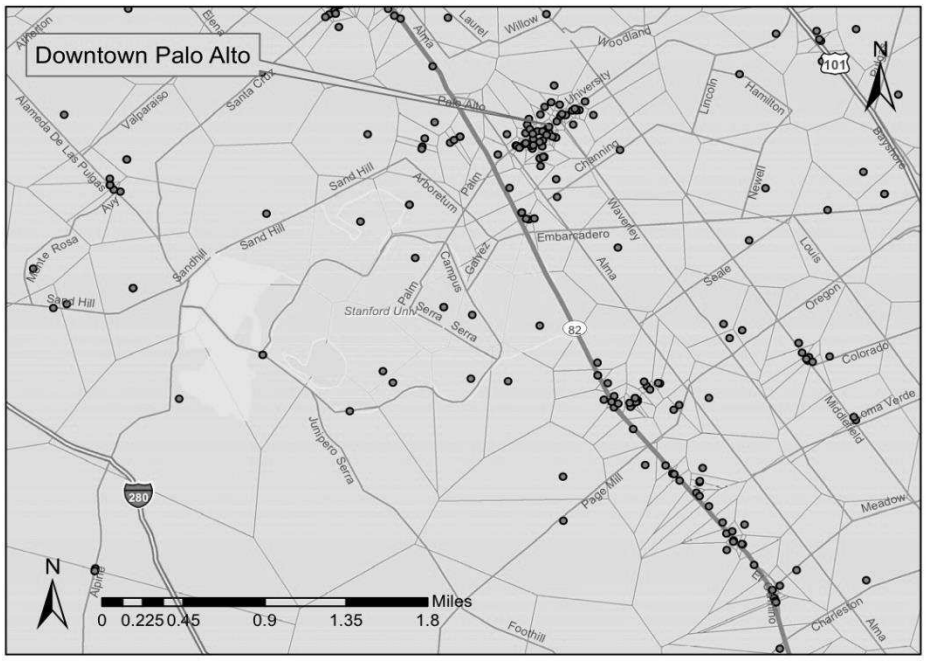

Figure 3a: Restaurants plotted on map of San Francisco in 2008

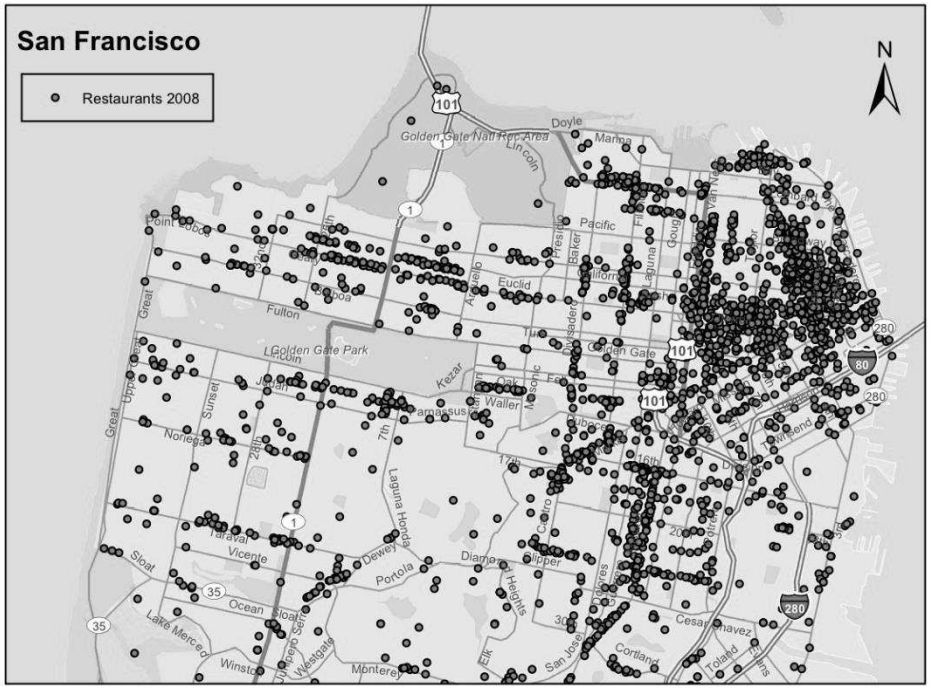

Figure 3b: Hotels plotted on map of San Francisco in 2008

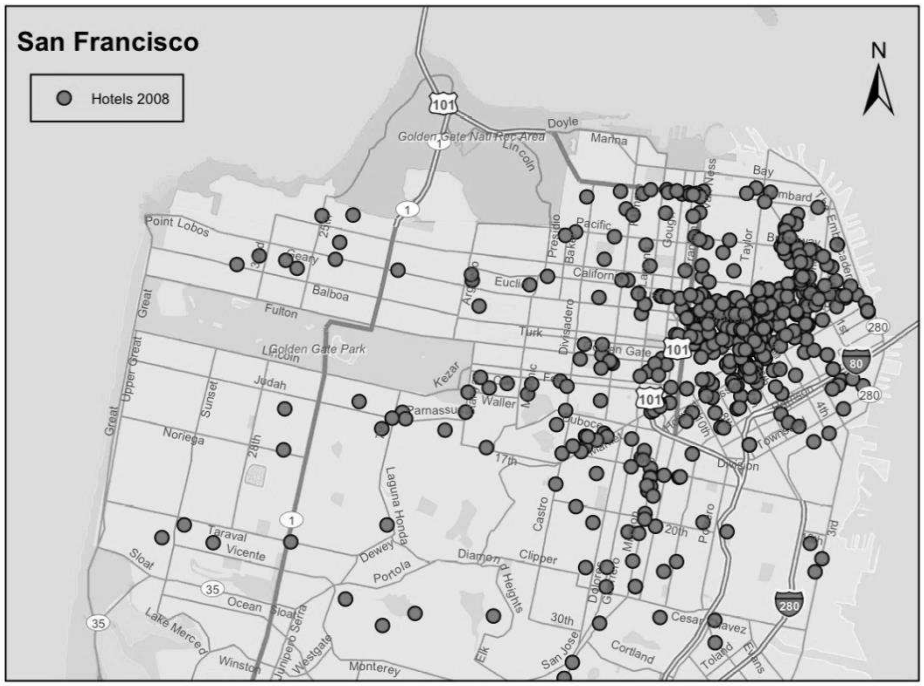

Figure 4: Kaplan-Meier plot of the survival function:
Restaurants 1990-2008, San Francisco Bay Area

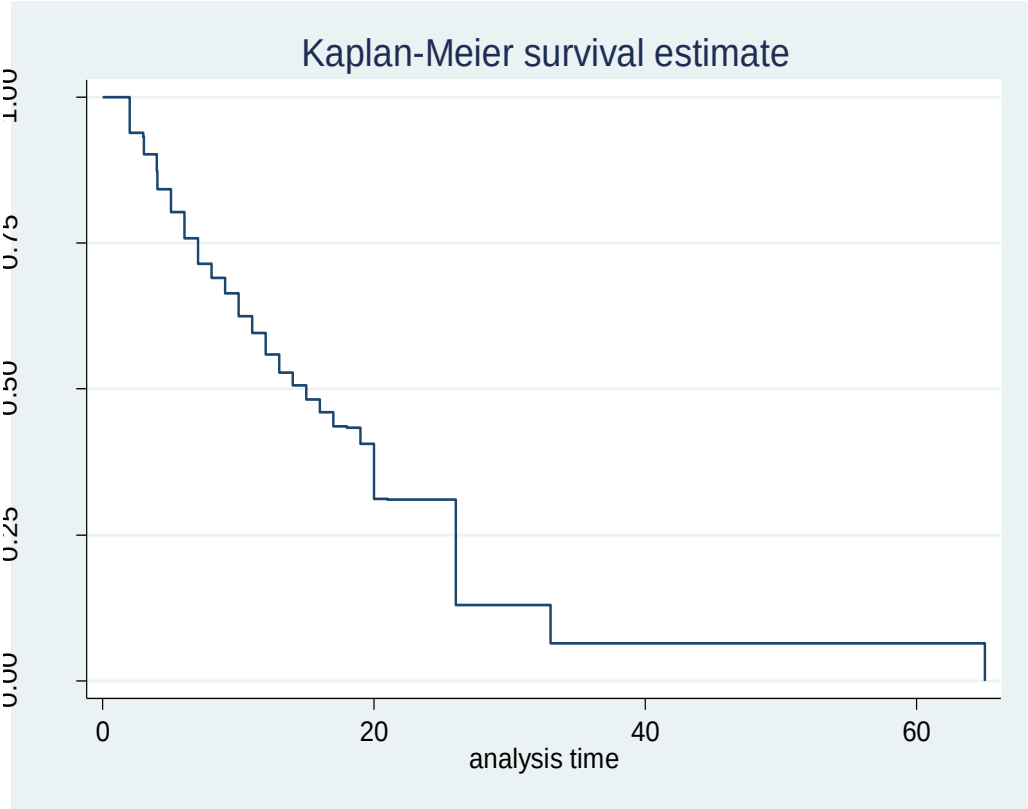

Table 1: Top recommended tourist sites in San Francisco Bay Area

	Frommer's	Lonely Planet	Fodor's
San Francisco	√	√	√
Sausalito/Tiburon	√	√	√
Berkeley/Oakland	√	√	√
Palo Alto/Stanford	√	√	√
San Mateo	√		
San Jose	√	√	√

Table 2: Variable description and summary statistics

	Variable	Description	Obs	Mean	Std. Dev.	Min	Max
1	Time to Failure	1 in year that establishment exits, 0 otherwise	6055	0.04	0.19	0.00	1.00
2	1/Hotel concentration	Annual count of hotels within 2 miles, in 1000s	5163	60.74	116.25	0.00	535.00
3	Chain size	Number of units belonging to the same firm, in 1000s	6055	0.55	1.14	0.00	7.91
4	Operator's ability	Dunn and Bradstreet's minimum annual Paydex score	6055	66.75	11.94	4.00	88.00
5	Inter-chain competition	Thiessen polygon (annual), squared km	5205	0.54	4.98	0.00	217.83
6	Intra-chain competition (in zip co	Annual count of establishments within the same chain in the zipcode,	6055	0.18	0.61	0.00	13.00
7	Chain age	Years since founding of the chain's first establishment	6055	11.33	5.73	1.00	20.00
8	Pedestrian activity	Annual ount of FIRE locations within zip code, in 1000s	5163	0.37	0.48	0.00	2.15
9	Population (zip code)	U.S. Census: Population of zip code	5947	3.22	1.53	0.08	7.61
10	Income per capita (zip code)	U.S. Census:Income per capita based on household income	5947	0.22	0.09	0.08	0.64

Table 3: Pairwise Correlations

		1	2	3	4	5	6	7	8	9	10
1	Exit	1.00									
2	1/Hotel concentration+	-0.01	1.00								
3	Chain size	-0.04*	-0.03*	1.00							
4	Operator's ability	-0.05*	0.01	0.01	1.00						
5	Inter-chain competition	-0.01	0.20*	0.00	0.03*	1.00					
6	Intra-chain competition (in zip co	0.02*	-0.02	0.41*	0.03*	-0.02	1.00				
7	Chain age	-0.03*	-0.05*	0.22*	0.07*	0.00	0.15*	1.00			
8	Pedestrian activity+	0.00	-0.06*	0.04*	0.02	-0.06*	0.14*	0.02	1.00		
9	Population (zip code)	0.00	0.02	0.01	0.01	0.01	-0.01	0.05*	-0.30*	1.00	
10	Income per capita (zip code)	0.02	0.05*	-0.04*	-0.01	0.00	0.02	-0.03*	0.07*	-0.24*	1.00

Note: The symbol + indicates measures taken within a 2 miles radius of the focal establishment. * $p<0.1$.

	TABLE 4: WEIBULL PARAMETRIC SURVIVAL ANALYSIS							
	1	2	3	4	5	6	7	8
Main variables								
Chain size	-0.34***	-0.36	-0.44***	-0.37	-0.36***	-0.41	-0.46***	-0.43
	(0.12)	(0.38)	(0.14)	(0.39)	(0.12)	(0.39)	(0.14)	(0.40)
1/Hotel concentration+	-0.33	0.56	-0.22	0.24	-1.48	-1.62	-1.38	-1.89
	(0.71)	(0.92)	(0.71)	(0.95)	(1.22)	(1.93)	(1.23)	(1.98)
Population (zip code)	0.01	0.04	0.00	0.01	0.02	0.04	0.00	0.02
	(0.05)	(0.08)	(0.05)	(0.09)	(0.05)	(0.08)	(0.05)	(0.09)
Income per capita (zip code)	0.64	1.88	0.34	1.53	0.69	1.95	0.38	1.64
	(0.76)	(1.29)	(0.77)	(1.34)	(0.76)	(1.29)	(0.77)	(1.35)
Chain size * 1/Hotel concentration+					2.39**	3.45*	2.39**	3.50*
					(1.11)	(1.84)	(1.12)	(1.91)
Other variables								
Operator's ability			-0.02***	-0.00			-0.02***	-0.00
			(0.01)	(0.01)			(0.01)	(0.01)
Chain age			-0.04**	0.00			-0.04**	0.00
			(0.02)	(0.04)			(0.02)	(0.04)
Inter-chain competition			-0.23	-0.27			-0.23	-0.27
			(0.15)	(0.20)			(0.15)	(0.21)
Intra-chain competition (in zip code)			0.35***	0.19*			0.36***	0.21*
			(0.08)	(0.11)			(0.08)	(0.11)
Pedestrian activity+			-0.13	-0.61			-0.13	-0.47
			(0.16)	(0.50)			(0.16)	(0.51)
Dummy variables								
County		6		6		6		6
SIC		8		8		8		8
Headquarters		594		594		594		594
Total establishments	1139	1139	1139	1139	1139	1139	1139	1139
Total observations	5,070	5,070	5,070	5,070	5,070	5,070	5,070	5,070
chi2	13.19	620.51	45.08	630.36	17.13	623.75	48.95	633.47

Table 4 shows the results for a suvival analaysis of a sample of California chain restaurants from 1990-2008. The symbol + indicates measures taken within a 2 miles radius of the focal establishment. *** p<0.01, ** p<0.05, * p<0.1.

	TABLE 5: COX SEMI-PARAMETRIC SURVIVAL ANALYSIS							
	1	2	3	4	5	6	7	8
Main variables								
Chain size	-0.34***	-0.47	-0.47***	-0.54	-0.36***	-0.56	-0.49***	-0.64
	(0.12)	(0.38)	(0.14)	(0.41)	(0.12)	(0.39)	(0.14)	(0.42)
1/Hotel concentration+	-0.44	0.35	-0.31	-0.15	-1.44	-1.45	-1.33	-1.95
	(0.71)	(0.90)	(0.71)	(0.93)	(1.15)	(1.57)	(1.16)	(1.70)
Population (zip code)	0.02	0.02	0.01	0.01	0.03	0.03	0.01	0.02
	(0.05)	(0.08)	(0.05)	(0.08)	(0.05)	(0.08)	(0.05)	(0.09)
Income per capita (zip code)	0.79	1.11	0.54	1.29	0.84	1.20	0.59	1.40
	(0.76)	(1.30)	(0.77)	(1.33)	(0.76)	(1.30)	(0.77)	(1.34)
Chain size * 1/Hotel concentration+					2.13**	3.06**	2.16**	3.19**
					(1.02)	(1.49)	(1.03)	(1.62)
Other variables								
Operator's ability			-0.02***	-0.01			-0.02***	-0.01
			(0.01)	(0.01)			(0.01)	(0.01)
Chain age			-0.02	0.09**			-0.02	0.08*
			(0.02)	(0.05)			(0.02)	(0.05)
Inter-chain competition			-0.19	-0.26			-0.19	-0.26
			(0.14)	(0.20)			(0.14)	(0.21)
Intra-chain competition (in zip code)			0.32***	0.20*			0.33***	0.22*
			(0.08)	(0.11)			(0.08)	(0.11)
Pedestrian activity+			-0.16	-0.71			-0.16	-0.52
			(0.16)	(0.51)			(0.16)	(0.53)
Dummy variables								
County		6		6		6		6
SIC		8		8		8		8
Headquarters		594		594		594		594
Total establishments	1139	1139	1139	1139	1139	1139	1139	1139
Total observations	5,070	5,070	5,070	5,070	5,070	5,070	5,070	5,070
chi2	14.03	599.05	39.35	611.16	17.61	602.95	42.95	614.67
Global test for proportional hazard (chi2)	5.53	65.26	7.93	64.88	6.35	65.21	8.93	65.19

Table 5 shows the results for a suvival analysis of a sample of California chain restaurants from 1990-2008. The symbol + indicates measures taken within a 2 miles radius of the focal establishment. *** p<0.01, ** p<0.05, * p<0.1.