THE ROLE OF OWNERSHIP SIZE AND PROXIMATE CUSTOMERS ON SURVIVAL: EVIDENCE FROM MULTI-ESTABLISHMENT RESTAURANTS

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Abstract

Economies of scale foster large multi-establishment firms’ competitiveness. Anecdotal evidence and a few studies, nonetheless, find that more establishments under a single ownership do not necessarily outgrow and outperform small ones. Applying the notion of fit between ownership size and proximate customers, we posit that an establishment affiliated with more units under an owner performs better in markets where its proximate customers are transient rather than local residents. Using a sample of multi-establishment restaurants, our evidence suggests that establishments under large ownership and surrounded by transient customers survive longer. Among the smallest owners, however, establishments survive longer in markets characterized by local residents rather than transient customers. Our results demonstrate the importance of optimizing the external fit between organizational form and environmental resources.

Key words: Chain organizations, Retailing, Governance, Franchise, Survival Analysis.
INTRODUCTION

The success and dominance of large multi-establishment businesses in many sectors has sparked considerable interest among scholars and the popular press. In particular, studies attribute the competitive advantages of this organizational form to uniformity and standardization for the establishments operated under the owner: (1) lower cost in raising capital, purchasing, production, distribution, and marketing; (2) enhanced internal knowledge transfer and learning; and (3) uniform identity and lower search cost for consumers (e.g., Caves and Murphy, 1976; Ingram and Baum, 1997; Kaufmann and Eroglu, 1999; Foster, Haltiwanger, and Krizan, 2006).

Indeed, theory suggests that ownership offers direct control on assets and other resources through fiat and hierarchy (Williamson, 1979; Grossman and Hart, 1986) and may foster economies of scale. Consistent with these observations, empirical work on multi-establishment businesses has found a positive association between “ownership size” – that is, the number of units under a single ownership – and better performance (e.g., Darr, Argote, and Epple, 1995; Ingram and Baum, 1997; Baum, 1999).

In spite of this, casual observation gives the impression that small multi-unit businesses can co-exist with large ones in some markets, and thrive while doing so. For example, Zachary’s Chicago Pizza, which only owns a total of four units in the San Francisco Bay Area but competes against large casual restaurants there, has survived for over three decades. Indeed, there are some explanations for the resilience of small multi-unit firms in the face of competition from larger firms. Scholarly work has noted that large multi-establishment businesses may exhibit competitive disadvantages under certain circumstances. For instance, larger businesses confront reduced flexibility in adapting their operations and offerings to local, idiosyncratic customers.
(e.g., Brickley and Dark, 1987; Ingram and Baum, 1997; Kaufmann and Eroglu, 1999). This implies that establishments under larger ownership (as measured by number of subordinate establishments) may not perform as well in markets where local residents are the probable customers as in markets replete with transient customers (i.e., tourists and business travelers).

While some empirical studies find the positive effect of ownership size – merely as a control variable – on performance (e.g., Darr, Argote, and Epple, 1995; Ingram and Baum, 1997; Baum, 1999), the relative performance of large versus small ownership of multi-establishment organizations remains unclear.

Our paper revisits the issue of firm size, specifically ownership size, to fill this void. Using a sample of multi-establishment restaurants spanning from 1990-2008 in the San Francisco Bay Area, we analyze the competitive (dis)advantages of individual establishments belonging to multi-unit restaurants (Kacker et al., 2014). Our paper empirically tests how the survival of individual establishments is affected by both ownership size and the nature of customers on whom the establishments likely draw – in terms of transient or local customers (Brickley and Dark, 1987). We posit that the more establishments an owner operates, the greater the economies of scale but less flexibility for firm-wide adaptations to idiosyncratic and heterogeneous customer environments (Bradach, 1997, 1998). Therefore, we emphasize the importance for all multi-establishment companies to find the optimal fit between organization size and environmental resources.

Similar to most work (e.g., Ingram and Baum, 1997; Shane, 1998), our analysis suggests that larger ownership size is more likely to extend an establishment’s survival. We also find some evidence that an establishment’s survival correlates with the likelihood of catering to local

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1 Potential horizontal negative externalities (such as free-riding) or positive externalities such as brand spillover among establishments often pose additional issues for multi-establishment businesses. See, for example, Brickley and Dark (1987), Dant and Schul (1992), Blair and Lafontaine (2005, pp.246-249), and Lu and Wedig (2013).
rather than transient customers. This supports the idea that local customers are likely to form relational ties with businesses in their communities, which facilitates self-enforcing performance (e.g., Telser, 1980; Morgan and Hunt, 1994; Oliver, 1999). More importantly, consistent with the logic of economies to scale, our analyses show that an increase in the size of restaurant ownership extends its establishments’ survival in markets where customers are more likely to be transient, but *hampers* their survival in heterogeneous markets where customers are more likely to be local patrons. In other words, we find a positive interaction effect on establishment-level survival between ownership size and the likelihood of serving transient customers. Moreover, we discover that, consistent with being more adaptive to idiosyncratic tastes, establishments of very small firms are associated with longer survival in markets where local customers are the more likely patrons.

Our study contributes to the literature on multi-establishment businesses by emphasizing the notion of fit between organizational strategies of place and space and the external environment (Thompson, 1967; Porter, 1980; Siggelkow, 2001; Sorenson and Baum, 2003). We highlight the alignment between the extent of establishments under a single ownership and the kind of likely customers proximate to those establishments. This perspective helps us to delineate the effect of business size on performance. Our measure of external environment is the likelihood of attracting transient or local customers. Unlike previous studies, this measure reflects proximate resources based on spatial propinquity rather than industrial or institutional arrangements (Eisenhardt and Schoonhoven, 1990; Audia, Freeman, and Reynolds, 2006; Marquis and Lounsbury, 2007; Whittington, Owen-Smith, and Powell, 2009; Almondoz, 2012), or embeddedness (e.g., Dahl and Sorenson, 2012). This approach complements previous work, by mirroring the degree of “localness” in the environment. Our results also have clear managerial
implications by establishing a stylized yet nuanced fact for the strategy of multi-establishment businesses, which are significant players in the retail and service sectors.

MULTI-ESTABLISHMENT BUSINESSES AND THEIR PROXIMATE CUSTOMERS

Effect of size

A few studies find a positive correlation between firm size and various measures of performance, where firm size is measured in terms of either ownership (e.g., Greve, 1996; Ingram and Baum, 1997; Sorenson and Sørensen, 2001; Foster et al., 2006) or franchise system (e.g., Ingram, 1996; Shane, 1996, 1998, 2001; Shane and Foo, 1999; Combs and Ketchen, 2003). These findings suggest that large multi-establishment businesses are a superior retail format, probably due to their economies of scale in branding, product development, finance, and operations. Examples of studies on ownership size include Darr, Argote, and Epple (1995) who show that the network and communication developed under single ownership improves knowledge transfer among its internal units. Similarly, Greve (1996) finds that the more radio stations an owner operates, the better the firm transfers knowledge and adopts communication technologies. Foster et al. (2006) also discover that larger multi-unit firms have higher technology adoption and productivity rates.

In terms of other performance measures, Ingram and Baum (1997) show that larger ownership size enhances survival among Manhattan hotels while Sorenson and and Sørensen (2001) link more company-owned units to larger franchise-system revenue.

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2 The extensive literature on multi-establishment businesses has also focused on, among others, the following issues: (1) the determinants of ownership 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; Bercovitz, 2002; Dant and Kaufmann, 2003; Lafontaine and Shaw, 2005); (2) the effect of the two ownership forms on firm performance, conflicts, or survival (e.g., Dant and Schul, 1992; Ingram, 1996; Shane, 1996; Ingram and Baum, 1997; Michael, 2002; Sorenson and Sørensen, 2001; Kalnins and Mayer, 2004; Srinivasan, 2006; Michael and Combs, 2008; Kosova and Lafontaine, 2010; Antia, Zheng, and Frazier, 2013); (3) the choice of contractual terms and marketing mix (Brickley, 1999; Agrawal and Lal, 1995; Mathewson and Winter, 1985; Michaels, 2002; Shane, 2001; Lafontaine and Oxley, 2004; Shane, Shankar, and Aravindakshan, 2006); and (4) the management of resources and the internal transfer of knowledge (Darr, Argote, and Epple, 1995; Greve, 1996; Baum and Ingram, 1998; Foster, Haltiwanger, and Krizan, 2006; Combs, Ketchen, and Hoover, 2004).
Moreover, many authors find large ownership size in retail franchising exhibits various competitive advantages in those chains. Brickley (1999) and Shane (1998, 2001) show that larger franchise systems that adopt the right mix of contractual terms reduce agency problems (i.e., free-riding, monitoring cost, holdup) and other operational 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 larger franchise systems maintain greater cognitive legitimacy (i.e., being more visible, more accepted). Similar to what has been found in single ownership multi-unit businesses, Bradach (1997, 1998) and Kaufmann and Eroglu (1999) also show enhanced knowledge transfer and innovation stemming from franchised units and spreading throughout the franchise system.

However, the evidence that large multi-establishment businesses outperform in all markets is inconclusive. As mentioned in the introduction, casual observation suggests that smaller chains may compete with large ones in the same market, and do not necessarily perform worse in terms of product and service quality, or survival. This anecdotal evidence is consistent with empirical studies by Azoulay and Shane (2001) and Barthélemy (2008), who show that number of establishments operated under franchise systems has neither a statistically significant effect on survival nor on the financial returns of a subsidiary. Recently, Butt and Antia (2016) fail to find an association between the growth in the number of system-wide units and franchisor’s survival. Likewise, citing data from the U.S. and the U.K., Blair and Lafontaine (2005, pp.20-34) reveal that growth of franchise chains from 1970s to early 2000s is at most similar to that of the overall economy.

The literature has attributed two main drawbacks to larger multi-establishment firms: (i) free riding, or horizontal externality, of services, product quality, and advertising efforts among
subsidiaries (e.g., Brickley and Dark, 1987; Michael, 2000), and (ii) stifled adaptation to idiosyncratic, local markets (e.g., Ingram and Baum, 1997). Free riding refers to the phenomenon where one establishment’s operator has the incentive to reduce quality and advertising efforts to save cost and thus take advantage of the efforts borne by other affiliated establishments (Brickley and Dark, 1987; Bradach, 1998; Blair and Lafontaine, 2005). When an establishment shirks, it captures all the cost savings stemming from less effort. The harm, nonetheless, from shirking is shared among all establishments. Consequently when the owner operates more units and, hence, in larger multi-establishment firms, there is a greater incentive for any single unit to shirk. Larger firms often have to use various mechanisms such as hybrid governance, performance clauses, monitoring, and threat of termination to curb the extent of such behavior (Bergen, Dutta, and Walker, 1992; Dant and Schul, 1992; Shane, 2001; Blain and Lafontaine, 2005).

At the same time, the requirement of uniformity in both larger multi-establishment firms and franchise systems poses challenges to adapting operations and marketing to idiosyncratic 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 company-wide may create tension and result in unsatisfactory offerings for some markets.³

In sum, we are agnostic about the effect of ownership size per se on establishment outcomes such as mortality rate. In fact, the inconclusive evidence motivates us to find a more nuanced view of the advantages and disadvantages of large ownership size. Thus, we turn to the

³ Recent studies have also explicitly looked at determinants of franchise-system 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 Kacker 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 scope all contribute to the growth of the number of establishments. But unlike us, these studies do not look at the effect of size on performance.
nature of the environment around an establishment, in particular to the character of the customers that an establishment will likely serve.

**Transient and Local Customers**

The nature of the proximate customers to whom an establishment caters can directly affect performance as well. The seminal work by Brickley and Dark (1987) distinguishes two kinds of customers who frequent multi-establishment retailers and service providers. “Transient customers” such as tourists and some business people travel to, and thus only stay temporarily at, a locale and so will be less likely to repeat their patronage to a given establishment regardless of their experience there. As such, an establishment that mainly caters to transient customers is more likely to free ride on the quality efforts of other establishments under the same ownership. In other words, an establishment serving transient customers has less incentive to uphold the quality of products and services desired by headquarters (Blair and Lafontaine, 2005). As a result, the owner incurs higher monitoring and enforcement costs across all units to overcome these horizontal externalities and to ensure performance.

“Local customers,” on the other hand, live close to a given establishment, which in turn makes them potential repeat patrons. It is well-known that time and distance constrain where people shop; thus increasing the likelihood that an establishment attracts and serves customers from its immediate neighborhood and geography (McCann 2013, pp.74-85). For example, Iacono, Krizek and El-Geneidy (2008) find that consumers will only walk up to two miles from where they are to go to a restaurant or to shop. Different from transient customers, both the likelihood of future interactions and a favorable purchase experience by local residents 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). The self-enforcing
relationships from repeated interactions (Telser, 1980; Gibbons 1992, pp.82-112) likely impose the “shadow of the future” on an establishment’s operator, who in turn, internalizes the incentive to provide products and services that match local customer preferences. All of these factors reduce undesirable agency costs for a branch located in a market with local patronage.

Considering the benefits of these self-reinforcing relationships, we posit that, holding other things constant, to the extent that establishments are likely to have local customers, they may garner more advantages than others with non-local, transient customers and thus exhibit lower mortality rate.

The Interaction of Ownership Size and Customer Types

Scholars have long observed that firms depend on environmental resources (Aldrich, 1979; Pfeffer and Salancik, 1978) and therefore may develop organizational strategies that fit the external environment (e.g., Thompson, 1967; Porter, 1980; Siggelkow, 2001) to improve their survival and performance. Firms with establishments in different geographic locations may contend with different environmental resources and constraints such as the character of customers that that vary from place to place (Sorenson and Baum, 2003).

As discussed above, inconclusive observations on the effect of ownership or system size in terms of number of establishments on survival and performance beg the question: Does firm size have more nuanced effects? We posit that the external fit between ownership size and the nature of their patrons is key to identifying the competitive (dis)advantages of large and small multi-establishment firms alike. In particular, the standardization in marketing and operations required by multi-unit firms enables system-wide adaptations but may have to compromise local adaptations (Bradach, 1998; Blair and Lafontaine, 2005; Dant et al., 2013). Firms with larger ownership size do allow their units to adapt somewhat to local tastes. However, maintaining
uniformity system-wide and thus a chain’s identity remains of ultimate importance (Bradach, 1998); otherwise, the multi-establishment organization risks losing economies of scale in important marketing and operational aspects as its ultimate competitive advantage. As such, an optimal customer strategy for large multi-establishment firm is to have individual units that, in spite of being geographically dispersed, target similar customer preferences. This strategy helps to attract patronage to the same company even though not necessarily to a particular establishment within the firm.

Based on this logic, targeting transient customers should be a strength of, for instance, large restaurant chains. By definition, locations with many transient customers draw them from diverse areas. In many contexts, the taste distribution of transient customers frequenting one location likely mirrors the taste distribution of transient customers drawn to another location. For instance, a wide variety of people make up the cohort of travelers visiting well-known tourist attractions in a given destination. In other words, travelers from across the country tend to frequent the same set of sites. Indeed, highly rated travel guidebooks almost always recommend the same set of places within a particular area. In the case of the San Francisco Bay Area from which our sample was drawn, tourists (regardless of hometown) visit a similar set of sites and cities, for example, Fisherman’s Wharf in San Francisco, Sausalito, UC Berkeley, and Palo Alto. Large multi-establishment restaurants then more easily target the same subset of transient customers across geographic space to take advantage of their in scale and perceived uniformity.

On the other hand, people often self-sort into residential areas where similar others live, creating neighborhoods with similar preferences yet clusters of varied preferences across neighborhoods (e.g., Wang, Fry, Cohn, Dockterman, 2008). For instance, in the six cities of San

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4 The tourist guides Frommer’s, Lonely Planet, and Fodor’s recommend identical towns that are worth visiting (San Francisco, Berkeley, Sausalito, Palo Alto, San Jose) except that Frommer’s recommends one additional (San Mateo).
Mateo (population 85,486; 16 sq. miles), Oakland (population 372,242; 78 sq. miles), Palo Alto (55,900; 24 sq. miles), Sausalito (population 7,152; 2 sq. miles), San Francisco (population 723,959; 47 sq. miles), and San José (782,225; 177 sq. miles) in the San Francisco Bay area, demographic factors that affect shopping and eating habits such as family composition, income, and ethnicity vary tremendously across the zip codes in these cities (U.S. Census 1990). Figure 1 illustrates these types of differences. Given these, compared to small firms, the requirement for a high degree of uniformity would hamper large multi-establishment firms attempting to cater to heterogeneous “micro-preferences” across geography.

<INSERT FIGURE 1>

Taking these arguments together, an establishment affiliated with a firm operating many units may survive longer in a market that consists of non-local, transient customers instead of local customers. In other words, we hypothesize a negative interaction effect between ownership size and catering to transient customers on establishment mortality.

RESEARCH DESIGN

Empirical Setting and Data

To examine the effects of ownership size of multi-establishment businesses and the character of an establishment’s proximate customers on performance, we investigate the survival rate of a sample of restaurant establishments 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, ownership size, and

5 Since we use the 1990 Census data in our econometric analysis, we use the same data in our illustration here. See pp.18-19 for our justifications for using the earlier instead of current census data in our formal analysis.
demographics (e.g., population and income level) provide substantial variation within the data. In addition to the restaurant industry that our analyses rely on, a wide variety of sectors (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 longitudinal 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, the number of affiliated establishments under a common ownership, and similar, relevant headquarters data (location, SIC code). We also use SIC code for each eating establishment (ethnic food restaurants, fast food, lunchrooms, family restaurants, pizza places, seafood restaurants, cafes and diners). Restaurants in the study include Bay Area favorites such as Asqew Grill (in San Francisco) and Pasta Pomodoro (with locations across the region). The data also cover well-known larger chains such as Chipotle, In-N-Out, and Panda Express to name just a few. Full survival models in our analysis cover 2,622 establishments belonging to 1,753 chains.

**Empirical Method and Dependent Variable**

Following standard event history techniques, we divide the data into annual spells for the time between founding and dissolution, thus creating 11,566 establishment-year observations. We code the event, an indicator variable, 0 for every year of operation and 1 for the failure year. Our analysis models the *hazard rate* of an individual restaurant (i.e., the establishment), specifically predicting the establishment’s instantaneous probability of failure, given its survival up to that
moment. It is worthwhile to note that we exclude from our data relocations or change of ownership, which we see as distinct from the concept of dissolution or failure. The sample comprises a total of 1,343 failures.

To estimate the hazard rate of failure, we use both parametric and semi-parametric survival models, i.e., Weibull and Cox regressions respectively (Cameron and Trivedi 2005). We specify the instantaneous failure rate of an establishment as:

$$h_j(t) = \lim_{\Delta t \to 0} \left( \frac{Pr(t, t+\Delta t|t)}{\Delta t} \right) $$

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

$$h_j(t) = h_0(t) \exp(x_j \beta) $$

where $h_0(t)$ is the baseline hazard, $x_j$ is a vector of covariates, and $\beta$ is a vector of coefficients. In (2), we follow the standard practice by assuming proportional hazards, i.e., the effect of a unit increase in a covariate is multiplicative with respect to the baseline hazard or failure rate. In other words, the baseline hazard $h_0(t)$ only depends on time and is factored out in the conditional hazard rate $h_j(t| x_j, \beta)$. The lower the hazard rate, the higher the probability of survival is in a given time interval (namely “Survival”). The mean Survival in our sample is 8.44 years, with a range of two to 47 years. (See Table 1 for summary statistics and Table 2 for pairwise correlations of all variables used in our analysis.) We also validate the property of proportional hazards that underlies both the Cox and Webull models used in (2) (Cameron and Trivedi 2005, p.591; Cleves et al., 2010).

<INSERT TABLE 1 AND TABLE 2 ABOUT HERE>

Since our key variables ownership size and customer type (see below) are longitudinal, we model the probability of exit by using fixed effects logit regression as well. Fixed effects
logit regression eliminates all observed and unobserved non-time varying effects such as establishment capability, managerial ability, organizational form (e.g., a franchised or company-owned unit), chain- and establishment-level resources, brand positioning, and government regulations that may correlate with observed covariates and thus bias our estimations (see Cameron and Trivedi 2005, pp.796-99, for model specifications and derivations). With this third approach, we more rigorously show the relationship among establishment survival, ownership size, and customer types (Cameron and Trivedi 2005, p.715). Nonetheless, given that the use of fixed effects logit regression in survival analysis results in the loss of all right-censored observations and thus a smaller sample size, we view it mostly as a robustness check on our two survival models.

**Main Explanatory Variables**

*Ownership size* is the number of affiliated establishments that report to the same topmost establishment, i.e., their headquarters or owner(s). In other words, we measure ownership size as the number of *other* affiliated establishments with the same owner. To wit, ownership size equals 1 when two establishments operate under the same ownership. Thus larger magnitudes coincide with more locations, and should reflect increased economies of scale in operations, purchasing, learning and/or brand exposure to consumers. These same attributes also likely lead to higher agency costs (e.g., control and coordination) in adapting to local environments. This count variable is highly skewed so we use its natural logarithm. From (2), we interpret the coefficient of the log-transformation of the variable as the elasticity of the hazard rate with respect to *Ownership size* (Wooldridge, 2010). Note that this variable measures the number of establishments under the same ownership, recorded both in years where there is an exit or entry of any of those establishments and

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6 For every establishment, the NETS data includes an annual record of the unique D-U-N-S number of the headquarters, which is the topmost domestic establishment in the “family tree.”
at the end of our data spell (year 2008). Survival models (Weibull and Cox) drop observations whenever our data have a missing value, resulting in 11,566 establishment-year observations. Moreover, some establishments (or, equivalently their corresponding company) have a constant value for ownership size from 1990 to 2008 because there is no entry or exit for the entire company. The fixed-effects logistic regressions drop those observations without across-time variations in ownership size in addition to the censored ones, producing a sample of 3,091 establishment-years.

Number of Hotels. We use the geographic information software ArsGIS to calculate the number of hotels located in a two-mile radius of each establishment. This acts as a proxy for customer types in a market as first proposed by Brickley and Dark’s (1987). In particular, the authors observe that hotels usually serve transient, non-local customers. Naturally, then, a two-mile area around a given establishment with a higher density of hotels coincides with a higher likelihood of attracting transient customers. As such, we use this number to measure the intensity of transient customers in the proximate market in which an establishment operates. Again, we log-transform the variable and hence its coefficient in (2) denotes the elasticity of the hazard rate with respect to Hotels.

Other Variables
In addition to the main explanatory variables, we include several others as controls. Number of Financial institutions measures the density of proximate financial, insurance, and real estate establishments to control for a central business district (CBD)’s customer mix. To control for the intensity of pedestrian activity and traffic, we aggregate the number of all types of financial and real estate institutions within a 2-mile radius of an establishment. These institutions are mostly located in CBDs and areas with high commercial activities. One would expect that pedestrian activity increases customer demand for an establishment’s business and possibly survival. This
variable also reflects the number of commuters and other non-local customers attracted to the CBD for business and work. Therefore, this variable helps to parse out the effect of CBD from the confounding effect of customers types proxyed by the intensity of Hotels. We log-transform the variable to reduce its skewness.

Market area. In a given market area, both transient and local customers may be attracted to restaurants establishments with both large and small ownership size. To measure local-market competition for all types of customers among other, non-affiliated establishments, we calculate a Thiessen polygon for every restaurant establishment in every year of its operation (Ghosh and MaLafferty, 1987; Jones and Simmons, 1993). Using the spatial analysis software ArcGIS, we draw the boundaries of the polygon halfway between the focal establishment and each of the proximate restaurants, to define an as-the-crow-flies annual measure of the market area or territory of each establishment. Large Thiessen 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\(^7\) – of restaurant establishments (including both independent single-establishment restaurants and multi-establishment restaurants) in the NETS database. To isolate local competition only among restaurants, we exclude all potentially complementary eateries: concessionaires, dessert places, ice cream parlors and yogurt shops. Figure 2 shows an example around Stanford University and nearby downtown Palo Alto. As an example, the figure shows that for 2008, the Thiessen polygons are small in downtown (along University Avenue) and on parts of Route 82, which is a major commercial street. Restaurants cluster in these districts compared to other areas shown on the map with larger Thiessen polygons and less restaurant concentration.

\(^7\) Our sample is much smaller than the population of restaurants in the NETS data because ours only includes establishments in chains but not independently run single-establishment restaurants.
Age rank. We sort all establishments in California by ownership (headquarters DUNS number) and date of establishment’s founding and assign a number for each establishment’s position in this sorted list. Larger numbers represent founding later in a firm’s operational history. We are agnostic about the effect of Age rank on survival because, on the one hand, later establishments, may benefit from the accumulated experience, skills, and business knowledge of the owner (Kalnins and Mayer, 2004). If earlier establishments show successful operations in markets with certain kinds of customers, the headquarters may follow suit by placing later ones in similar markets. On the other hand, later establishments may be more prone to failure as they are often located in less optimal areas as the firm expands the number of establishments under its control (Bronnenberg, Dhar, and Dube, 2009; Kalnins and Lafontaine, 2013). Either way, controlling for the rank order of establishments is important.\(^8\)

Intra-chain units. To control for the negative effects of possible free-riding, cannibalization, or encroachment, and the positive effects of brand spillover, knowledge transfer, and close monitoring of proximate and affiliated establishments (e.g., Kalnins and Mayer, 2004; Pancras et al., 2012; Lu and Wedig, 2013; Kim and Jap, 2016), we sum the number of affiliated units located in the same zip code.

In addition, we include two control variables for socio-economic demographics: per capita income (“Income”) and population (“Population”) of the establishment’s zip code from the 1990 U.S. Census. These demographic data precede the timeframe of our analysis, and hence are predetermined helping to alleviate any potential endogeneity issues (Wooldridge, 2010; Kalnins and Lafontaine, 2013). Also, after the 1990 Census, to calculate summary statistics the U.S. Census

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\(^8\) See also Boulding and Christen (2003) for reviews on profit implications of market-entry order of business units across various industries.
Bureau shifted to zip code tabulation areas, ZCTAs, (which are different than zip codes), making it almost impossible to accurately incorporate later demographic data with our analysis over time.

Lastly, in some of our regressions, we enter dummy variables for county, 6-digit SIC codes, and ownership headquarters. County governments regulate restaurants health codes, and we include the dummies 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).

Headquarters dummies serve an important function to control for unobserved headquarter- and owner-specific factors such as long-term strategy, product positioning, branding, operations, and resources and capabilities enacted in a business’s establishments. They also account for organizational form such as proprietorships versus limited corporations and franchised versus company-owned establishments. We find this particularly useful given that our data do not contain information about the latter distinction. Clearly, an owner would consider the presence of transient versus local customers when deciding on an establishment’s location. For instance, Brickley and Dark (1987) find independent franchisees rather than franchisors are more likely located in markets with mostly local customers; the dummy variable controls for that. Moreover, for a franchisee of a national chain, the HQ dummy represent a mixture of both the owner’s capability and discretion in management, as well as, the franchisor’s standardized operations and unified strategy imposed on the franchisee. On the other hand, a company-owned unit under the direct management of the central authority is potentially better positioned to obtain resources and support. In our view, HQ
dummies account for these and other unobserved, ownership-level fixed characteristics and hence isolate the effect of heterogeneous ownership forms from the effect of ownership size.

RESULTS

Before turning to our analyses, we first show examples of the locations of restaurant establishments and hotels and how they overlap. Recall that we use the density of hotels in the two-mile radius of a restaurant establishment to proxy for its likelihood of serving transient versus local customers (Brickley and Dark, 1987). Figures 3(a) and 3(b) illustrate that, restaurants and hotels are more densely located in the northeast part of San Francisco’s commercial and tourist districts (i.e., along Market Street and the Embarcadero). Many of the restaurants in these areas face a lot of transient customers (i.e., tourists and business travelers). Overlaying these two figures would show some restaurants located in residential districts in the southwest parts of the city where they are more likely to garner local customers.

<INSERT FIGURE 3(a) and 3(b) ABOUT HERE>

Results using Weibull and Cox Models

Our analyses first use efficient, parametric Weibull regressions. More flexible, semi-parametric Cox models follow these, where we also test the important assumption of proportional hazard underlying both survival models. Finally, to check for robustness, we use fixed-effects logistic regressions.

Table 3 shows our main results for Weibull models with estimated coefficients (note: not hazard ratios). In model (1), we regress hazard rate on log(Ownership size), log(Local customers), three establishment characteristics – Market area, Intra-chain units, and Age rank – and two socio-economic variables at the zip-code level – Local population and Disposable income. We include County and SIC fixed effects there as well. Model (2) adds the interaction term between log(Ownership size) and log(Local customers), which is our main interest. To control for the effect
of commuters and pedestrian traffic, model (3) includes the log value of the number of Financial institutions. The full model (4) adds headquarters fixed effects to control for unobserved headquarter- and ownership-level fixed effects.

The effects of the first key variable log(Ownership size) are consistent and negative throughout the four models. The magnitude of the coefficients, and thus their economic significance, seems to be large. The negative effect on exit weakened a bit to -0.182 in the full model (4) when HQ dummies are included. This main effect means that a 1% increase in the number of establishments under the same ownership decreases the mortality (hazard) rate of an establishment by 18.2%. The results for ownership size in our regressions corroborate most prior empirical studies on survival and performance (e.g., Ingram and Baum, 1997; Sorenson and Sørensen, 2001). Further, these reconfirm that, on average, the benefits of economies of scale play a more dominant role than potential problems of free riding and lack of local adaptation on a restaurant establishment’s survival.

The coefficients of the second variable log(Hotels), a proxy for the number of transient customers, exhibit large standard errors, rendering the main effect not statistically significant across all four models. A possible explanation for this weaker-than-expected result is that firms with larger ownership size may be able to reduce agency problems such as free riding and adverse customer services by active monitoring, proper incentives, and other contractual provisions (Brickley, 1999; Kaufmann and Lafontaine, 1994; Shane, 1998, 2001). These efforts may make the potential effect on survival enhancement from local, repeat customers less

---

9 Recall that when log(x_i) is used as a covariate, the associated coefficient \( \beta_i \) is simply the elasticity of hazard with respect to \( x_i \) (Wooldridge 2010). To see this, taking log on both sides of (2). Denote \( h \) as the hazard rate. Then log(h) = \( \varepsilon \) log(x_i). Taking the derivative with respect to \( x_i \) obtains \( d\log(h)/d\log(x_i) = \varepsilon \). The left-hand side can be rewritten as \( (dh/h)/(dx_i/x_i) \), which imply the elasticity of hazard rate with respect to \( x_i \). That is, \( \beta_i = \varepsilon \) measures the percentage change in hazard rate when there is a one percentage change in \( x_i \).
pronounced. Nevertheless, in the full model (4), the positive coefficient 0.48 is fairly large so worthy of discussing its economic meaning. The value of the coefficient means a 1% increase in the number of hotels in an establishment’s two-mile radius increases the mortality rate of that establishment by 48%.

We now turn to the result for our key proposition. In Table 3, models (2) through (4) consistently show negative coefficients for the interaction term of log(Ownership size) and log(Hotels). Moreover, the magnitude even increases as we include more covariates in the regressions. The p-values range from 0.09 (model 4) to 0.18 (models 2 and 3), which are statistically significant for one-tail tests at the 10% level. In other words, we find that establishments with greater ownership size are associated with a lower hazard rate in markets where transient customers are the more likely patrons. The magnitude of the coefficients is notably large. For instance, in the full model (4) where we control for headquarter fixed effects, the estimated coefficient is -0.018. This means that an addition (reduction, respectively) of 1% of establishments by an owner reduces the elasticity of mortality with respect to transient (local) customers – proxied by the number of surrounding hotels – on mortality rate by 1.8%. Or equivalently, a 1% increase in the likelihood of patronized by transient (local, respectively) customers reduces the elasticity of mortality of with respect to ownership size by 1.8%. Notice that, relative to model (3), including headquarters’ fixed effects in the full model (4) reduces the main effect of log(Ownership size) but doubles the magnitude of the interaction effect suggesting that controlling for headquarters appears meaningful.

---

10 See below for the positive and statistically significant coefficient estimated in the fixed effects logit regressions.
11 To interpret the economic meaning of the coefficient of the interaction term, notice that \( \log(h) = \beta \log(x_1) \log(x_2) \), where \( h \) is hazard rate, \( x_1 \) and \( x_2 \) are Chain size and Hotels. Taking derivative with respect to \( \log(x_1) \) yields \( \frac{d(\log(h))}{d(\log(x_1))} = \beta \log(x_2) \). This implies \( \frac{d(\varepsilon_{h,x_1})}{dx_2} \) = \( \beta \), where \( \varepsilon_{h,x_1} \) is the elasticity of hazard rate with respect to \( x_1 \) and \( \frac{dx_2}{x_2} \) is the proportional or percentage change of \( x_2 \).
This key result is consistent with our rationale that for an establishment with larger ownership size in a market consisting mainly of transient customers, its economies of scale render it more competitive compared to those with smaller ownership size. Or equivalently, for a given ownership size, a greater likelihood of transient customers further enhances the benefits of economies of scale to establishments’ survival. This result underscores the importance of the alignment of an organization and its proximate resources – in this case the customer environment which a company’s establishments serve.

Turning to control variables, we find that large standard errors produce imprecise estimates for Market Area over all the models. Since Market Area\textsuperscript{12} measures the broad level of competition among both single-establishments and various multi-establishment restaurants and across customer types (transient and local), this covariate helps to parse out market competition and the level of external fit tested in the interaction effect above. As one would expect, the positive coefficients of Intra-firm units show that more densely located sibling establishments are associated with higher failure rate. This is consistent with the idea that more intense intra-brand competition hurts an individual establishment’s survival (Pancras \textit{et al.}, 2012). For example, a coefficient of 0.111 (p < 0.01) in the full model (4) implies that each additional sibling establishment placed in the same zip code of the focal unit shifts its hazard up by 11.1%. Age rank measures the rank order of an establishment’s age in the company. We find that establishments opened later have significant, higher mortality rate. The reason may be that, despite possible owner’s accumulation of experience and knowledge, entrepreneurs add establishments that are eventually in less desirable markets (Kalnins and Lafontaine, 2013). Both factors would lead to the classic diminishing returns in terms of survival duration.

\textsuperscript{12} Recall that we use the spatial analysis software ArcGIS mapping the population of restaurants to calculate the Thiessen polygons that measure the proximate market area of each establishment.
controls for the effect on survival from characteristics of CBDs such as commuters and pedestrian traffic; but its negative estimates, nonetheless, are not statistically significant.

Finally, local population and the level of disposable income have little effect in the first three models on an establishment’s mortality. After including HQ dummies, however, the expected negative coefficient of Local population becomes statistically significant.

The shape parameter, $\chi$, of the hazard function $h(t)$ (bottom of Table 3) is larger than one in all models, and hence, there is evidence of positive duration dependence, conditional on the independent variables (Wooldridge, 2010). Meaning that for a given establishment, the instantaneous mortality rate increases with the length of time in operation. An increasing hazard function aligns with organizational theory’s notions on age-related structural inertia, which can hinder adaptation and, ultimately, survival (e.g. Le Mens, Hannan, and Polos, 2015).

Table 4 describes the flexible, semi-parametric Cox regressions which make no assumption about the baseline hazard, $h_0(t)$, in (2). The results are qualitatively similar to those in Table 3. In terms of the main effects for the two key variables, we continue to find that larger ownership size is associated with longer-lived establishments. In the full model, results again show that establishments in areas with more local residents have a lower mortality rate ($\beta = 0.072$), and that the coefficient is marginally significant with a one-tail test ($p = 0.27$). At the same time, the interaction between the logarithmic values of ownership size and hotels around an establishment has p-values ranging from 0.11 (model 4: $\beta = -0.018$) to 0.13 (model 2: $\beta = -0.09$ and model 3: $\beta = -0.010$) and hence remains statistically significant for one-tailed tests.

The validity of using the Cox and Weibull models to examine hazard rates hinges on their underlying proportional-hazard assumption. We perform specification tests to verify it (Cleves et
The bottom of Table 4 shows that all models maintain extremely small chi-squared statistics for the three main variables and thus we cannot reject the null hypothesis of proportional hazards of these variables. This test result supports using the two survival models.

Robustness Check: Fixed-effects Logit Models and Others

Even though we use several dummy variables in our survival analysis, additional unobserved heterogeneity at establishment-, company-, and market-level may bias our results. To eliminate such unobserved effects, we use fixed-effects logit regressions to check for robustness (Cameron and Trivedi, 2005). Notice that, since these models use the variations in the longitudinal nature of data, we lose a number of observations by omitting those who never exit during the data span (i.e., censored at the year 2009).

In Table 5, we first regress exit (or not) on the two main variables, log(Ownership size) and log(Hotels), and market and intra-firm competition. Then we add both the interaction between log(Ownership size) and log(Hotels) and log(Financial institutions) in model (2). We find ownership size is negatively associated with failure rate in model (1), but its effect is absorbed by its interaction term with log(Hotels) in model (2). More hotels are significantly associated with higher mortality in both models, showing the benefit of being surrounded by local customers. Importantly, the interaction term between log(Ownership size) and log(Hotels) again supports our key proposition. Additionally, failure decreases with greater Market area, while it increases with greater intra-firm competition. Finally, CBDs correlate with higher failure.

An establishment’s performance may take some time to stabilize as the owner gets familiar with operations and the market environment. As a robustness check, we remove the initial three years of operation and find qualitatively similar results. Furthermore, city governments (e.g., the
city of Los Gatos) regulate zoning laws and may have peculiar preferences for independent operators over large chains in their jurisdictions. Using city dummies instead of county dummies, nonetheless, still gives consistent results for the interaction effect. Given these robustness checks we conclude that our two statistical approaches, the Cox and Weibull models, reasonably demonstrate the relationship between the interaction of chain size and customer type on survival.

Finally, while HQ dummies control for and fixed-effect logit models eliminate headquarter- and company-wide fixed effects, some may be concerned that our measure of ownership size may underestimate the effect of having a shared brand that local consumers recognize (Norton, 1988). For instance, one could attribute the stronger survival of a two-unit McDonald’s franchisee not only to being agile but also to its attractiveness to local customers by a national brand. However, this shared-brand effect, if exists and were not taken care of by headquarter dummies or fixed effects, should boost survival for both large and small owners in a franchise system. This would diminish or eliminate the interaction effect between ownership size and customer type. As such, our estimated coefficient of the interaction term could be viewed as a conservative test since its magnitude is biased toward zero.13

A Graphical Illustration
Since both the main and interaction effects of log(Ownership size) and log(Hotels) play some role in establishment mortality, we graphically illustrate their net effect by using the predicted values obtained in Weibull regressions as specified in the full model (4) in Table 3. We find some intriguing and nuanced patterns.

---
13 Given our data limitations, we view our analysis as having established correlations instead of causality. For instance, our data lack plausible instrumental variables that matter for the choice of transient versus local markets but not with survival. Rather than use weak or implausible instrumental variables that may lead to grave erroneous bias (Bound, Jaeger, and Baker, 1995; Conley, Hansen, and Rossi, 2012), we settle for extensive controls.
In Figure 4(a), the grey, long-dash curve denoted by “Median size/Median hotels” shows the hazard rate over time of the establishments belonging to the median ownership size and surrounded by the median number of hotels in our data, where the medians are taken in terms of their respective logarithm values (as used in our regressions) and all control variables held at their means. The medians correspond to an ownership size of about 620 establishments and 12 hotels in the proximity of an establishment. As the graph shows, taking into account both main and interaction effects, the mortality rate of the “Median size/Median hotels” curve increases since inception, as indicated by the larger-than-one estimated parameter $\chi$ of our Weibull regressions (see Table 3).

<INSERT FIGURES 4(a) and 4(b) ABOUT HERE>

Next, we contrast the distinctive failure patterns of establishments belonging to small versus large ownership size and operating in markets with local versus transient customers. Net of main and interaction effects, Figure 4(a) shows the predicted mortality rate defined by two levels of ownership size and two levels of number of hotels. Specifically, “Small size” and “Few hotels” are chosen at their respective 25th percentile (both at their log values), or an ownership size of about 110 establishments, and about 3.3 hotels surrounding a typical establishment. “Large size” and “Many hotels” are chosen at their respective 75th percentile, or an ownership size of about 3,294 establishments, and 23 hotels surrounding an establishment. The four upward sloping curves (on either side of the median curve) represent the two by two combinations.

There are two features worth mentioning. First, both the “Large size/Many hotels” and the “Large size/Few hotels” curves are below the curves representing “Small size/Many hotels” and “Small size/Few hotels.” This means that at the chosen values of size and hotels, the mortality rate of establishments with smaller ownership size exceeds that of establishments with
larger ownership size regardless of the nature of proximate customers. Second, “Small size/Many hotels” has lower mortality than “Small size/Few hotels” and “Large size/Many hotels” has lower mortality than “Large size/Few hotels.” Therefore, at the chosen values, regardless whether it belongs to the large owner or the small owner, an establishment surrounded by many hotels shows lower mortality rate than one surrounded by few hotels. This implies that in spite of the positive main effect of log(Hotels) on time-to-failure, when ownership size is moderate, the sum of its negative main effect and the interaction between ownership size and hotels dominates.

When is it beneficial for a restaurant establishment to be surrounded by few hotels, or many local customers? We present the case in Figure 4(b). We choose ownership size at the 10th percentiles (“Small size”) and hotels in terms of its logarithm value 10th (“Few hotels”) and 90th (“Many hotels”) percentiles, corresponding to 5 establishments and 1.1 and 49 hotels respectively. Again, the two curves representing the “Small size” firm lie above the “Median size/Median hotels” line. However, the relative position of the two “Small size” curves in Figure 4(b) is flipped compared to the analogous curves in Figure 4(a): now establishments located among few hotels and thus lots of local residents exhibit lower failure rate than those with many hotels or lots of transient customers. This indicates that when hotels are few and ownership size is small, the negative interaction effect between ownership size and hotels overwhelms the positive main effect of log(Hotels) on time-to-failure. Upon close inspection, we find that this transition occurs at the 15th percentiles combination. That is, at about ownership size of 10 establishments, “Small size/Few hotels” (i.e., 4 hotels) transitions to a lower mortality rate than “Small size/Many hotels” (i.e., 33 hotels, value at the 85th percentiles of log(Hotels)). This result suggests that, although on average establishments with few siblings have higher failure rates than those with many siblings, very small firms’ failure diminishes by being locally adaptive to fewer
markets rather than taking advantage of the economies of scale derived from wider coverage. Thus, while all establishments may face potentially self-reinforcing relationships from local patrons, only those affiliated with very small firms may exploit those idiosyncratic resources to extend survival. We view this as an important nuanced discovery about chain organizations.

CONCLUSION

Despite considerable interest in and empirical studies on the size of chain organizations and the effect of size on performance and survival, previous evidence is inconclusive. The economies of scale in resources and operations may provide large firms significant competitive advantage. However, their uniformity requirements and system-wide standardization can hinder adapting operations to local markets where customer preferences vary across geography.

We investigate the role of ownership size and the character of customers served on restaurant establishments’ survival. Using a sample of over 2600 establishments operated in the San Francisco Bay Area and affiliated with about 1,750 multi-establishment restaurant firms, we test the main effects of ownership size and the character of customers – that is, local versus transient – surrounding an establishment, and the interaction effect of the two factors on establishment survival. Our analysis suggests that the main effects of ownership size and local customers are positive on establishment survival. Moreover, we find strong evidence that establishments with larger firm size survive longer in markets where transient customers are more likely patrons. Furthermore, among establishments having very few siblings, operating in markets with mostly local customers extends survival more than operating close to more transient customers.

Our analysis rests on the theoretical notions of external fit of organizational form and market environment (Thompson, 1968; Porter, 1996; Sigglekow, 2001). Our nuanced findings on
the comparative (dis)advantages of being large versus small imply that multi-establishment organizations of all sizes should strategically locate their establishments as a means of aligning their firm with environmental resources. Even though establishments run by larger owners overall may have a longer survival, judiciously considering the appropriateness of the firm’s organizational configuration with the environment (e.g., the type of customers they are likely to serve) further enhances survival. At the same time, our analysis illustrates the benefits to very small operators of locating in markets where local customers are likely patrons. We view these results as having important strategic value for chain organizations both large and small.

Our analyses benefit from multi-level data on establishments, headquarters, and local markets, and the limitations point to future research questions. First, in contrast to previous studies on local environment that stress institutional or industrial structure, or embeddedness, our measure of proximate customers reflects the prevalence of residents and thus the degree of “localness” in the environment. Nevertheless, we surmise that our operationalization applies to various ways that markets manifest the character of place. Future studies might explore other aspects of market heterogeneity to examine organizational fit. Second, while we control for a variety of fixed effects and use three different estimation methods, future work should look for data that come from either field experiments or shocks to treat location choice as exogenous. We hope that this study motivates additional research on the intersection between place, strategy and performance.
References


Figure 1: Population demographics in randomly selected zip codes across several San Francisco Bay Area cities

Note: All data from the U.S. Census 1990. Median income is in $1,000. Zip code locations: 94105 and 94115 in the City of San Francisco; 94305 in the City of Palo Alto; 94401 in the City of San Mateo; 94606 and 94607 in the City of Oakland; 94965 in the City of Sausalito; and 95133 and 95112 in the City of San José.

Figure 2: Theissen polygons representing establishment’s market area in Palo Alto in 2008
Figure 3(a): Restaurants plotted on map of San Francisco in 2008

Figure 3(b): Hotels plotted on map of San Francisco in 2008
Figure 4(a): Predicted mortality rates: establishments with ownership size and number of hotels within two miles: 25\textsuperscript{th} percentile vs. 75\textsuperscript{th} percentile

![Graph showing mortality rates for establishments with small size and many hotels vs. large size and few hotels, with different percentiles.](image)

Figure 4(b): Predicted mortality rates: establishments with ownership size at 10\textsuperscript{th} percentile and number of hotels within 2-miles at 10\textsuperscript{th} and 90\textsuperscript{th} percentiles

![Graph showing mortality rates for establishments with small size and many hotels vs. median size and median hotels, with different percentiles.](image)
Table 1: Variable descriptions and summary statistics
(Sample size: 15336 Establishment-Year)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Mean</th>
<th>S.D.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time to failure</strong></td>
<td>Number of year before exiting</td>
<td>8.445</td>
<td>4.935</td>
<td>1.996</td>
<td>46.995</td>
</tr>
<tr>
<td><strong>Ownership size</strong></td>
<td>Number of units reporting to the same headquarters or owner</td>
<td>1995.699</td>
<td>2509.610</td>
<td>1</td>
<td>8126</td>
</tr>
<tr>
<td><strong>Number of Hotels</strong></td>
<td>Number of hotels located within a 2-mile radius</td>
<td>44.371</td>
<td>100.389</td>
<td>0</td>
<td>535</td>
</tr>
<tr>
<td><strong>Market area</strong></td>
<td>Thiessen polygon. in squared miles</td>
<td>1.100</td>
<td>12.230</td>
<td>0.000</td>
<td>681.443</td>
</tr>
<tr>
<td><strong>Intra-firm units</strong></td>
<td>Number of affiliated/sibling establishments located in the same zip</td>
<td>0.547</td>
<td>1.297</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td><strong>Age rank</strong></td>
<td>The rank of founding date of the establishment within the chain (in 1,000s)</td>
<td>0.130</td>
<td>0.238</td>
<td>0.001</td>
<td>1.303</td>
</tr>
<tr>
<td><strong>Financial institutions</strong></td>
<td>Number of financial institutions and real estate agencies located with a 2-mile radius (in 1,000s)</td>
<td>0.296</td>
<td>0.410</td>
<td>0.002</td>
<td>2.160</td>
</tr>
<tr>
<td><strong>Local population</strong></td>
<td>Population located in the zip code (in 10,000s)</td>
<td>3.443</td>
<td>1.560</td>
<td>0.076</td>
<td>7.611</td>
</tr>
<tr>
<td><strong>Income level</strong></td>
<td>Personal disposable income in the zip code (in USD10,000s)</td>
<td>0.211</td>
<td>0.084</td>
<td>0.078</td>
<td>0.641</td>
</tr>
</tbody>
</table>

* We use log values in our regressions.

Table 2: Pairwise Correlations

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 <strong>Survival time</strong></td>
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<tr>
<td>2 <strong>Ownership size</strong></td>
<td>-0.009</td>
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<tr>
<td>3 <strong>Number of hotels</strong></td>
<td></td>
<td>0.031*</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4 <strong>Market area</strong></td>
<td></td>
<td>0.949*</td>
<td>0.019*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 <strong>Intra-chain units</strong></td>
<td></td>
<td>-0.010</td>
<td>-0.019*</td>
<td>-0.043*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 <strong>Age rank</strong></td>
<td></td>
<td>0.349*</td>
<td>0.291*</td>
<td>0.373*</td>
<td>-0.010</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7 <strong>Number of financial institutions</strong></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>8 <strong>Local population</strong></td>
<td></td>
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<tr>
<td>9 <strong>Income level</strong></td>
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* p<0.10.
TABLE 3: Establishment Mortality in Multi-Establishment Restaurants – Weibull Models
Dependent variable: Mortality Rate

<table>
<thead>
<tr>
<th></th>
<th>Model (1)</th>
<th>Model (2)</th>
<th>Model (3)</th>
<th>Model (4)</th>
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<tr>
<td><strong>Main variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log(Ownership size)</td>
<td>-0.405***</td>
<td>-0.384***</td>
<td>-0.384***</td>
<td>-0.182*</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.019)</td>
<td>(0.019)</td>
<td>(0.110)</td>
</tr>
<tr>
<td>log(Hotels)</td>
<td>-0.023</td>
<td>0.000</td>
<td>0.016</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.022)</td>
<td>(0.026)</td>
<td>(0.065)</td>
</tr>
<tr>
<td>log(Ownership size)*log(Hotels)</td>
<td>-0.009§</td>
<td>-0.009§</td>
<td>-0.018§††</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.011)</td>
<td></td>
</tr>
<tr>
<td><strong>Other variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Market area</td>
<td>-0.004</td>
<td>-0.004</td>
<td>-0.005</td>
<td>0.001</td>
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<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
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</tr>
<tr>
<td>Intra-firm units</td>
<td>0.099***</td>
<td>0.113***</td>
<td>0.116***</td>
<td>0.111***</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.037)</td>
<td>(0.037)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>Age rank</td>
<td>0.684***</td>
<td>0.675**</td>
<td>0.685***</td>
<td>2.167***</td>
</tr>
<tr>
<td></td>
<td>(0.265)</td>
<td>(0.266)</td>
<td>(0.265)</td>
<td>(0.316)</td>
</tr>
<tr>
<td>log(Financial institutions)</td>
<td>-0.048</td>
<td>-0.010</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.063)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local population</td>
<td>-0.016</td>
<td>-0.016</td>
<td>-0.019</td>
<td>-0.065**</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Disposable income</td>
<td>-0.266</td>
<td>-0.249</td>
<td>-0.255</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>(0.270)</td>
<td>(0.271)</td>
<td>(0.271)</td>
<td>(0.489)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.653**</td>
<td>-0.713***</td>
<td>-0.527**</td>
<td>-0.650</td>
</tr>
<tr>
<td></td>
<td>(0.224)</td>
<td>(0.226)</td>
<td>(0.266)</td>
<td>(1.675)</td>
</tr>
<tr>
<td><strong>Dummy variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>SIC6</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>HQ</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1753</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>1.219***</td>
<td>1.220***</td>
<td>1.225***</td>
<td>2.052***</td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td>(0.030)</td>
<td>(0.031)</td>
<td>(0.079)</td>
</tr>
<tr>
<td>$\chi^2$ statistic</td>
<td>1.818***</td>
<td>1.819***</td>
<td>1.821***</td>
<td>2.857***</td>
</tr>
<tr>
<td>N</td>
<td>11,566</td>
<td>11,566</td>
<td>11,566</td>
<td>11,566</td>
</tr>
</tbody>
</table>

One-tail test p-value: $^*p < 0.10$; $^†p < 0.05$; $^‡p < 0.01$. Two-tail test p-value: $^*p < 0.10$; $^**p < 0.05$; $^***p < 0.01$.
Estimated coefficients shown in the table. Robust standard errors in parentheses for models (1)-(3); standard errors in parentheses for model (4). $^*'$ The value of the parameter $\chi$ determines the shape of the hazard function. It is increasing when $\chi > 1$, constant when $\chi = 1$, and decreasing when $\chi < 1$. 
TABLE 4: Establishment Mortality in Multi-Establishment Restaurants – Cox Models
Dependent variable: Mortality Rate

<table>
<thead>
<tr>
<th></th>
<th>Model (1)</th>
<th>Model (2)</th>
<th>Model (3)</th>
<th>Model (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log(Ownership size)</td>
<td>-0.378***</td>
<td>-0.353***</td>
<td>-0.353***</td>
<td>-0.201*</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.021)</td>
<td>(0.020)</td>
<td>(0.111)</td>
</tr>
<tr>
<td>log(Hotels)</td>
<td>-0.015</td>
<td>0.012</td>
<td>0.031</td>
<td>0.072</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.031)</td>
<td>(0.027)</td>
<td>(0.066)</td>
</tr>
<tr>
<td>log(Ownership)*log(Hotels)</td>
<td>-0.009§</td>
<td>-0.010‡</td>
<td>-0.018§</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.011)</td>
<td></td>
</tr>
<tr>
<td><strong>Other variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market area</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.004</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Intra-firm units</td>
<td>0.086**</td>
<td>0.103***</td>
<td>0.105***</td>
<td>0.110***</td>
</tr>
<tr>
<td></td>
<td>(0.034)</td>
<td>(0.036)</td>
<td>(0.036)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>Age rank</td>
<td>-0.145</td>
<td>-0.164</td>
<td>-0.153</td>
<td>0.637*</td>
</tr>
<tr>
<td></td>
<td>(0.269)</td>
<td>(0.270)</td>
<td>(0.295)</td>
<td>(0.344)</td>
</tr>
<tr>
<td>log(Financial institutions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dummy variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>SIC6</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>HQ</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1753</td>
</tr>
<tr>
<td>Test of proportional-hazard assumption on main variables - $\chi^2$ statistic:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log(Ownership size)</td>
<td>0.44</td>
<td>0.20</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>log(Hotels)</td>
<td>0.48</td>
<td>0.16</td>
<td>0.14</td>
<td>0.22</td>
</tr>
<tr>
<td>log(Ownership size)* log(Hotels)</td>
<td>0.09</td>
<td>0.05</td>
<td>0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>$\chi^2$ statistic</td>
<td>1,756***</td>
<td>1,759***</td>
<td>1,761***</td>
<td>2,873***</td>
</tr>
<tr>
<td>N</td>
<td>11,566</td>
<td>11,566</td>
<td>11,566</td>
<td>11,566</td>
</tr>
</tbody>
</table>

One-tail test p-value: §p < 0.10; §§p < 0.05; §§§p < 0.01. Two-tail test p-value: *p < 0.10; **p < 0.05; ***p < 0.01. Estimated coefficients shown in the table. Robust standard errors in parentheses for models (1) – (3); standard errors in parentheses for model (4).
TABLE 5: Establishment Failure in Multi-Unit Restaurants: Fixed-Effects Logit Models
Dependent variable: Exit or Not (in operation = 0, exit = 1)

<table>
<thead>
<tr>
<th>Main variables</th>
<th>Model (1)</th>
<th>Model (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(Ownership size)</td>
<td>-0.245**</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td>(0.103)</td>
<td>(0.271)</td>
</tr>
<tr>
<td>log(Hotels)</td>
<td>11.120***</td>
<td>7.053***</td>
</tr>
<tr>
<td></td>
<td>(0.745)</td>
<td>(1.047)</td>
</tr>
<tr>
<td>log(Ownership size)*log(Hotels)</td>
<td>-0.180§§</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.096)</td>
<td></td>
</tr>
<tr>
<td>Other variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market area</td>
<td>-1.194***</td>
<td>-1.244***</td>
</tr>
<tr>
<td></td>
<td>(0.437)</td>
<td>(0.295)</td>
</tr>
<tr>
<td>Intra-firm units</td>
<td>0.433**</td>
<td>0.495</td>
</tr>
<tr>
<td></td>
<td>(0.194)</td>
<td>(0.363)</td>
</tr>
<tr>
<td>log(Financial institutions)</td>
<td>36.294***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.678)</td>
<td></td>
</tr>
<tr>
<td>$\chi^2$ statistic</td>
<td>690***</td>
<td>1,305***</td>
</tr>
<tr>
<td>N</td>
<td>3,091</td>
<td>3,091</td>
</tr>
</tbody>
</table>

One-tail test p-value: $^p < 0.10; ^{p} < 0.05; ^{pp} < 0.01$. Two-tail test p-value: $^p < 0.10; ^{p} < 0.05; ^{pp} < 0.01$. Estimated coefficients shown in the table. Standard errors in parentheses.