Firm Organization and Retail Industry Dynamics

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Abstract

This paper investigates the spatial organization and dynamics of retail markets using establishment level data on entry, exit, and location choice in the retail alcoholic beverage industry. Establishments are classified into two groups based on firm affiliation: chain vs. stand-alone stores. Stand-alone stores are further broken down into two categories according to product lines offered: diversified vs. specialized stores. The organization and dynamics of the various groups differ markedly. The number of chain stores per capita declines significantly with market size, and these stores exhibit lower entry and exit rates in larger markets. This behavior cannot be readily reconciled with the competitive industry theory. In contrast, both the number per capita and the turnover rates of stand-alone stores are invariant to market size, a behavior consistent with that of a competitive industry. These findings suggest a dominant firms-competitive fringe organization as one potential characterization of retail markets.

Key Words: Market Structure, Spatial Competition, Industry Dynamics.

JEL Classification: L13, L22, L81, R3.

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1 Introduction

In many retail markets, the brands of a particular good are typically available from various establishments that represent diverse approaches to business.[1] An establishment can be affiliated with a large firm, or it can be an owner-operated store. In addition, an establishment can be diversified, offering several different products, or specialized, offering only a narrowly defined set of products. Given this diversity among establishments with respect to firm affiliation and specialization, it is natural to inquire how these differences matter for market organization and dynamics. Towards a better understanding of these issues, this paper first lays out the basic facts about the cross-sectional organization of markets: Does the composition of establishments vary systematically across markets with market size, fixed costs, and other market characteristics? Second, entry and exit patterns into local markets are investigated: Do entry and exit patterns differ across establishment types? If so, how are these turnover rates related to each other and do they vary across markets? This paper provides empirical evidence on these issues using establishment level data on entry, exit, and location choice in the retail alcoholic beverage industry. The findings broadly suggest that the organization and dynamics of various establishment categories within a market differ markedly.

The novel database used in this paper provides full coverage of all establishments licensed to sell alcoholic beverages for off-premise consumption in California during the years 1995-1998. The data allows classification of establishments into several groups according to firm affiliation and product line specialization. Figure 1 presents the classification scheme. Based on firm affiliation, establishments are classified into two major groups. "Chain stores" contains all establishments that are part of a national or local store chain. All other establishments are classified in the category "stand-alone", which covers owner operated stores and stores that are owned by a firm that is not a parent of a chain. Stand-alone establishments are further broken down into two categories: "diversified stores" that sell a range of products in addition to alcoholic beverages, and "specialized stores" that primarily engage in alcohol retail. Chains are not further classified based on specialization, because only a very small fraction of them are specialized in alcohol retail. Although there is a growing literature that investigates the emergence of superstores and chains in retailing, relatively little is known about the nature of competition between the different categories as classified here.[2]

[1] Throughout the paper, an establishment refers to a single store, as opposed to a firm which may consist of one or more stores. Also, the words establishment and store will be used interchangeably.

[2] See Bagwell, Ramey, and Spulber (1997), and Holmes (1999) for models that offer explanations for the emergence and growth of superstores in U.S. retailing.

The static organization of establishment types across markets are analyzed based on alternative theories' predictions regarding the change in the number of establishments with market size. In the standard competitive industry theory, if consumers' demand is independent of the market size as in Bresnahan and Reiss (1991), the number of establishments is proportional to market size (in other words, establishments per capita is a constant). This is a consequence of the fact that the price and sales of an establishment are independent of the number of competitors in the market. If strategic behavior is important, as in many oligopolistic competition models, markups are not invariant to the competitors, but rather fall as the number of competitors increase. As a result, an establishment's sales has to expand with market size to cover fixed costs, and larger markets are served by fewer establishments, leading to a decline in the number of establishments per capita with increasing market size.[3]

These predictions may not exactly carry over to more specific models, such as one where an oligopoly of dominant establishments interacts with a competitive fringe. In fact, it is important to understand how the predictions change when such a hybrid model is considered, because such a model may potentially be representative for many retail markets where a small number of large stores interact with a large number of small stores. In a simple vertically differentiated products model, where one product is sold by identical Cournot oligopolists and the other by a perfectly competitive fringe composed of identical, price taking establishments, it is demonstrated that the number of both the oligopoly and the fringe establishments per capita decline with market size. The rates of decline with market size, though, differ across the two segments of the market. As market size increases, the number of oligopolists per capita continues to decline, whereas the number of fringe establishments per capita approaches a constant.

The relevance of these static predictions regarding the number of establishments per capita are investigated using a sample of 218 cities with population larger than 25,000.[4] The findings suggest that, controlling for observables, the number of chain stores per capita declines significantly with market size, whereas the number of stand-alone stores per capita is invariant to market size. Overall, the number of establishments per capita declines with market size, although this decline is less pronounced compared to the case of chains. This behavior is broadly consistent with the large market behavior of the oligopoly-fringe model.

To complement and extend the characterization of the local markets' organization, this paper

[3] See also Campbell and Hopenhayn (1999) for a generic model where this is the case.

[4] While a market is identified to be a city, the shortcomings of doing so is clear. Consumers typically visit a neighboring city for shopping. Nevertheless, the words 'city' and 'market' will be used interchangeably throughout the paper.

also looks at the differences in the patterns of entry and exit across establishment categories and cities. While the full dynamics of the oligopoly-competitive fringe model is well beyond the scope of the paper, the existing theories provide some guidance. Hopenhayn's (1992) competitive industry dynamics model has clear predictions regarding the relation between market characteristics and the turnover.[5] In particular, under fairly general assumptions also satisfied by the competitive fringe in the oligopoly-fringe model, both the entry and the exit rates should be invariant to market size in a stationary equilibrium. The empirical analysis supports this prediction for the dynamic behavior of stand-alone stores, but not for chain stores. Both the entry and exit rates decline with market size for the latter category. In addition, stand-alone stores exhibit relatively high turnover across markets compared to chains. The predictions of Hopenhayn's (1992) model about the impact of other market characteristics (such as fixed costs and wages) on the turnover also seem to broadly hold for stand-alone stores, but not for chains. Nevertheless, the evidence presented on these other predictions is weaker in view of the fact that the variables used to measure market characteristics are at best proxies for their actual counterparts. Future work with more precise measurement is required for a deeper investigation of these predictions. There is also a need for further development of dynamic models, such as Ericson and Pakes (1995), to understand the relation between market characteristics and the dynamic behavior of chains as evidenced in this paper. In particular, models that study the dynamic interaction between dominant firms and a competitive fringe could help us understand the patterns found here.

The analysis here contributes in two main ways to the existing literature on retail markets: First, the heterogeneity among establishments is explicitly recognized. Second, dynamic, as well as static patterns are documented. Both of these dimensions turn out to be important in understanding the functioning of local markets. The results, neverthless, can be reconciled with the previous work. Bresnahan and Reiss (1991) study small town retail and service markets and find that competitive conduct in such markets do not change with entry once the market has two to three establishments. Campbell and Hopenhayn (1999), in contrast, characterize the behavior of broadly defined 2-digit retail industries across large urban markets, and find that, in a majority of the industries, the conduct changes with the addition of entrants even across large markets. The behavior of the stand-alone stores observed here is broadly consistent with Bresnahan and Reiss (1991), in view of the fact that they focus on industries where establishments are relatively homogenous and mostly stand-alone. The pattern for chains and the industry as a whole is consistent with Campbell and Hopenhayn (1999). While this consistency reinforces the interpretation that the chains' behavior

[5]Turnover, as used in this paper, refers to entry and exit together.

is different from that of a competitive industry, it also points to the importance of recognizing heterogeneity: High-level industry aggregation may obscure the interesting patterns exhibited by different segments of the market.

The remainder of the paper is organized as follows. Section 2 discusses the theories to motivate the empirical work. The dataset used is described in Section 3, together with the details on the institutional environment. Section 4 presents the results on the static organization of different establishment types across cities. Dynamic patterns are investigated in Section 5, followed by the conclusion and directions for future work in Section 6.

2 Theories

This section has two objectives: First, static theories of competitive and imperfectly competitive industries are analyzed with special emphasis on how the number of producers change across markets with market characteristics, particularly with market size. Second, existing dynamic theories are investigated to establish a link between market characteristics and turnover.

A competitive industry is characterized by a large number of identical, price taking establishments. If consumers' demand is independent of the market size as in Bresnahan and Reiss (1991), the number of establishments is proportional to market size (in other words, establishments per capita is a constant), and the average establishment size is invariant to market size. These predictions remain valid under establishment heterogeneity and dynamic extensions that incorporate entry and exit, as in Hopenhayn (1992).

When the industry is characterized by some type of imperfect competition, as in Cournot model or Salop's (1979) circle model, these predictions are no longer valid. Common feature of these models is that as the number of competitors increase with market size, markups fall, and an establishment's sales has to increase to cover the fixed costs, assuming that the fixed costs do not change. As each establishment gets larger, one should observe a less than proportional increase in the number of establishments, or equivalently, a decline in the number of establishments per capita.

What happens if a group of dominant establishments and a competitive fringe interact in a market? In particular, do the separate predictions about the pattern of establishments per capita for competitive and imperfectly competitive models carry over to the hybrid model? The fact that many local retail markets are composed of a few large stores and a large number of small stores suggests that answers to these questions might be relevant in understanding the functioning of such markets. The following is a simple model that investigates this possibility.

2.1 Cournot Oligopolists and Competitive Fringe

The model in this section considers explicitly the interaction between Cournot oligopolists and a competitive fringe in a static setting. Consider a city with a continuum of S consumers. Each consumer derives a marginal utility of α from quality. The taste parameter α is uniformly distributed on the interval $[\underline{\alpha}, \overline{\alpha}]$, where $\underline{\alpha} > 0$ and $\overline{\alpha} - \underline{\alpha} = 1$. Assume that each type α is represented in the city. A type α consumer's utility from a product with quality θ and price p is given by

$$u(\theta; \alpha) = \alpha\theta - p$$

This utility function is frequently used in the vertically differentiated products literature.[6]

There are only two different qualities of a product available in the city. The low quality product is available from N_O identical Cournot oligopolists, and its quality level is θ_O (O stands for oligopoly). The high quality product is provided by a competitive fringe of N_F establishments, and its quality level is θ_F (F stands for fringe). To put this specification into context, one may imagine the oligopolists as the superstores selling a standardized version of the good and providing low service, and the competitive fringe as the specialized stores selling customized, brand-name versions of the good and providing high service. Other interpretations are possible. For example, oligopolists might be envisioned as stores located at a shopping center in the middle of the city, and specialized stores as located at the periphery. θ_O and θ_F then correspond to the travel time, and α, this time defined over $[-\overline{\alpha}, -\underline{\alpha}]$, is the marginal utility from reducing the travel time.

The demand for each quality is determined by the consumer type α^* who is indifferent between the two qualities available at prices p_O and p_F

$$\alpha\theta_F - p_F = \alpha\theta_O - p_O$$

Solving for α yields $\alpha^* = (p_F - p_O)/(\theta_F - \theta_O)$.[7] Normalizing $\theta_F - \theta_O = 1$, it is easy to see that the demand functions for both qualities are given by

$$\begin{aligned} D_O(p_O, p_F) &= S(p_F - p_O - \underline{\alpha}) \\ D_F(p_F, p_O) &= S(\overline{\alpha} - p_F + p_O) \end{aligned}$$

Note that these demand functions are linear in prices and multiplicatively separable in market size and an individual's demand.

[6] See, for example, Chapter 7 in Tirole (1988) and the references therein.

[7] Market coverage requires $\underline{\alpha}\theta_O \geq p_O$. It will soon be clear that the requirement is $\theta_O \geq \underline{\alpha}^{-1}(c_O + f_O^{1/2} S^{-1/2})$, where c_O and $f_O^{1/2}$ are constants. Then the market is covered for all $S \geq 1$ if we choose $\theta_O \geq \underline{\alpha}^{-1}(c_O + f_O^{1/2})$. Here, the choice of quality is not explicitly modelled and simply taken as given to ensure market coverage.

The oligopolists and fringe establishments simultaneously choose their output to maximize profits. An oligopolist takes as given the output of other oligopolists and the price of the fringe, and maximizes its profits

$$\max_{q_O} \; q_O(-\frac{Q_O}{S} + p_F - \underline{\alpha} - c_O)$$

where Q_O is the total output of the oligopoly sector and c_O is the marginal cost common to all oligopolists. For the moment assume that $p_F - \underline{\alpha} - c_O > 0$, for the optimal choice of output to be strictly positive. Later on, this will yield a restriction on admissible cost structures of the oligopoly and the fringe.

From the maximization problem, the output for an oligopolist is obtained as $q_O^* = S(p_F - \underline{\alpha} - c_O)/(N_O + 1)$. The maximized profit for an oligopolist is then

$$\pi_O^* = S\left(\frac{p_F - \underline{\alpha} - c_O}{N_O + 1}\right)^2 \tag{1}$$

There is free entry into the oligopoly, which ensures that, in equilibrium, $\pi_O^* = f_O$, where f_O is the fixed cost for an oligopolist. Together with (1), this condition will yield N_O^*, the equilibrium number of oligopolists. Before that, the behavior of the fringe and the price p_F needs to be determined.

A fringe establishment takes p_F as given and solves the following problem

$$\max_{q_F} \; p_F q_F - c_F q_F^2$$

Together with the fixed costs of production, f_F, the cost structure of a fringe establishments is the standard U-shaped one. Under this specification, the optimal output is $q_F^* = p_F/2c_F$, and the maximized profit is $\pi_F^* = p_F^2/4c_F$. As in the oligopoly case, free entry into the fringe requires $\pi_F^* = f_F$. Free entry condition immediately determines the fringe price as $p_F^* = 2(c_F f_F)^{1/2}$. This price is invariant to city size S, and depends only on the cost structure of the fringe. Given this price, the output of a fringe establishment is given by $q_F^* = (f_F/c_F)^{1/2}$, which is also invariant to city size.

The total output of the fringe depends on the output of the oligopoly, and this is the crucial link between the two sectors. Given p_F^*, the equilibrium number of oligopolists can be calculated from the free entry condition as

$$N_O^* = f_O^{-1/2}(2(c_F f_F)^{1/2} - \underline{\alpha} - c_O)S^{1/2} - 1$$

where it is assumed that $2(c_F f_F)^{1/2} - \underline{\alpha} - c_O > 0$, to ensure the nonnegativity of N_O^*. This is also the requirement for an oligopolist's optimal output to be strictly positive as mentioned earlier. It is easy to see that N_O^* is increasing less than proportionally with S. The number of oligopolists per capita is then given by

$$\frac{N_O^*}{S} = f_O^{-1/2}(2(c_F f_F)^{1/2} - \underline{\alpha} - c_O)S^{-1/2} - S^{-1} \tag{2}$$

The equilibrium output of an oligopolist, or equivalently, the average output in the oligopoly, is $q_O^* = f_O^{1/2} S^{1/2}$, which clearly increases in S. Also, note that the price is given by $p_O^* = c_O + f_O^{1/2} S^{-1/2}$, and it declines with S.[8] This contrasts with the fringe price, which is a constant. As the city gets larger, the price of the oligopoly declines because of lower markups due to tougher competition. An implication is that the relative price of the high quality good increases with city size.

The total oligopoly output in equilibrium is

$$Q_O^* = N_O^* q_O^* = S\left[2(c_F f_F)^{1/2} - \underline{\alpha} - c_O - f_O^{1/2} S^{-1/2}\right]$$

which increases in S. From this, the output of the fringe can be obtained as

$$Q_F^* = S - Q_O^* = S\left[\overline{\alpha} + c_O - 2(c_F f_F)^{1/2} + f_O^{1/2} S^{-1/2}\right]$$

where it is assumed that $c_O + \overline{\alpha} - 2(c_F f_F)^{1/2} > 0$, to ensure the nonnegativity of the output for all market sizes. Note that the fringe output also increases in S. Thus, market expansion increases output in both sectors. This market expansion effect is represented by S outside the brackets in both output equations. There is also a substitution effect: as market size increases, both the absolute and the relative price of the low quality good decreases, which causes an increasing proportion of consumers to switch to the low quality good. This effect is represented by the terms in brackets in both output expressions. Therefore, the oligopoly output per capita increases with market size, while the fringe output per capita decreases. Finally, the number of fringe establishments per capita can be obtained from Q_F^* and q_F^* as

$$\frac{N_F^*}{S} = (f_F/c_F)^{-1/2}[\overline{\alpha} + c_O - 2(c_F f_F)^{1/2} + f_O^{1/2} S^{-1/2}] \tag{3}$$

As the model stands, the number of oligopolists per capita is declining for $S > (4/f_O^{-2}(2(c_F f_F)^{1/2} - \underline{\alpha} - c_O)^2)$, and the number of fringe establishments per capita is declining for all $S > 0$. The rates of decline, however, are different. It is worth considering how the number of establishments per capita behave in large markets, in view of the fact that the empirical work deals with relatively large cities, at least compared to the small towns in Bresnahan and Reiss (1991).[9] Note that the

[8] Note also that this price ensures market coverage as required in footnote 7.

[9] The smallest city studied here has approximately 3 times the largest town's population in their sample.

leading term in (2) is the first term. The second term approaches to zero with S. On the other hand, the leading term in (3) is the first term, and the second term becomes quickly negligible as S increases. This suggests that the large market behavior for oligopolists and fringe establishments per capita should differ from each other.

Using the expressions for establishments per capita in (2) and (3), the share of total establishments in each sector are given by

$$\frac{N_O^*}{N_O^* + N_F^*} = \frac{N_O^*/S}{N_O^*/S + N_F^*/S} \tag{4}$$

$$\frac{N_F^*}{N_O^* + N_F^*} = \frac{N_F^*/S}{N_O^*/S + N_F^*/S} \tag{5}$$

Note that as a result of the different convergence rates of (2) and (3), the shares in (4) and (5) also have different convergence rates. It is easy to verify that, as market size increases, the share of total establishments in the fringe approaches 1, whereas the share in the oligopoly goes to 0.

Depending on the cost structure, different patterns can be obtained for the functions in (2), (3), (4), and (5). Figure 2 displays the simulated number of establishments per capita and share of total establishments in each sector under different scenarios for the industry's cost structure. The market size range is chosen to be S = 10 to 100,000, and the lowest type consumer's marginal utility is set to $\underline{\alpha} = 0.001$. The plots are in logarithms so that the slopes of the curves are elasticities. As market size increases, establishments per capita in the oligopoly sector declines and the elasticity with respect to the market size asymptotes to $-1/2$.[10] The number of fringe establishments per capita declines and levels off with market size, and the elasticity approaches zero. Also, the share of total establishments in the fringe approaches 1 (its logarithm approaches 0), and the share in the oligopoly approaches to zero (its logarithm decreases to $-\infty$).

While the model presented is special in many respects, the predictions remain valid when we consider alternative modelling strategies for the sectors in the market. For example, one can model the fringe as a monopolistically competitive sector, producing differentiated goods. In addition, Salop's (1979) circle model can be used to model the oligopoly. The empirical implications of these different combinations are essentially the same.

[10] The magnitude of this elasticity depends on the sensitivity of variable profits to the number of competitors. While it is $-1/2$ for the particular model considered, it will in general be some negative.

2.2 Connection to Empirical Work

Equations (2), (3), (4) and (5) are functions of market size, costs, and the marginal utility. Although not explicitly incorporated into the model, the utility parameter α will in general be a function of an individual consumer's characteristics, such as tastes and income. Therefore, demographic differences across cities can have an impact on the number of establishments per capita and the share of total establishments for a given category. Thus, for a given establishment category j, any of the equations can be generically specified for a city c as

$$y_c^j = g^j(S_c, \mathbf{x}_c) \tag{6}$$

where $g^j(\cdot)$ is any function, S_c is the market size as before, and $\mathbf{x}_c$ is a vector of city-specific variables that account for costs and tastes. The right hand side variable y_c^j is either the number of establishments per capita, or the share of total establishments. For the empirical analysis, the following log-linear specification for the relation in (6) is adopted

$$\log y_c^j = \alpha^j + \beta^j \log S_c + \mathbf{x}_c' \boldsymbol{\gamma}^j + \boldsymbol{\varepsilon}_c^j \tag{7}$$

The variables in $\mathbf{x}_c$ are either in logarithm or level, depending on the definition of the variable, as will be discussed later. The primary coefficient of interest in (7) is β^j. If the log-linear specification is not grossly at odds with the data, then the competitive model predicts $\beta^j = 0$, while an imperfect competition model would predict $\beta^j < 0$. The oligopoly-competitive fringe model has the implication that, for large markets, $\beta^j = 0$ for the fringe and $\beta^j < 0$ for the oligopoly.

The empirical analysis looks at a cross-section of cities to infer, using (7), whether any of the predictions discussed in this section regarding the number of establishments is valid for the industry studied. Note that, while the oligopoly in the model is associated with the large, chain stores and the fringe with the small, stand-alone stores, empirical work proceeds without any such presumption. Ultimately, patterns in the data will determine which sector behaves what way.

2.3 Dynamics

There is no theoretical work that considers the full dynamics of a dominant firms - competitive fringe model, such as the one presented above. One strand of the literature focuses on the interaction of a monopolist and a competitive fringe, such as Holmes (1996), and Berck and Perloff (1988). While these models are appropriate for small town markets where one dominant establishment interacts with small establishments, they are not informative about larger markets, where typically a group of dominant establishments interacts with a competitive fringe. Moreover, neither of the models provide a comprehensive framework that allows comparative statics regarding market characteristics. The development of such a dynamic model is beyond the scope of this paper, but is an important future research area.

There are mainly two approaches to the theory of industry dynamics in the literature: one that considers perfectly competitive industries, such as Jovanovic (1982), Hopenhayn (1992), and Jovanovic and MacDonald (1994), and the other that deals with a more general class of industries, including the imperfectly competitive ones, notably Pakes and McGuire (1994), and Ericson and Pakes (1995). The common element in these models is the establishment heterogeneity, which is summarized by a random productivity parameter that evolves over time to shape establishment dynamics.

In Hopenhayn's (1992) model, establishments maximize their expected discounted profits over time given perfect anticipation of the industry aggregates and the stochastic process the productivity parameter follows. Entry takes place whenever a potential entrant can make non-negative profits net of entry costs. Exit occurs whenever an incumbent's productivity level falls below an exit threshold and the establishment can no longer sustain non-negative profits net of fixed costs incurred every period. Under the conditions that the industry is a price taker in the input markets and the profit function of an establishment is separable in its productivity parameter and market prices, the model exhibits a unique stationary equilibrium where the number of firms, aggregate output, input and output prices, exit threshold, and the number of entrants are constant over time. Of interest here is the comparative statics of the turnover rates with respect to market characteristics in the stationary equilibrium. The main predictions of the model are as follows:

i) Entry and exit rates do not vary with market size,

ii) An increase in fixed costs leads to an increase in exit rate and a decrease in entry rate,

iii) An increase in entry costs decreases both entry and exit rates,

iv) Entry and exit rates are invariant to a change in the exogenously given wage rate.

Caution must be exercised in exploring the relevance of these predictions in a cross-section of markets. Clearly, the assumptions underlying these predictions are restrictive. Stationarity is an important restriction by itself. If some markets experience persistent growth or decline, the validity of the predictions is questionable. In addition, the setup described above leaves out some interesting possibilities such as a systematic change across markets in the productivity of entrants. If, for example, larger markets attract potential entrants with higher than average productivity, we might observe higher entry rates in larger markets, even in the presence of larger entry costs and fixed costs. The empirical analysis discusses these concerns in more detail.

The competitive theory ignores any post-entry strategic interaction between establishments. Ericson and Pakes (1995) is a pioneer work on the dynamics of industries where establishments do not behave competitively. In their model, an establishment's dynamic profit maximization problem depends on the distribution of its rivals' productivity levels. An establishment's survival is determined not only by changes in its own productivity through active investment (such as R&D), but also by the evolution of its rivals' productivities and by market characteristics. Thus, their framework allows for 'toughness' of rivals to influence the dynamics of an establishment. Unfortunately, though, their model does not provide any straightforward theoretical predictions regarding the impact of market characteristics. These predictions might depend on the assumed type of imperfect competition in the markets, and more work is required towards obtaining predictions for a general class of models. The empirical work in this paper is a preliminary step towards understanding these impacts' nature.

The competitive fringe in the oligopoly - fringe model presented earlier satisfies all the assumptions about the industry structure studied in Hopenhayn (1992).[11] Therefore one may expect the dynamics of the fringe to be in line with his model, while the dynamic behavior of the oligopoly is likely to be different, but no clear predictions are available. One important goal of the empirical work in this paper is then to document the differences in the dynamics of the various sectors in the market.

3 Data and Institutional Environment

The main database used in this paper comes directly from the records of California Department of Alcoholic Beverage Control (DABC), the state authority responsible for enforcing alcoholic beverage regulations and maintaining records of alcoholic beverage manufacturing and distribution licenses. Because of the legal requirements, the data is highly reliable and covers all licensed establishments. Below, a brief summary is provided regarding the institutional details about the organization of retail alcohol industry in California, followed by a detailed look at the dataset's contents.

[11] Although the establishments in the fringe are homogenous, the results do not change when heterogenity is introduced as in Hopenhayn (1992).

3.1 Institutional Environment

California is one of the 32 license states in which alcoholic beverages are produced, distributed and sold by private enterprises holding state-issued licenses. In this paper, the focus is only on those establishments that sell alcoholic beverages for off-premise consumption. These establishments are classified under 'off-sale general' category according to the license coding system of the DABC. All types of alcoholic beverages, i.e. beer, wine, and distilled spirits, can be sold under this license. The application fee for such a license was $12,000 as of 1998, regardless of the location of the premise for which the license is intended. The issue of a license is subject to passing a thorough inspection of the applicant's background (e.g. criminal record), and the prospective premise's suitability (e.g. proximity to residences). If a license is granted, it has to be renewed every year at a fee, which, as of 1998, amounted to $350 - about 3% of the application fee. This fee does not depend on the sales of an establishment, unlike a wine or beer manufacturer's license which is subject to an annual fee depending on the production volume, and unlike an on-sale license, where the annual fee depends on the population of the city. Thus, in off-sale retail, each establishment faces the same legal fees for operation regardless of the location and sales volume. Licenses can be transferred from premise to premise, or from one licensee to the other at the same premise. Each such transfer involves a new application fee, and the issue of a new license. Transfers are common in this industry. One obvious reason for this is that an already established premise with a license is unlikely to be denied for a new license.

Before 1978, there were important restrictions on pricing in the industry. Retailers had to be involved in fair contracts, which prevented them to sell any brand they carry at a price lower than what was previously filed with the state by a competitor selling the same or a close substitute within the same geographic area defined by the regulatory authority. After successful challenges by retailers that this practice was against antitrust laws, such restrictions are no longer in effect since 1978 by a California Supreme Court rule. The deregulation brought about a shakeout and changes in the size distribution of establishments. The evolution of the industry structure after deregulation is further investigated in Campbell and Dinlersoz (1999).

While prices are no longer regulated, there is one important regulation that can potentially affect the analysis here. There are county-wide restrictions on entry to alcohol retail business: for off-sale general retail, the number of establishments per capita in a county is regulated to be no more than one per 2,500 inhabitants. When this restriction is non-binding for a county, the county attains the unconstrained equilibrium number of establishments. When this restriction is binding, however, entry is not possible even if it is profitable, and the unconstrained equilibrium number of establishments is not attained. In this case, the regulation can also indirectly affect exit by maintaining higher than free entry equilibrium profits for incumbents. It turns out, however, that such restrictions are rarely binding. Figure 3 displays how actual number of establishments per capita compares with the regulatory limit for all 58 counties in California at the beginning of 1998. Note that the regulatory limit is not exactly a straight line (level at log(1/2500)), because the regulations allow for an additional establishment when a city's population exceeds an integer multiple of 2500 by a fraction. An analysis of the establishments per capita by county for 1998 (as well as each year from 1994 to 1997) reveals that many counties have far less number of establishments than the maximum number allowed, and this behavior is more pronounced for more populated counties. This is a direct result of the fact that establishments per capita is declining across counties with population as confirmed by the regression curves in the figure. For many small counties, though, the regulatory limit is exceeded. There are several reasons for this. First, the alcoholic beverages code allows for additional establishments beyond the regulatory limit, if an entrepreneur can successfully argue that substantial public interest will be served. Second, the code states that no active license can be cancelled if it was already in effect at the time the restrictions on the number of establishments is imposed and/or revised. This also covers the case where a county's population shrinks and, consequently, the limit on establishments per capita declines.

Figures 4 and 5 display the pattern of establishments per capita across cities, for all cities and for cities with population greater or equal to 25,000, respectively. This paper considers only the cities with a population of at least 25,000 in 1990 due to non-availability of data on several demographic characteristics for smaller cities. All of these cities are located in those counties for which the number of establishments are far below the restrictions. Also, entry and exit during 1994-1998 period did not cause any of the counties in the analysis to reach the regulatory limit for establishments per capita.

The patterns in Figures 4 and 5 are already somewhat suggestive about the organization of the industry across cities. The simple bivariate linear regression (OLS) and least absolute deviation (LAD) regression in logarithms both produce significantly negative coefficients for population, indicating a decline in establishments per capita with market size. However, most of this decline occurs relatively over the range of medium sized cities, and the decline is much less perceptible for larger cities. Nonparametric regression using a kernel estimator confirms this behavior. For the sample of cities with population at least 25,000 the decline is still significant, but much less in magnitude. Detailed analysis of the change in establishments per capita across cities is deferred to following sections.

3.2 Classification of Establishments

For each establishment, the data provides the license number, exact premise address including county, city, zipcode and street information, entry date, exit date, and the type of the establishment. No information on sales or output is available. The type of the establishment is identified by the firm affiliation information and the type of business the establishment is in. While many classification schemes are possible using this information, this paper uses a simple approach for brevity. The classification scheme is pictured in Figure 1. An establishment is included in the chain category, if it is part of a national chain (such as Albertsons Inc., Longs Drugs, Rite Aid, or Safeway Inc.), or a local chain based in California (such as Beverages and More, Stater Bros., Super A Foods, or Raleys). The identities of chain stores' parent firms in the data were also verified using several internet resources and trade journals. All the remaining establishments are included in the stand-alone category, which contains all other store types, mostly mom-and-pop stores. Stand-alone stores are further broken down into two categories based on whether their principal line of business is liquor retail (the category named specialized), or they sell other products as well (the category named diversified). The former category includes all stores that report its main business as liquor retail. The latter category is an eclectic group that includes grocery stores, deli stores, food markets, etc. An overwhelming majority of chain stores is diversified (only 27 out of 2931 chain stores in 1998 were specialized in alcohol retail), so chain stores are not further classified based on specialization.

The classification is done using a series of dummy variables. Table 1 summarizes these variables. At the establishment level, the only other variable is the age, which is the number of years an establishment has been in alcohol retail business. Age is calculated by the difference between the year of analysis, 1998, and the license issue year.

3.3 City Characteristics

The main geographic unit of analysis in this paper is a city. Clearly, city boundaries need not coincide with the spatial extent of the local market for establishments in the city. Methods for identifying the spatial extent of competition are in their infancy, and generally require data on prices. For example, Pinkse, Slade and Brett (1997) use prices posted by gasoline stations to estimate the cross-price response coefficients and determine the spatial extent of competition. Unfortunately, such methods are not applicable to the data here, as there is no price information available.

The data for 1998 is used to study the static organization of establishment categories and the turnover patterns. Variables that are used to describe city characteristics are summarized in Table 2.

Table 3 and 4 present the descriptive statistics and correlations for these variables. These variables come from a diverse set of sources, which are indicated in the table. Some of the listed variables are available only for the year 1990. Since the main goal here is to capture cross-sectional differences across cities, rather than any time series aspects, the 1990 counterparts should be useful as long as the cross-sectional differences in these variables persist over time.

The market size is measured by the number of residents aged 21 and over, that is, the drinking age population in a city.[12] A set of variables are used to control for demographic differences across cities that may affect demand for alcoholic beverages, such as race composition, and income. Also, to control for variable and fixed costs of establishments, wage and rent are included. Wage is available at the county level for 1996. The median house rent is only a proxy for the actual cost of store space. In fact, one would like to have a measure of average rent per square foot of store space in a city, but no such variable is available. It should also be noted that wage and rent also vary across different establishment groups in the sample. It would be too optimistic to expect that different establishment categories pay the same wage and rent. Unfortunately, a finer breakdown of these two variables by establishment type is not available.

3.4 Construction of Entry and Exit Figures

Entry into the industry is defined as obtaining a license and starting alcohol retail business at a premise. For specialized establishments with main business in liquor, entry means starting a new business entity. For other establishments, entry means starting a product line, and does not necessarily correspond to a new business overall. The original license issue year allows us to track the entry of each establishment. Entry can occur either at a new premise or at a previously existing premise via license transfer. License renewals at the same premise are not considered as entry, but license transfers that result in a change of ownership and/or premise are, because the new license holder corresponds to a new entrepreneur that does not necessarily have the same approach to business and represents a different managerial talent, even at the same location. Upon a transfer, the transferred license is automatically cancelled, and the new establishment is assigned a new license number.

Exit from the industry is defined as a voluntary cancellation or surrender of a license and discontinuation of business at a premise. While exit corresponds to a total business shutdown for specialized establishments, it means discontinuing a product line for others, and does not necessar-

[12]Including residents with ages 17 to 20 in the market definition did not yield substantially different results in the analysis to follow.

ily correspond to exit from other product lines. On the other hand, exit of a chain or diversified establishment might result in exit from an otherwise profitable alcohol retail business. Unfortunately, no identification is available for such exits. As in entry, license transfers are considered as exit, if ownership changes. License revocations due to violations of the alcohol retail codes are not considered as exits, because they do not represent voluntary shutdowns. Such instances are rare and account only for a minuscule portion of the turnover (approximately less than 0.5% of all exits are license revocations).

4 Organization of Establishment Types across Cities

Towards understanding the differences between different establishment types, this section empirically characterizes the organization of the retail alcohol industry across cities by category. The results are interpreted based on the predictions regarding the number of establishments per capita and share of total establishments discussed earlier.

4.1 Composition of Establishments

Table 5 provides descriptive statistics for the share of total establishments by different establishment types at the beginning of 1998. A majority of the establishments are stand-alone stores, and most of those stores are specialized in alcohol retail. Chains and specialized establishments are represented in all 218 cities, and there are no diversified stores in 15 cities in the sample. This does not mean that there is no grocery stores or deli stores in those cities, but just that there are no such stores offering alcohol as part of their product lines.

What determines this diverse pattern of establishment composition across cities? In particular, how do market characteristics affect this composition? In a simple OLS framework following the specification in (7), Table 6 gives an idea on these issues.[13] In all regressions, the dependent variable is the logarithm (in base 10) of the share of total establishments in a given category, and the regressors enter in logs except for fraction of population that is nonwhite.[14] In the interpretation of

[13]Least Absolute Deviation (LAD) regressions were also run without a change in the conclusions.

[14]In the interpretation of the results, it should be noted that for chains, the location choices of a parent firm's establishments in different cities are likely to be interdependent. This is because the parent firm would choose to locate those establishments in order to maximize the joint profit, and the distance between any two stores of a parent firm will reflect this. This may be important for both intra- and inter-city location patterns. These issues are ignored here, for the sake of obtaining a simple, preliminary look at the organization of markets.

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The results in Table 6 reveal that stand-alone stores constitute an increasing share of total establishments as drinking age population in a city increases. The reverse result holds for chain stores. The coefficient for chains suggest that there is approximately a 0.04% decline in the share of chain stores with a 1% increase in market size. This is accompanied by a 0.03% increase in the share of stand-alone establishments, although the coefficient is not highly significant. It seems like specialized stores account for most of this increase, and the share of diversified stores is virtually invariant to market size. These coefficient estimates seem to be grossly in line with the Cournot oligopolists - competitive fringe model discussed earlier.

Other regressors also contribute to the change in the share of establishments across cities in important ways. Chains stores constitute a lower share of establishments where fraction of nonwhite residents is higher, and the reverse holds for stand-alone stores. In addition, share of chains increases with income, while share of stand-alone stores decreases. The coefficient is not highly significant for chains, but has a relatively high magnitude, compared to market size's impact. Also, the negative association between income and share of stand-alone stores is again mostly driven by specialized stores, and the magnitude and significance is relatively high.

Share of neither chains nor stand-alone establishments change significantly with wage. However, when diversified and specialized stores are considered separately, wage seems to have a large and significant impact on the share, with opposite signs for the two categories. The impact of wage is more significant for diversified stores than for specialized ones. It is also interesting to note that rent seems to have a negative but insignificant coefficient for chains. The coefficient is also insignificant for stand-alone stores overall, but, as in wage, its impact is substantially different and significant for specialized and diversified stores. The regressors altogether explain about 10 to 30 percent of variation in the shares across cities, the poorest fit being for diversified stores.

In general, the results reveal important differences in the composition of markets across cities. The share of chains decreases significantly with market size, and the share of stand-alone stores increases, although this increase is not highly significant.

4.2 Establishments per Capita

Table 7 contains the results from OLS regressions based again on (7).[15] The dependent variable is the establishments per drinking age resident expressed in logarithm (base 10), and the regressors are in the same format as in the previous section. The first notable feature is that the coefficient of market size is significant and negative for chains, but fails to be so for other categories. The coefficient for chains indicates that there is about a 0.10% decline in number of chain stores per capita with a 1% increase in drinking age population. The decline for all establishments is much less in magnitude. This is probably because the decline in chains per capita is masked by the relative invariance of stand-alone stores per capita with respect to market size. Again, at a broad level, this finding is consistent with the oligopoly - fringe model's predictions for large cities.

Regarding the appropriateness of separate OLS regressions there is one important point: since different establishment types compete within the same city-market, the error terms are likely to be correlated across regressions. Hence, a seemingly unrelated regressions (SUR) framework is appropriate for joint tests on the coefficients of interest. Coefficient estimates are the same for both separate OLS estimations and the SUR estimation. Table 7 contains the Breusch-Pagan test statistic for independence of residuals across regressions. The test strongly rejects the independence of error terms. Note also that the test for the joint significance of market size's coefficients across regressions also rejects the hypothesis that market size does not matter for establishments for capita. This result appears to be driven by the pattern exhibited by chain stores.

Observe also that overall establishments per capita is declining sharply with income, but this seems to be driven mostly by stand-alone stores, in particular, by specialized stores. Also, establishments per capita is negatively associated with nonwhite population and rent, and positively associated with wage. None of these coefficients are significant, though. Again, there are differences in the impacts of these variables across categories. Wage is significant only for diversified stores, and has a relatively large positive coefficient. For chains and specialized stores, the impact of wage is negative, but not significant. Finally, note that there are less chains and diversified stores per capita in high rent cities, but more specialized stores, although the coefficients in chains and specialized stores regressions are not significant.

The findings on the coefficients of market size in these regressions, together with the results in the previous section, seem to broadly suggest that the industry's organization is in line with the oligopoly - competitive fringe model.

[15] Again, Least Absolute Deviation (LAD) regressions were also run without a change in the conclusions.

4.3 Robustness

To refine the baseline empirical results discussed to this point, additional regressors were added to the analysis. These account for other concerns that were not addressed in the theory and empirical sections.

Substitution Effects from Other Industries. One potential concern is the substitution effects, if any, from "on-sale" establishments, such as restaurant and bars. If, as cities get larger, more and more people eat and drink out, rather than buying packaged liquor, then this may be one explanation why there are less chain stores per capita in larger cities. This argumant, though, leaves unexplained why stand-alone stores are not affected the same way. Nevertheless, to check for the possible impact, the sales per capita (in logs) in eating and drinking places[16] was added as a regressor in both the static and dynamic analysis. In establishment per capita regressions, this variable turns out to have a significant, positive coefficient for stand-alone, specialized, and diversified stores, but turns out to be insignificant for chain stores. Moreover, the conclusions about the impact of market size does not change after controlling for this variable. As an alternative, sales per capita was used as a dependent variable, and there is no indication that there is a significant increase in this variable as city size increases. Also, the conclusions of the dynamic analysis did not change when this variable was added.

Neighborhood Effects. Another concern is related to the possibility that the variable income is indeed acting as a proxy for neighborhood quality. In fact, coefficients indicate that there are significantly less specialized stores per capita in cities with higher median family income. There may be two reasons for this: establishments may be larger in high income places, or poor neighborhoods have more establishments. If the quality of the neighborhood is an omitted variable highly correlated with income and income is highly correlated with market size, then there is potentially an omitted variable bias on the coefficient of market size. However, note from table 4 that income and market size (POP*AGE21O) has a correlation of only -0.03. This alleviates omitted variable bias concerns. Nevertheless, controls for neighborhood quality, such as crime rate (serious crimes per capita known to police) and percent of families with income below poverty level,[17] were added as regressors. None of these variables alter the findings regarding the impact of market size.

Religion Composition. Another variable was added to control for the impact of religious practices on the results. This variable is the fraction of people in a county that are full members of

[16]This variable is available from CSA.

[17]Both variables are available from CCDB.

a religious group.[18] Again, the results for market size was robust to the inclusion of this variable.

5 Dynamics of the Industry

This section deals with the dynamics of the industry, which complements and extends the analysis in the previous section. The main focus is on the cross-sectional differences in the patterns of turnover across cities and establishment types. Time series aspects are left for future work. The analysis first considers the general pattern of turnover across cities during 1995-1998, and then delves into differences across establishment categories in the patterns and determinants of turnover.

5.1 The General Pattern

Entry and exit rates for an establishment category in a city during year t are defined using the following convention

$$\textit{Entry (Exit) Rate} = \frac{\text{Number of establishments that enter (exit) during year } t}{\text{Number of establishments active at the beginning of year } t} \tag{8}$$

This definition is similar to the one used by Dunne, Roberts, and Samuelson (1988). Unlike in their work, though, the rates here are defined by establishment category, rather than for all establishments pooled. This approach is superior here because the pool of potential entrants and exiting establishments depend on how each category is represented in the sample.

The statewide evolution of the entry and exit rates for all establishments pooled is shown in Figure 6. The industry exhibits a decline in entry rate and an increase in exit rate during this period. Entry rate levels off after 1996. Exit rate increases between 1996 and 1997, and somewhat stabilizes between 1997 and 1998. As result, there was a negative net entry during 1997 and 1998. Overall, the industry experienced a slight decline in the number of establishments during the 1995-1998 period (about 5% compared to the beginning of 1995).

How different are the entry and exit rates of different establishment types during that period? Table 8 provides summary statistics for entry and exit rates across cities by type. The reported rates are time averages. While diversified stores exhibit a net entry during the period, chains and specialized stores exhibit a net exit. The difference between entry and exit rates for each category is significant as evidenced by the t-statistics from pairwise comparison of means across cities. Chains exhibit the lowest entry rate, and diversified stores have the highest entry rate during the period.

[18]This variable was contructed from the data in Bradley, et al. *Churches and Church Membership in the United States, 1990.*

The lowest exit rate, on the other hand, is exhibited by chain stores, and the highest by specialized stores. While not reported in the table, the pairwise differences in entry rates for chains and stand-alone stores are significant, as well as the differences in exit rates. Specialized and diversified stores appear to be a high turnover segment of the market, whereas chains exhibit a relatively low turnover.

How are entry and exit patterns of different establishment types related? Tables 9 and 10 present simple correlations for entry and exit rates across categories. Table 9 suggests that chains' entry rate is negatively correlated with entry rate of stand-alone stores, in particular, with that of specialized stores, although the magnitudes are not too high. There is also a positive but small correlation between entry rates of chains and diversified stores, as well as between diversified and specialized stores.

Turning to the exit rates in Table 10, note that exit rates for stand-alone stores and specialized stores are negatively correlated with the exit rate of chains. In addition, there is a slight positive correlation between exit rates of chains and diversified stores. The correlation between diversified and specialized stores' exit rates is relatively high and positive.

Finally, Table 11 presents correlations of entry rates with exit rates. First note that, reading off the principal diagonal, entry and exit rates for all types are highly positively correlated with each other. This positive correlation is much more pronounced for stand-alone stores, especially for specialized stores. The other noticeably high correlation is between diversified stores' entry rate and specialized stores' exit rate. Entry rate for specialized stores is also negatively correlated with exit rate of chains, and chains' entry rate is slightly negatively correlated with exit rate of stand-alone stores, in particular, with that of diversified stores. Specialized stores' entry rate is positively correlated with the exit rate of diversified stores, and the magnitude of this correlation is relatively high.

In general, one should be cautious about reading too much into the patterns presented in this section, because these correlations do not necessarily reflect any causality between entry and exit rates, and a number of factors, such as city demographics, can account for them. The following sections analyze in more detail the differences across establishment types and cities in turnover rates. Nevertheless, the important results from the correlation analysis can be summarized as follows:

(a) For each establishment type, cities with higher entry rate tend to be the cities with higher exit rate as well,

(b) Cities with higher entry (exit) rates of chains tend to exhibit lower entry (exit) rates of specialized stores, although these correlations are not strong,

(c) Cities with higher entry rate of diversified stores tend to have higher exit rates for specialized stores. The reverse relationship also holds, but is much weaker,

(d) Chains' entry rate is not highly correlated with stand-alone stores' exit rate, and vice versa.

These results suggest that turnover rates are much more correlated within categories than across categories. Of course, these are based on contemporaneous correlations and the pattern for correlations over time is also important. Entry into a market may not lead to changes in entry and exit patterns in that market on impact, but may do so over a period of time. Such investigations are not the focus of this paper, as stated before, and is left to future work. In what follows, the cross-sectional determinants of exit and entry are further investigated using city level co-variates. This is done by focusing on 1998, the year for which the static analysis was carried out earlier. The results were repeated for other years in the sample as well, without a substantial change in the main findings.

5.2 Exit

This section provides a detailed look at the determinants of exit across cities for different establishment categories. Given the sharp differences in the organization of different establishment categories across cities, one expects discrepancies in their dynamic behavior as well.

Suppose that the expected future discounted profit, v_{ic}, of an establishment i in a given city c is a function of a vector of establishment specific features, $\mathbf{z}_i$ and a vector of general market characteristics, $\mathbf{x}_c$, which includes market size, variable, and fixed costs

$$v_{ic} = v(\mathbf{z}_i, \mathbf{x}_c)$$

Exit of an establishment is equivalent to saying that it is not profitable to continue operation given the establishment characteristics and market environment, i.e. $v_{ic} < 0$. If one denotes the exit event with an indicator X_{ic} that takes a value of 1 if establishment i in city c exits within the period of analysis, and 0 otherwise, then one can associate the event of exit to the event of being non-profitable, i.e. $X_{ic} = 1 \Leftrightarrow v_{ic} < 0$. Then, the probabilities associated with the two events are the same, i.e. $P(X_{ic} = 1) = P(v_{ic} < 0)$. Now, suppose that the probability of exit is a linear function of the observables $\mathbf{z}_i$ and $\mathbf{x}_c$, and, an establishment and city specific error term ε_{ic}

$$P(X_{ic} = 1) = \alpha + \mathbf{z}_i' \boldsymbol{\beta} + \mathbf{x}_c' \boldsymbol{\gamma} + \varepsilon_{ic} \tag{9}$$

where ε_{ic} is allowed to be correlated with ε_{jc} if establishments i and j are located in the same city c. In addition, if the error term ε_{ic} is assumed to have a logistic distribution, then the parameter vector $\mathbf{\Theta} = \{\boldsymbol{\beta}, \boldsymbol{\gamma}\}$ in equation (9) can be estimated by maximum likelihood using as the dependent variable the exit indicator X_{ic}.[19] The covariance matrix under the assumed error structure is estimated based on White (1982).

As before, the regressors are in logs except for the fraction nonwhite and establishment age.[20] A control variable for population growth (POPGRO) during 1998 is also added. It is important to control for growth because the predictions discussed earlier assume stationarity. The results are given in Table 12. The first column does the analysis for all establishments grouped, and dummies are added to control for establishment type. The omitted category is chains. Note that this specification constrains the coefficients for market variables to be the same across categories. The remaining columns reports separate estimation results for each category.

Overall, exit probability declines significantly with establishment age, but this effect is more pronounced for specialized stores. Age does not seem to matter for chain stores at all, and it is not highly significant for diversified stores. One potential explanation for this might be that chains tend to be larger establishments, and age for such establishments may not matter much on top of the size's impact on survival. On the other hand, the importance of age for specialized stores might reflect some 'tougher selection' effect in the sense that such stores may need longer time until they establish themselves profitably at a location. Further work and data are needed to address these possibilities.

Exit probability also declines with market size when all establishments are pooled, although the effect is not highly significant. This effect is much stronger for chains and diversified stores (highly significant only for chains), but not for specialized stores. The relative invariance of the exit rate for stand-alone stores, and in particular, for specialized stores, is consistent with the predictions of Hopenhayn's (1992) model for a competitive industry. This does not seem to be the case for chains.

The growth variable is uniformly insignificant for all categories although its sign is always positive and relatively large in magnitude, which suggests that exit probability increases with growth. Income and nonwhite population do not have highly significant coefficients, the only important exception is the significant and large increase in exit probability for chains where a larger fraction of the population is nonwhite. While wage does not seem to influence the exit probability for chains,

[19] Probit and some asymmetric specifications of the distribution did not yield substantially different results.

[20] A small number of establishments that enterd during 1998 were active only for part of the year and exited before the end of the year. For such establishments, age is set to zero, and the logarithm is not applicable.

it does so significantly in the case of stand-alone stores. Exit probability is lower in high wage cities, especially for diversified stores. The relative unimportance of the wage for specialized stores' exit rate is again consistent with the predictions of the competitive theory. Finally, the impact of rent on the exit probability is also diverse for different categories. While rent is positively associated with exit probability for stand-alone stores, it is negatively associated for chains. The latter effect is much more significant and higher in magnitude. If one views rent as a crude proxy for fixed costs and/or entry costs, the pattern for stand-alone stores is consistent with the competitive theory.

The impression from the analysis in this section is that the exit patterns for different categories differ in important ways. The results are broadly in line with the competitive theory for stand-alone stores, more so for specialized ones, but the chains' behavior is substantially different.

5.3 Entry

Unlike in the case of exit, the set of potential entrants is not observable, hence an establishment level logit analysis is not applicable. Nevertheless, the analysis proceeds here with a simple specification: the number of potential entrants is proportional to the number of incumbent establishments in the market. This is the general approach in the entry and exit literature (see Dunne, Roberts, and Samuelson (1988)). It is assumed that the number of type j establishments that enter a city c with a total of N^j type j incumbent establishments, E_c^j, follows a Poisson process conditional on a vector of market characteristics, $\mathbf{x}_c$. That is,

$$P(E_c^j = m) = \frac{e^{-\lambda_c^j N^j} (\lambda_c^j N^j)^m}{m!}$$

and the entry rate, λ_c^j takes the form

$$\lambda_c^j = exp(\alpha^j + \mathbf{x}_c^{'} \boldsymbol{\gamma}^j + \varepsilon_c^j)$$

where the error term ε_c^j is assumed to be independent across cities. The exponential formulation ensures the non-negativity of the entry rate. The model is straightforward to estimate by maximum likelihood methods.

Limitations of the Poisson specification is well-known. The fact that the mean equals variance may lead to artificially low standard errors for the parameter estimates. To address this concern, the tests for the Poisson fit were constructed based on Cameron and Trivedi (1986). For all the estimations to follow in the rest of this section, the tests consistently failed to reject the Poisson specification for the data against more flexible specifications such as Negative Binomial distribution.

The market characteristics and the industry structure variables used here are the same as in the exit analysis. The estimated coefficients are given in Table 13. Overall, as in the case of exit, the entry rate declines with market size, although the coefficient is significant only at 5% level. This effect is largely driven by chains. The entry rate for stand-alone stores is also negatively associated with market size, but the coefficient is not highly significant. The impact seems to be stronger for specialized stores, but not for diversified stores. This pattern for market size's impact appears to be consistent with the competitive theory for stand-alone stores, but not for chains. It looks like the entry rate of chains falls significantly as markets get larger.

Growth in market size seems to increase entry for all categories, but the coefficients are significant only for diversified stores, and, as a result, for stand-alone stores. Entry is not highly responsive to population growth in chains and specialized stores. Together with the positive association between exit and growth, this result suggests that markets experiencing growth tend to have higher turnover. It should be noted, though, the growth is measured only for one year, and long run growth effects may be different from what is observed here. As in the case of exit, nonwhite population and income do not turn out to have highly significant impact on entry. In particular, chains' entry rate tend to decline with nonwhite population, but increase with income, and a weak relation is observed between stand-alone stores' entry rate and these variables.

Higher wages have a negative, but insignificant, impact on entry overall. This effect is linked primarily to specialized stores' entry rate, which declines significantly with wage. Chains' entry rate is positively associated with wages, but this effect is again not significant. In the case of diversified stores, entry also decreases with wages, but not significantly. Entry rate is also negatively related to rent overall. While for stand-alone stores rent has a positive but insignificant impact on entry rate, chains' entry rate decline significantly with rent and the magnitude of this decline is relatively high. Together with rent's negative impact on exit rate, this suggests that chains' turnover is much lower in high rent cities. Note also that, in general, the impact of rent on entry for chain, specialized, and diversified stores tends to be larger in magnitude than in the case of exit.

As in the static analysis, the sensitivity of the results to inclusion of additional regressors were checked. The findings on the impact of market size on entry and exit rates were not affected substantially.

Viewed together, the analysis on entry and exit reveal important differences in the turnover patterns of different establishment categories across markets. While stand-alone stores tend to exhibit a turnover pattern that is broadly consistent with the competitive industry theory, the chains' turnover does not seem to fall within the same framework.

Reconciling the findings on the static and dynamic patterns, the industry seems to behave in the lines of the oligopoly-competitive fringe framework. It would be too optimistic, though, to claim that what is observed here exactly coincides with the model presented. There are many gaps that need to be filled in, such as clear predictions regarding the impact of market characteristics on the dynamics of the oligopoly-competitive fringe model, and for imperfect competition models, in general.

It is also important to somehow quantify the degree of interaction between the oligopoly and the fringe. In particular, if the products offered by the fringe and the oligopoly are sufficiently differentiated so that the demand linkage between the two sectors is broken, we might just as well be looking at two totally separate industries, one behaving oligopolistically, the other competitively. Further work is required to identify how the different segments interact with each other, possibly by analyzing how changes in prices or sales in one sector responds to those in other sectors. Nevertheless, the patterns presented here indicate a clear separation of activity across different sectors of the market.

6 Conclusion

Empirical work describing the nature of spatial competition in retail markets is still in its infancy. This paper has taken a mostly descriptive step by analyzing the static organization and dynamics across markets of an important retail sector. The evidence presented in this paper suggests that it is essential to recognize heterogeneity of establishments within a market to understand how markets are organized. Indeed, different establishment groups seem to exhibit surprisingly different static and dynamic behavior across markets, and the interaction among these groups determine the overall dynamics of the market.

The patterns found here suggest a view of local markets where dominant establishments consisting of chains and a fringe composed of stand-alone stores interact. While the static organization of the former group is inconsistent with that of a competitive industry, the latter group behaves like one. It is likely that this type of interaction is not limited to the particular industry studied here, but may apply to some other retail markets as well.

On the theoretical side, the findings call for the development of industry dynamics models that will allow us to analyze the interaction between dominant firms and a competitive fringe as one potentially representative model for some retail sectors. In particular, incorporation of entry, exit and location choice in such models are important and challenging avenues of future research.

The extension of the dynamic analysis to several periods will enhance the analysis. Time series aspects, such as the response of the markets to entry, can be analyzed. Also, questions that are important from a policy and welfare point of view, such as whether there is a continuing trend towards the sweep of stand-alone stores from the market, can be addressed.

Finally, the results in this paper are by no means representative of the retail sector as a whole and future work extending the analysis here to other industries is required. While availability of data seems to be a serious impediment to such work, a comprehensive database on entry and exit patterns of several retail industries is currently being developed by the U.S. Census Bureau and will allow for a more aggregate look at the turnover patterns as in Dunne, Roberts, and Samuelson's (1988) study of manufacturing industries.

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Variable	Description
CHAIN	Dummy variable for an establishment that is part of a local or national chain.
STAND-ALONE	Dummy variable for an establishment that is not part of a chain.
DIVERSIFIED	Dummy variable for a stand-alone establishment that offers multiple products including alcoholic beverages.
SPECIALIZED	Dummy variable for a stand-alone establishment that is specialized in alcohol retail.
AGE	Number of years an establishment has been in alcohol retail business.

Table 1. Description of establishment specific variables

Variable	Description	Source
POPULATION	Population estimate, beginning of 1998	CSA
POPGRO	Population growth during 1998	CSA
INCOME	Median family income in 1990	CCDB
NONWHITE	Percent in 1990 of population that is nonwhite	CCDB
AGE21O	Percent in 1990 of population older than 21 years (drinking age)	CCDB
WAGE	County average wage in liquor stores in 1996	CBP
RENT	Median rent in renter occupied housing units in 1990	CCDB

Notes: CSA stands for California Statistical Abstract issued by California Department of Finance. CCDB and CBP stand for County and City Databook and County Business Patterns, respectively, and both are issued by U.S. Bureau of the Census.

Table 2. Variables describing city characteristics

Variable	Unit	Mean	Std.	Min	Max
POPULATION		108,893	275,330	18,100	3,716,000
POPGRO	%	1.7	1.2	-1.6	7.1
INCOME	$	44,425	13,500	23,262	95,602
NONWHITE	%	28	17	3	89
AGE21O	%	69	6	53	91
WAGE	$	12,050	3,140	5,110	21,530
RENT	$	674	144	391	1,001

Notes: INCOME and RENT are in 1990 dollars, and WAGE is in 1996 dollars.

Table 3. Descriptive statistics for city characteristics

Variable	POPGRO	INCOME	NONWHITE	AGE21O	WAGE	RENT
POPULATION	0.03	-0.09	0.21	-0.05	-0.06	-0.08
POP*AGE21O	0.02	-0.03	0.16	0.06	-0.02	-0.03
POPGRO	1.00	0.05	-0.11	-0.08	-0.24	0.02
INCOME		1.00	-0.49	0.54	0.39	0.84
NONWHITE			1.00	-0.48	-0.06	-0.25
AGE21O				1.00	0.28	0.42
WAGE					1.00	0.46
RENT						1.00

Notes: In correlations, POPULATION, POP*AGE21O, INCOME, RENT and WAGE are in logs because they enter the regressions in logs. POPGRO is the percent growth in population during 1998.

Table 4. Correlations between city characteristics

	Statewide	Across Cities			
Type	Mean	Mean	Std.	Min	Max
CHAIN	0.32	0.38	0.14	0.07	0.84
STAND-ALONE	0.68	0.62	0.14	0.16	0.93
DIVERSIFIED	0.22	0.19	0.11	0.00	0.57
SPECIALIZED	0.46	0.42	0.13	0.04	0.82

Table 5. Share of total establishments by establishment type

	Dependent Variable: Share of total establishments			
Independent Variable	CHAIN	STAND-ALONE	DIVERSIFIED	SPECIALIZED
CONSTANT	-1.197	0.262	-1.184	0.090
	(0.00)	(0.45)	(0.37)	(0.37)
POP*AGE21O	-0.039	0.031	-0.003	0.028
	(0.01)	(0.07)	(0.95)	(0.32)
NONWHITE	-0.308	0.147	0.044	0.224
	(0.00)	(0.00)	(0.79)	(0.01)
INCOME	0.412	-0.229	0.315	-0.538
	(0.08)	(0.03)	(0.41)	(0.02)
WAGE	-0.057	0.046	0.663	-0.239
	(0.62)	(0.49)	(0.00)	(0.07)
RENT	-0.227	0.075	-1.320	0.996
	(0.35)	(0.52)	(0.00)	(0.00)
N	218	218	203	218
R^2	0.28	0.22	0.12	0.18
$Prob > F$	0.00	0.00	0.00	0.00

Notes: Dependent variables are in logs. Heteroskedasticity-consistent t-distribution significance levels are in parantheses.

Table 6. OLS regression results for establishment composition across cities

	Dependent Variable: Establishments per capita				
Independent Variable	Overall	CHAIN	STAND-ALONE	DIVERSIFIED	SPECIALIZED
CONSTANT	-0.829	-1.377	-0.194	-1.323	-0.199
	(0.04)	(0.05)	(0.79)	(0.29)	(0.82)
POP*AGE21O	-0.024	-0.107	0.033	0.007	0.032
	(0.04)	(0.01)	(0.43)	(0.91)	(0.56)
NONWHITE	-0.095	-0.482	0.069	-0.259	0.050
	(0.12)	(0.00)	(0.45)	(0.12)	(0.73)
INCOME	-0.624	-0.043	-0.842	-0.645	-0.973
	(0.00)	(0.85)	(0.01)	(0.14)	(0.00)
WAGE	0.084	-0.109	0.036	0.731	-0.224
	(0.33)	(0.48)	(0.80)	(0.00)	(0.29)
RENT	-0.105	-0.360	0.111	-0.922	0.652
	(0.53)	(0.23)	(0.78)	(0.04)	(0.14)
N	218	218	218	203	218
R^2	0.31	0.22	0.29	0.21	0.21
$Prob > F$	0.00	0.00	0.00	0.00	0.00
$Breusch - Pagan\ Stat.$	236.72	$Prob > \chi^2$	0.00		
$Joint\ significance\ of$ POP*AGE21O $coef.$	3.03	$Prob > \chi^2$	0.01		

Notes: Dependent variables are in logs. Establishments per capita is the number of establishments per drinking age person. Heteroskedasticity-consistent t-distribution significance levels are in parantheses. The last two rows report the Breusch-Pagan test statistic for independence of residuals across regressions and joint test for the significance of population. Both tests have an asymptotic χ^2 distribution.

Table 7. OLS regression results for establishments per capita across cities

Type	Entry Rate Mean	Entry Rate Std.	Exit Rate Mean	Exit Rate Std.	Comparison of Means $t - stat$	Comparison of Means $Prob > \|t\|$
CHAIN	0.048	0.081	0.063	0.079	-2.53	0.01
STAND-ALONE	0.125	0.097	0.149	0.103	-4.03	0.00
DIVERSIFIED	0.156	0.082	0.105	0.092	3.05	0.00
SPECIALIZED	0.109	0.100	0.164	0.061	-4.88	0.00

Notes: Reported statistics are calculated using time averages for each city over the years 1995-1998. Comparison of mean entry and exit rates across cities for each category is based on a two-sided paired t-test.

Table 8. Entry and exit rates by type across cities

	Entry Rate		
Type	STAND-ALONE	DIVERSIFIED	SPECIALIZED
CHAIN	-0.083	0.033	-0.113
DIVERSIFIED		1.000	0.054

Notes: All correlations are averages over the years 1995-1998.

Table 9. Correlation of entry rates across cities

	Exit Rate		
Type	STAND-ALONE	DIVERSIFIED	SPECIALIZED
CHAIN	-0.057	0.060	-0.090
DIVERSIFIED		1.000	0.156

Notes: All correlations are averages over the years 1995-1998.

Table 10. Correlation of exit rates across cities

	Entry Rate ⟶			
Exit Rate ↓	STAND-ALONE	CHAIN	DIVERSIFIED	SPECIALIZED
STAND-ALONE	0.637	-0.008	0.437	0.518
CHAIN	-0.010	0.430	0.074	-0.092
DIVERSIFIED	0.277	-0.044	0.377	0.114
SPECIALIZED	0.573	0.014	0.335	0.539

Notes: All correlations are averages over the years 1995-1998.

Table 11. Correlations of entry rates with exit rates across cities

	Dependent Variable: Exit Indicator, X_{ic}^{j}				
Variable	Overall	CHAIN	STAND-ALONE	DIVERSIFIED	SPECIALIZED
CONSTANT	-0.615	1.619	-1.209	2.446	-1.891
	(0.73)	(0.66)	(0.56)	(0.57)	(0.39)
DIVERSIFIED	0.275	-	-	-	-
	(0.00)				
SPECIALIZED	1.127	-	-	-	-
	(0.00)				
AGE	-0.029	-0.013	-0.029	-0.024	-0.037
	(0.00)	(0.43)	(0.00)	(0.15)	(0.00)
POP*AGE21O	-0.099	-0.129	-0.098	-0.248	-0.043
	(0.04)	(0.01)	(0.09)	(0.07)	(0.43)
POPGRO	4.341	8.542	2.940	0.778	3.920
	(0.25)	(0.14)	(0.49)	(0.92)	(0.38)
NONWHITE	0.333	1.160	0.261	0.172	0.229
	(0.19)	(0.03)	(0.34)	(0.79)	(0.47)
INCOME	0.036	1.489	-0.509	-0.615	-0.233
	(0.95)	(0.34)	(0.47)	(0.67)	(0.77)
WAGE	-0.569	-0.252	-1.115	-2.564	0.244
	(0.20)	(0.81)	(0.02)	(0.02)	(0.70)
RENT	-0.338	-3.758	1.315	0.802	0.582
	(0.66)	(0.03)	(0.11)	(0.67)	(0.50)
N	9313	2931	6382	2076	4306
$Log-likelihood$	-3521	-746	-2824	-641	-2118
$Prob > \chi^2$	0.00	0.01	0.00	0.00	0.00

Notes: White's (1982) robust significance levels in parantheses. The omitted category in the first column is CHAIN.

Table 12. Logit analysis of exit probability by establishment type

	Dependent Variable: Number of Entrants, E_c^j				
Variable	Overall	CHAIN	STAND-ALONE	DIVERSIFIED	SPECIALIZED
CONSTANT	0.288	7.514	-2.098	-2.313	-1.869
	(0.87)	(0.10)	(0.31)	(0.45)	(0.50)
POP*AGE21O	-0.059	-0.179	-0.102	0.036	-0.120
	(0.05)	(0.01)	(0.12)	(0.21)	(0.10)
POPGRO	4.845	2.582	7.670	11.556	4.347
	(0.19)	(0.72)	(0.04)	(0.03)	(0.42)
NONWHITE	0.201	-0.200	0.072	-0.069	0.248
	(0.45)	(0.78)	(0.80)	(0.87)	(0.52)
INCOME	0.113	1.446	0.088	-0.361	-0.145
	(0.87)	(0.40)	(0.90)	(0.75)	(0.88)
WAGE	-0.278	0.768	-0.753	-0.794	-1.689
	(0.52)	(0.44)	(0.08)	(0.21)	(0.02)
RENT	-0.933	-6.113	0.301	1.007	1.078
	(0.23)	(0.00)	(0.73)	(0.44)	(0.36)
N	218	218	218	218	218
$Log-likelihood$	-405	-201	-381	-291	-302
$Prob > \chi^2$	0.00	0.00	0.00	0.00	0.00

Notes: Standard normal significance levels in parantheses.

Table 13. Poisson analysis of entry rate by establishment type

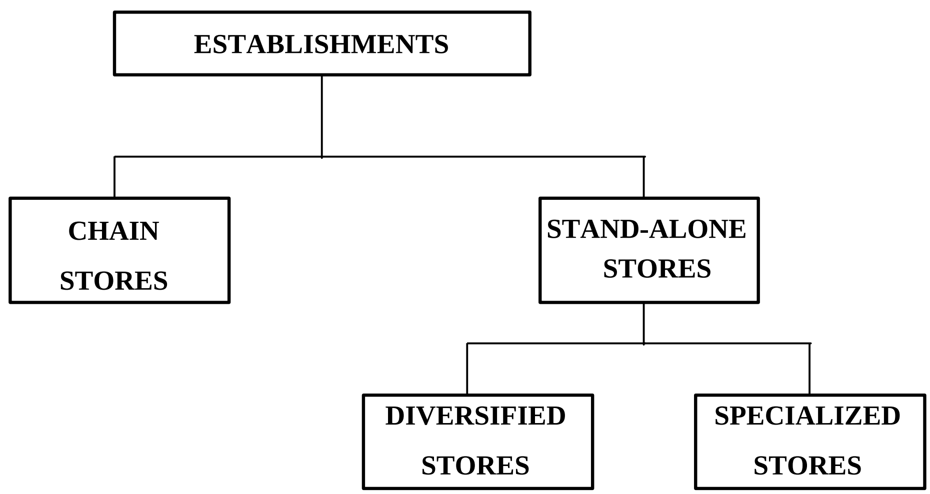

Figure 1: Establishment classification scheme

Figure 2: Establishments per capita vs. population: Simulations from the Cournot oligopoly - competitive fringe model (Population range: $S = 10$ *to* $100,000$ and the lowest type consumer's marginal utility: $\underline{\alpha} = 0.001$)

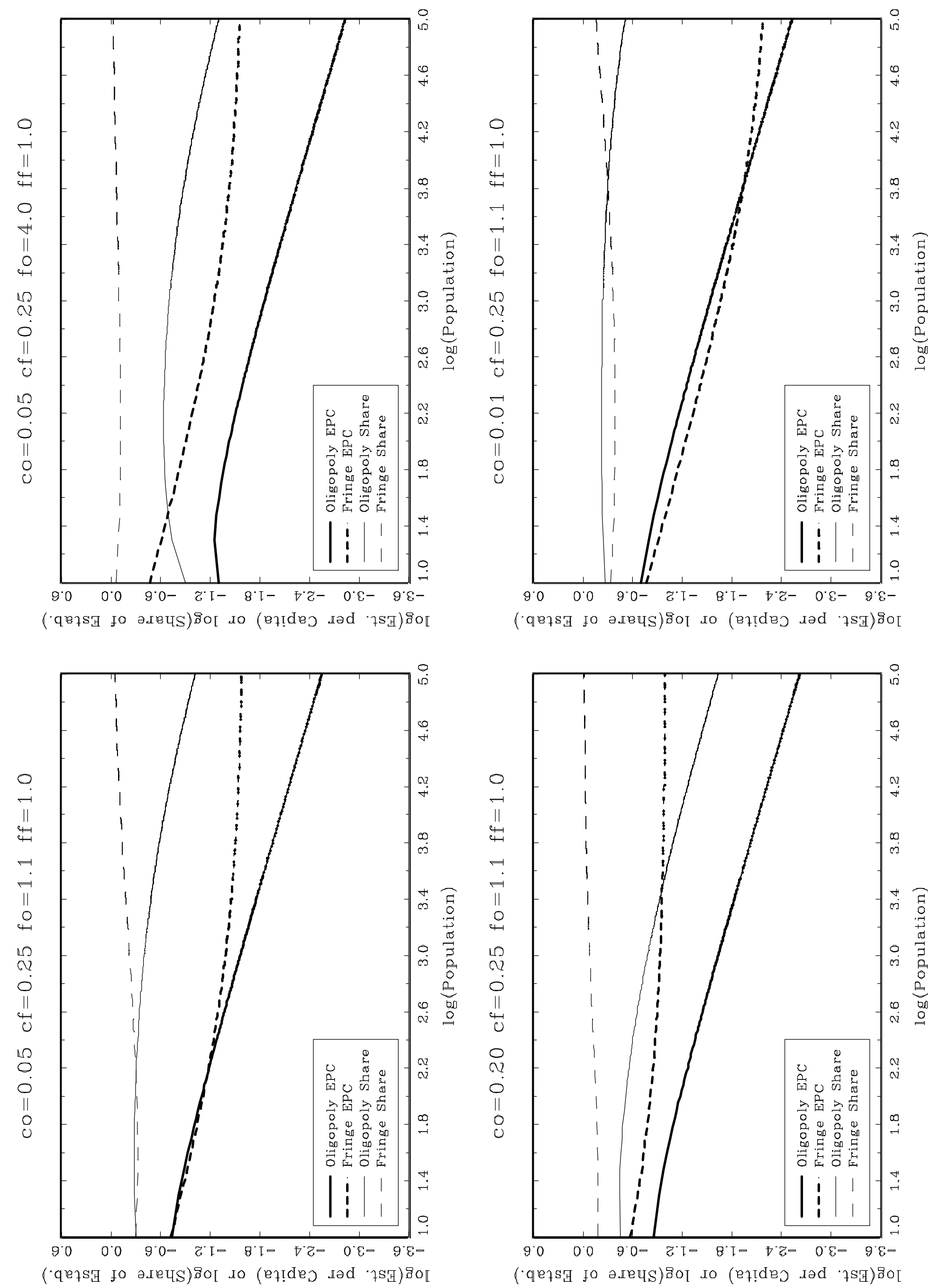

Figure 3: Establishments per capita vs. county population in California off-sale general alcoholic beverages industry, 1998. (For the non-parametric estimate, a Gaussian kernel was used with an optimally chosen plug-in bandwidth of $h = cn^{-1/5}$ where $c = 1.5$ and n is the sample size.)

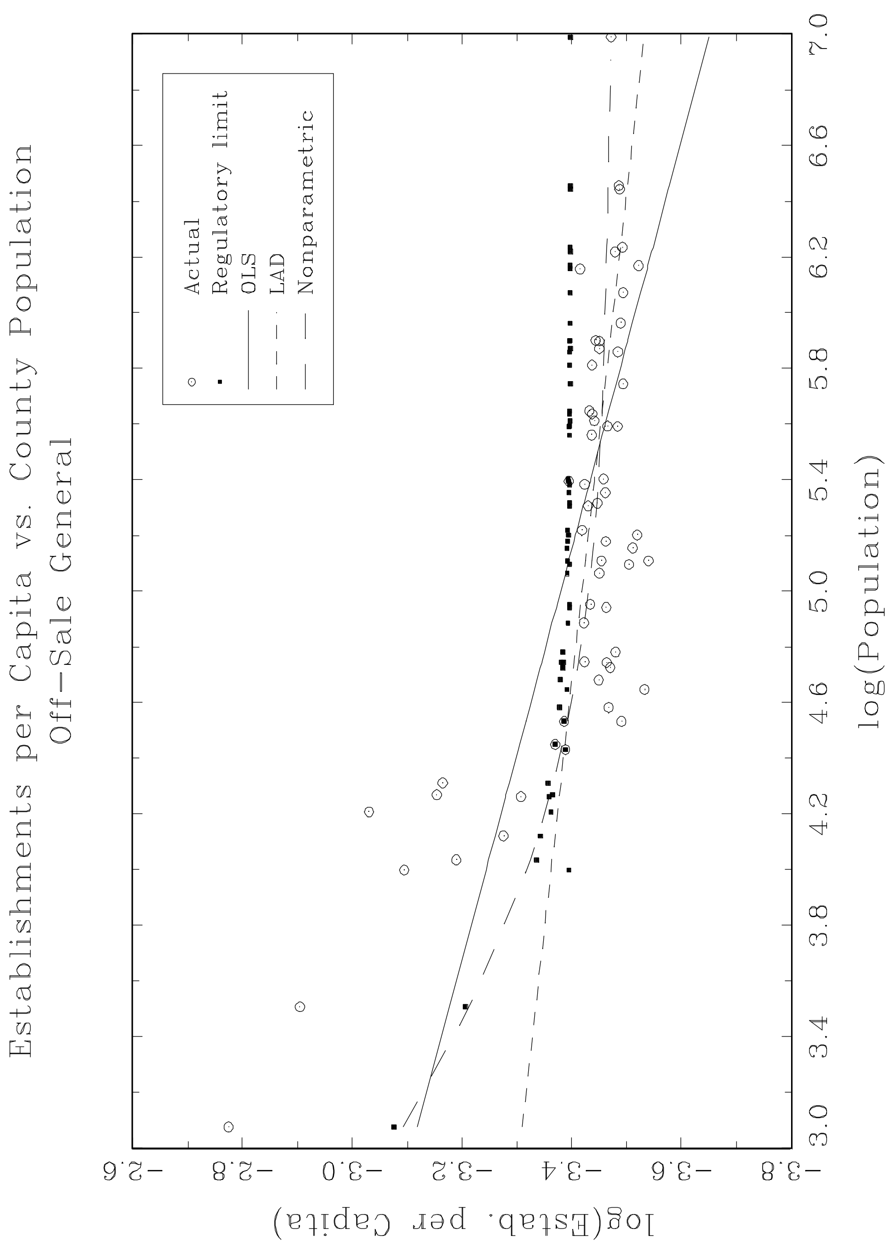

Figure 4: Establishments per capita vs. city population in California off-sale general alcoholic beverages industry, 1998. (For the non-parametric estimate, a Gaussian kernel was used with an optimally chosen plug-in bandwidth of $h = cn^{-1/5}$ where $c = 1.5$ and n is the sample size.)

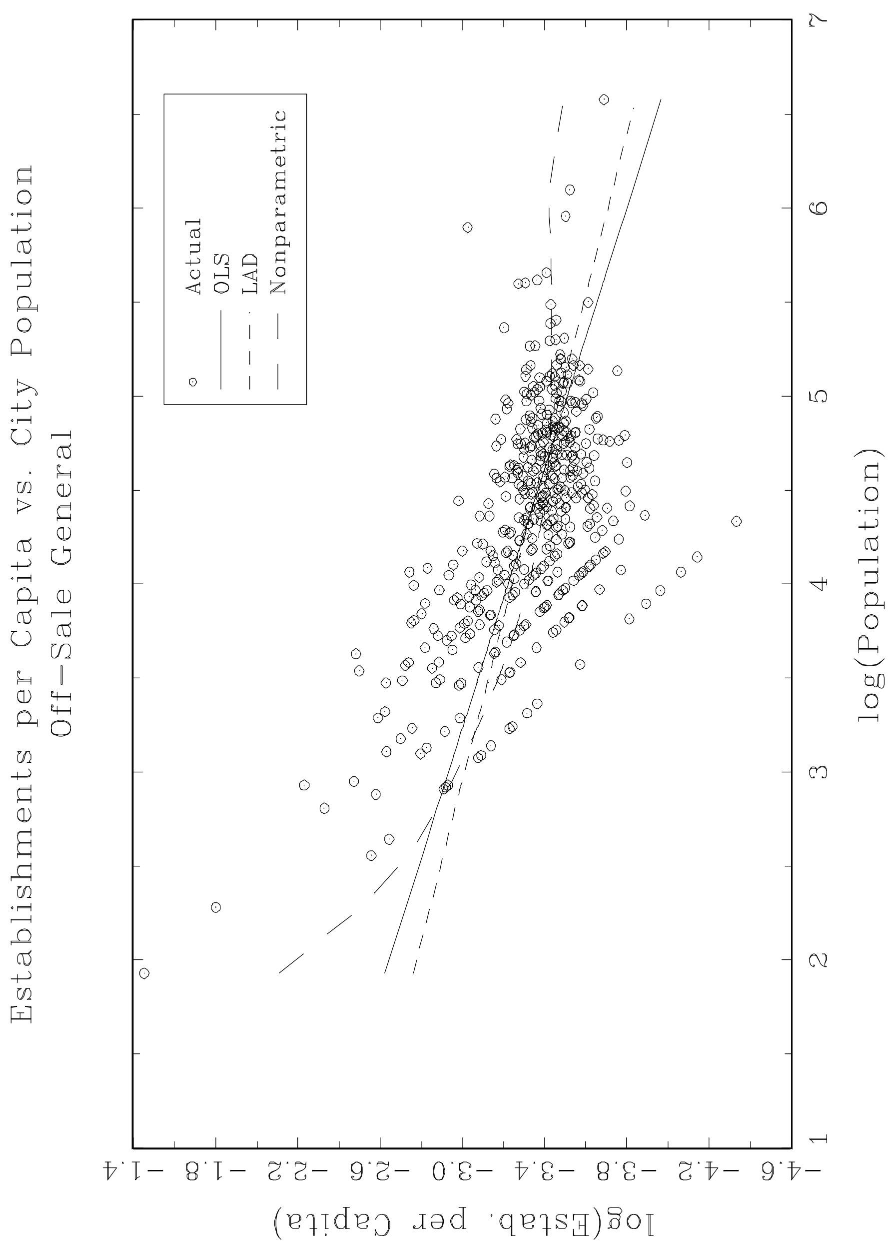

Figure 5: Establishments per capita vs. city population in California off-sale general alcoholic beverages industry, 1998: cities with population greater than 25,000 (For the non-parametric estimate, a Gaussian kernel was used with an optimally chosen plug-in bandwidth of $h = cn^{-1/5}$ where $c = 1.5$ and n is the sample size.)

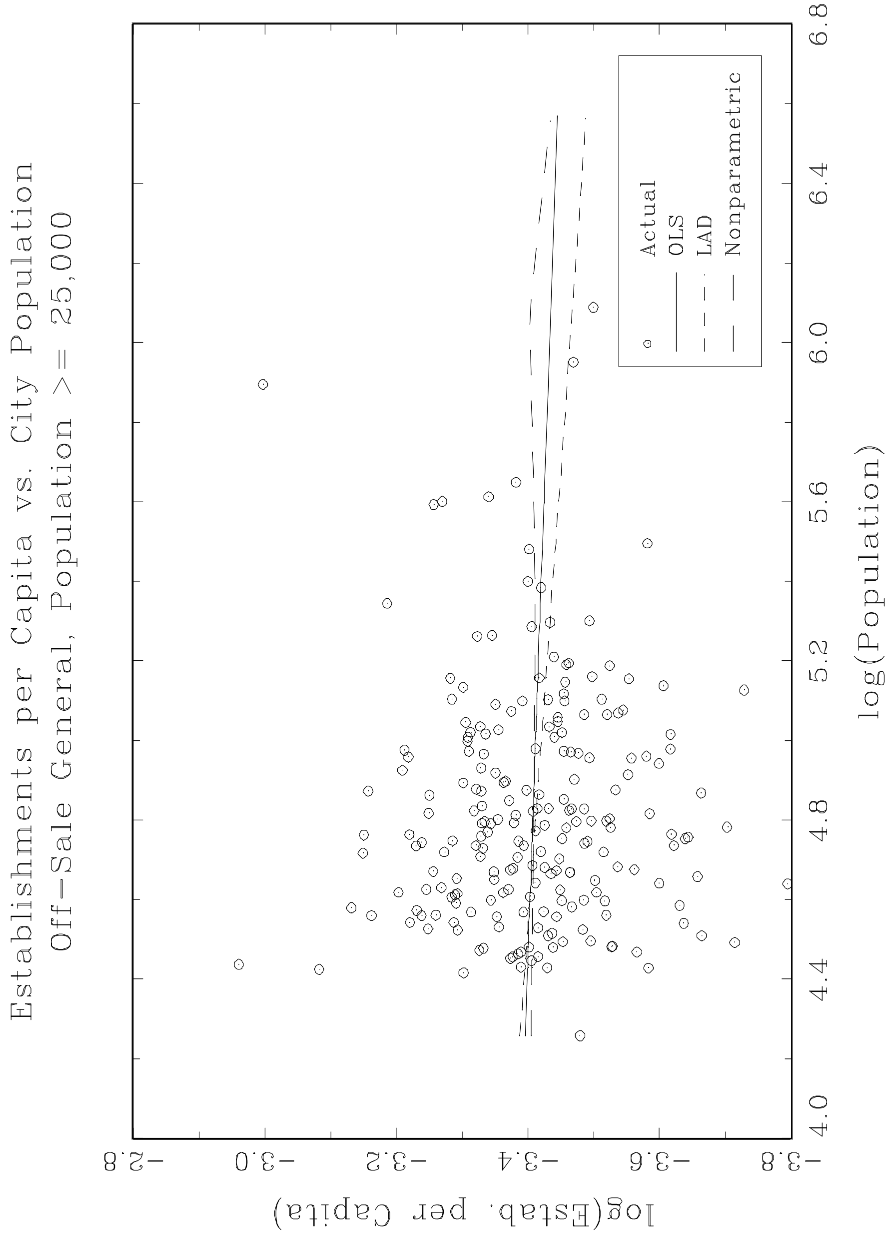

Figure 6: Statewide entry and exit rates during 1995-1998