Entry and Exit in Geographic Markets

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1 Introduction

The relationship between the size of a market and the competitiveness of the market has been of long-standing interest to IO economists. Empirical studies have used the relationship between the size of a geographic market, measured as market population, and both the number of firms in the market and the average sales of the firms to indirectly draw inferences about the degree of competition in the market. A second line of inquiry has relied on dynamic models that make predictions about how the impediments to new firm entry, such as the magnitude of sunk entry costs, affect the patterns of firm turnover in order to infer the extent of competitive pressure from potential entrants. In this paper we estimate a structural model of firm entry and exit developed by Pakes, Ostrovsky, and Berry (2004) that can sort out three separate components of the competitive process. Using the model we can identify the effect of an increase in the number of firms on the profits of firms in a market, and the magnitudes of entry costs and firm scrap values that are key determinants of the degree of firm turnover.

We use the empirical model to analyze the entry and exit patterns of establishments in two medical-related service industries, dentists and chiropractors. Using micro data collected as part of the Census of Service Industries, we measure the number of establishments and the flows of entering and exiting establishments for more than 750 small geographic markets in the U.S. at five-year intervals over the 1977-2002 period. In addition to measuring the entry and exit flows, we are able to measure the average revenue and average profits of establishments in each geographic market and year. We use this data to estimate a three equation model that describes establishment profits, the rate of entry, and the rate of exit across the geographic markets and time periods. Preliminary results indicate that the direct effects of an increase in the number of establishments on average profits are not strong. The effect is statistically significant in the dentist industry, but has the expected negative effect in only the largest markets. The relevant parameters are not statistically significant in the chiropractor industry. Overall, it appears that most markets do not have significant competitive effects resulting from an expansion in the market size and number of producers. This could reflect a competitive effect that diminishes rapidly with increases in the number of firms, so that most markets we observe have converged to competitive outcomes. The entry cost and scrap value parameters are statistically significant for both industries and the magnitudes of the entry costs are fairly large. Overall, the model estimates provide support for the view that fully dynamic models are necessary to analyze industry entry and exit patterns.

The next section of this paper summarizes the empirical literature that focuses on the number of firms or entry/exit patterns in order to infer the degree of competition in a market. The third section summarizes the theoretical and empirical model of entry and exit developed by Pakes, Ostrovsky,and Berry (2004) that we estimate in this paper. The fourth section summarizes our data focusing on the measurment of entry and exit, profitability and the number of potential entrants in each geographic market. The fifth section reports the patterns of profitability and turnover in the dentist and chiropractor markets and econometric estimates of the profit function, entry cost distribution and scrap value distribution for each industry. The final section summarizes the paper and discusses area that require further work.

2 Market Size, Entry, and Exit

One line of inquiry in the empirical literature on entry and exit has focused on drawing inferences about market competition from observations on the number of firms, the average size of firms, and exogenous measures of market size (such as population). In a series of papers Bresnahan and Reiss(1987, 1991), developed the insight that, if entry of additional firms into a market compresses the average markup of all firms in operation, then the market size needed to support an additional firm will be larger than if this competitive effect was absent. Alternatively, markets with more firms would also have a larger average market size per firm. Using data on the number of firms and population for a cross-section of geographic markets in five different service and retail industries, Bresnahan and Reiss found that there was a positive correlation between the number of firms and population per firm over the range of approximately one to three firms in the market. As the number of firms increased beyond three, population per firm became constant and they interpreted this as evidence that the competitive effect of additional firms on average markups was exhausted. Campbell and Hopenhayn (2002) extended this insight, and studied the implications of increased market size on the average size of firms in the market. If larger markets are more competitive and hence have lower markups, then average firm size will be larger because the firms must sell more output to cover their fixed costs. Using cross-sectional data for geographic markets in 13 retail industries, they found that average firm size is larger in markets with larger population, which they interpret as evidence that there is a competitive effect of an increase in the number of firms. In contrast to Bresnahan and Reiss, they find that this competitive effect persists even when there are a large number of firms in the market.

Both of these papers are similar in that they focus on long-run equilibrium differences in the number of firms across markets with different populations. They also treat all firms within the market as homogeneous. Several papers have generalized the homogeneity assumption while maintaining the focus on differences in the equilibrium number of firms across markets of different size. In his study of airline markets, Berry (1992) allows for differences in fixed costs across firms and models the number of firms as a function of market and firm characteristics. He finds that average firm profits are negatively affected by an increase in the number of producers. Mazzeo (2002) and Seim (2002) both allow for different degrees of product differentiation across firms within the same market. Mazzeo models the number of high-quality and low-quality firms in a market and finds significant own and cross-effects of the number of firms of each type on the average profits of each type. Seim allows firms to differ in their geographic location within the market and studies the location decision of new firms. She finds that increasing distance between firms insulates them from the competitive effects.

One common factor that characterizes these studies is that they are all two-period models. In the first period each potential entrant makes a decision to participate in the market and then profits are realized in the second period. This framework misses the dynamics of the entry and exit process, particularly the simultaneous entry and exit that characterizes firm behavior in most industries. (see Dunne, Roberts, and Samuelson (1988) and Dunne and Roberts (1991) for evidence from U.S. manufacturing and Foster, Haltiwanger, and Krizan (2001) and Jarmin, Klimek, and Miranda (2003) for nonmanufacturing. Theoretical models that focus on the entry and exit process have been developed by a number of authors including Jovanovic (1982), Lambson (1991), Hopenhayn (1992), and Ericson and Pakes (1995). These models share the feature that the participation decision for incumbent firms differs from the decision for a potential entrant. When deciding to remain in operation, incumbents compare the expected sum of discounted future profits with the scrap value they would earn by liquidating the firm. In contrast, potential entrants compare the discounted future payoff from entering with the sunk entry cost they must incur at the time of entry. This distinction, which is based on the fact that the entry cost is irrelevant for incumbent producers but not for potential entrants, has important implications for the way that market structure, particularly the number of firms, responds to exogenous factors that change profits.

The presence of the sunk entry cost, particularly when combined with uncertainty about future market conditions, gives rise to hysteresis in market structure (Dixit

and Pindyck (1994)). For example, suppose there is an exogenous increase in market demand that raises profits sufficiently to induce potential entrants to pay the sunk cost and enter the market. If the market demand and profits then return to their initial levels those new firms may find it profitable to remain in operation rather than exit. The number of firms thus responds asymmetrically to changes in demand or, equivalently, the history of market structure, and not just current and future profit determinants, matters in explaining the current number of firms. This insight was incorporated into an empirical model of the number of firms by Bresnahan and Reiss (1994). Using data on the number of dentists operating in small geographic markets at two time periods, they found that market history was an important determinant of the number of firms, which is consistent with the sunk cost-hysteresis framework.[1]

Empirical models of firm entry and exit that are based on a fully dynamic framework must incorporate information on the scrap values faced by incumbents and the sunk costs of entry faced by potential entrants, as well as the profits earned by each participant in the market. There are very few empirical papers that have attempted to quantify these important variables. Das (1992) studies the closing decision of cement kilns and jointly estimates the operating profits, fixed costs, and scrap value of a kiln in a dynamic structural model of production. Her framework also allows for heterogeneity in profits at the level of the individual kiln. Das, Roberts, and Tybout (2002) estimate a dynamic, structural model of a domestic producer's decision to enter the export market. They estimate the distribution of sunk entry costs faced by potential entrants as well as the exporting profit function where the latter depends on both observed and unobserved sources of heterogeneity. They show how the entry costs affect the use of the entry/exit and quantity margins as the source of adjustment in an industry's export supply. While both of these models estimate these important dynamic parameters, they treat each firm as a price-taker in a competitive environment and do not incorporate any competitive effects of entry.

Most recently, Pesendorfer and Schmidt-Dengler (2003) and Pakes, Ostrovsky, and Berry (2004) have developed methodologies for estimating fully dynamic models when markets are imperfectly competitive. Pesendorfer and Schmidt-Dengler

[1] When it is also recognized that firms within an industry may be heterogenous in their underlying productivity or profitability, as the theoretical models referenced above do, then the presence of sunk costs has other implications for the size distribution of firms, the distribution of underlying productivity, and the productivity differentials between surviving and failing firms. Some of these implications of the sunk cost framework are examined empirically in Aw, Chung, and Roberts (2003).

use their methodology to estimate entry costs and profit functions for several retail industries. In this paper we utilize the model developed by Pakes, Ostrovsky, and Berry and apply it to data on the entry and exit rates of dentists and chiropractors across a large number of geographic markets. The goal is to estimate the competitive effect of an increase in the number of firms on average profits in a market, as well as parameters describing the distribution of sunk entry costs and firm scrap values.

3 A Model of Entry, Exit, and Profit

3.1 Theoretical Model

In this section we outline the dynamic model of entry and exit developed by Pakes, Ostrovsky, and Berry (2004). Using this model we will estimate the distribution of firm-level scrap values, the distribution of firm-level entry costs, and the firm's profit function. The latter gives the average profit earned by a firm in the market as a function of the number of firms in operation and market size.

The description of the model begins with a description of an incumbent producer's decision to exit or remain in operation after the current period. The payoff from exiting is the profit earned this period $\pi(n, z; \theta)$ plus the discounted scrap value they earn by exiting next period $\delta\phi$. In this case n is the number of incumbents in the market at the beginning of the period, z is an exogenous profit shifter that evolves as a finite-state Markov process, θ is a vector of profit function parameters, δ is the discount rate, and ϕ is the scrap value of the firm, which is treated as a random draw for each firm from an underlying distribution. The incumbent compares this with the sum of current profits and the continuation value from remaining in operation next period. The payoff from the incumbent's discrete exit/continue decision can be expressed as:

$$V(n, z; \phi, \theta) = max\{\pi(n, z; \theta) + \delta\phi, \pi(n, z, \theta) + \delta VC(n, z; \theta)\} \quad (1)$$

where VC is the expectation of the next period's realized value function. The expectation is taken over the possible number of exits x, entrants e, profit shifter z, and the scrap value ϕ. Defining $p^c(e, x|n, z, \chi = 1)$ as the incumbent's perceived probability of the number of entrants and exits given the incumbent itself is continuing, then VC can be written as:

$$VC(n,z;\theta) = \sum_{z'}\sum_{e,x}\int_{\phi'} V(n+e-x,z';\phi')p(d\phi')p^c(e,x|n,z,\chi=1)p(z'|z) \quad (2)$$

Each potential entrant faces a decision to enter at the start of the next period. The payoff from entering is:

$$VE(n,z;\theta) = \sum_{z'}\sum_{e,x}\int_{\phi'} V(n+e-x,z';\phi')p(d\phi')p^e(e,x|n,z,\chi=1)p(z'|z) \quad (3)$$

Similarly, $p^e(e,x|n,z,\chi=1)$ is defined as the perceived probability of the number of entrants and exits given that the potential entrant enters. The potential entrant enters if its value of entry is larger than its entry cost κ:

$$\delta VE(n,z,\theta) \geq \kappa \quad (4)$$

Under a few additional assumptions, Pakes, Ostrosky, and Berry characterize a Markov Perfect equilibrium in this model. They assume that ex post entry profit for each firm only depends on the number of firms and the common profit shifter in the same market. Thus all firms in a market are identical in their level of profits. Profits can differ across markets as a result of additional idiosyncratic shocks as long as the shocks are *i.i.d.*. Further, the sunk costs and scrap values are *i.i.d.* over time and across markets. Incumbents and entrants know these distribution and their own realizations, but do not know the realizations of their competitors. Finally, they specify the distribution of the scrap value to be an exponential distribution with parameter σ. They show that the continuation and entry values $VC(n,z;\theta,\sigma)$ and $VE(n,z;\theta,\sigma)$ at the state (n,z) can be written as functions of current profits, the probability of exit, and the transition matrix for future states. Specifically, in matrix form, the continuation value for a firm is:

$$VC(\theta,\sigma) = M_c[\pi(\theta)+\delta\sigma p^x] + \delta M_c VC(\theta,\sigma) \quad (5)$$

where M_c is the incumbents' perceived transition probabilities for the state variables (n,z) and p^x is the probability of exit for each state. Solving for $VC(\theta)$ gives:

$$VC(\theta,\sigma) = [I-\delta M_c]^{-1} M_c[\pi(\theta)+\delta\sigma p^x] \quad (6)$$

Notice that the value of continuation depends on both the parameter σ that characterizes the distribution of scrap values and the set of profit function parameters θ.

They derive a similar equation for the value of entering:

$$VE(\theta,\sigma) = M_e(\pi(\theta) + \delta VC(\theta,\sigma) + \delta\sigma p^x) \tag{7}$$

where M_e is the potential entrants' perceived transition probabilities for the state variables.

The assumption of an exponential distribution for the firm's scrap value is crucial to writing VC in this recursive structure. The great advantage of this formulation is that, given estimates of M_c, M_e, p^x,and π we can calculate the value of continuation and entry without solving the dynamic entry/exit game. This greatly simplifies estimation of the model as developed in the next subsection.

3.2 Empirical Model

The goal of the empirical model is to estimate the vector of profit function parameters θ, the parameter describing the exponential distribution of scrap values σ, and a parameter a describing the distribution of entry costs. We will utilize a panel data set for a cross-section of approximately 750 geographic markets over 5 time periods. The state variables are the number of establishments in operation n and the level of population z in the market/year observation. Pakes, Ostrosky, and Berry (2004) develop several two-stage estimation methods for the the scrap value and entry cost parameters, assuming that the profit function parameters are known. Our estimator is a straight-forward extension of one of their estimators that includes estimation of the profit parameters as well.

The first step of their estimation method is to estimate the probability of exit $p^x(n,z)$ and the two transition matrices $M_c(n,z)(n',z')$ and $M_e(n,z)(n',z')$. All of these can be estimated by discretizing the values of the state variables (n,z) and calculating the empirical exit rates and transition frequencies from the market-level panel data.

Define the number of market-year observations observed in the discrete state (n,z) as $T(n,z) = \{t : (n_t, z_t) = (n,z)\}$.Consistent estimators of the three matrices can be constructed from the observed number of exits and transition patterns for each state. The estimators are:

$$p^x(n,z) = \frac{1}{\sharp T(n,z)} \sum_{t \in T(n,z)} \frac{x_t}{n} \tag{8}$$

$$\hat{M}_c(n,z)(n',z') = \frac{\sum_{t\in T(n,z)}(n-x_t)1_{[(n_{t+1},z_{t+1})=(n',z')]}}{\sum_{t\in T(n,z)}(n-x_t)} \tag{9}$$

$$\hat{M}_e(n,z)(n',z') = \frac{\sum_{t\in T(n,z)}(e_t)1_{[(n_{t+1},z_{t+1})=(n',z')]}}{\sum_{t\in T(n,z)}(e_t)} \tag{10}$$

Equation (9) is very intuitive as it describes an incumbent's probability of transiting from state (n,z) to state (n',z'), conditional on not exiting in state (n,z). Similarly, (10) describes an potential entrant's probability of transiting from state (n,z) to state (n',z'), conditional on entering in state (n,z). All of the estimators above converge to the true value provided that $\sharp T(n,z) \to \infty$.

Using these first-stage estimators we can now construct estimates of the entry and continuation values $\hat{VE}$ and $\hat{VC}$ by substituting them into equations (6) and (7) above. Given an estimate of the discount rate δ, only the profit function parameters θ and the scrap value parameter $\sigma$are unknown in equations (6) and (7).

The second stage of the estimation method estimates the parameters of the profit function, scrap value distribution, and entry cost distribution. Denote $\Gamma = (\theta, \sigma, a)$ as the full parameter vector to be estimated. We assume that the profit function for all firms in a market in state (n,z) can be written as:

$$\pi(n,z) = \theta_0 + \theta_1 z + \theta_2 n + \theta_3 (z/n) + \epsilon \tag{11}$$

The idiosyncratic shock ϵ is i.i.d. both across markets and over time.

Given the assumption that the profit function is linear in the parameter vector θ, then both $\hat{VE}$ and $\hat{VC}$ are linear functions of the parameters θ and σ. Given a set of parameter estimates for θ and σ, we construct $VC(\hat{\theta},\sigma)$ and $VE(\hat{\theta},\sigma)$ from the first step. The predicted probability of entry and exit for a market in state (n,z) is:

$$\hat{P}_e(n,z) = F^{\kappa}(\hat{VE}(n,z)|\Gamma) \tag{12}$$

$$\hat{P}_x(n,z) = 1 - F^{\phi}(\hat{VC}(n,z)|\Gamma) \tag{13}$$

Estimation will be based on a comparison of the profit, equation (11), probability of entry (12), and probability of exit (13), predicted by the model, with the average firm profit, entry, and exit rates observed in the data. We use a method of moment estimator that minimizes the difference between actual entry and exit rates and profit levels and the ones predicted by the model at each data point.

The moment conditions we use are:

$$\begin{aligned}
E(\hat{P}_x(n,z) - P_x(n,z)) &= 0 \\
E(\hat{P}_e(n,z) - P_e(n,z)) &= 0 \\
E(pr\hat{o}fit - profit) &= 0 \\
cov(\hat{P}_x(n,z) - P_x(n,z), z) &= 0 \\
cov(\hat{P}_e(n,z) - P_e(n,z), z) &= 0 \\
cov(pr\hat{o}fit - profit, z) &= 0 \\
cov(\hat{P}_x(n,z) - P_x(n,z), n) &= 0 \\
cov(\hat{P}_e(n,z) - P_e(n,z), n) &= 0 \\
cov(pr\hat{o}fit - profit, n) &= 0 \\
cov(\hat{P}_x(n,z) - P_x(n,z), z/n) &= 0 \\
cov(\hat{P}_e(n,z) - P_e(n,z), z/n) &= 0 \\
cov(pr\hat{o}fit - profit, z/n) &= 0 \qquad (14)
\end{aligned}$$

Pakes, Ostrovsky and Berry (2004) propose a set of possible estimators using different combinations of first and second stage procedures. However, in our Monte Carlo experiments as well as theirs, using the empirical Markov matrix in the first stage and a method of moment estimator in the second stage always tends to perform the best. Another feature to notice for our model is that we use 12 moments to identify the scrap value/entry cost parameters (σ, a) and profit function parameters θ simultaneously, while in Pakes, Ostrovsky and Berry (2004), they only use the first two moments to exactly identify (σ, a). The motivation behind this is that profits could have additional idiosyncratic shocks that are not observed by the econometrician, so to estimate the profit separately is not as efficient as to estimate it together with the dynamic parameters.

Obviously, there are limitations of the model when we apply it to real world data. There is no firm heterogeneity within a market except for the i.i.d scrap value shock for incumbents and the i.i.d. entry cost shock for potential entrants. Different market observations (over time or cross-sectionally) with the same (n, z) can only differ in

the level of profits due to idiosyncratic shocks. There cannot be any serial correlation or geographic correlation in the profit shocks across observations. In particular, this rules out market-specific component in the profit function error.

3.3 Simulation of the Model

To assess how well this method of moments estimator is likely to perform, we conduct a small Monte Carlo experiment before we apply the estimator to actual data.

We assume the current profit is determined by the profit function in equation (11). The exogenous profit shifter z represents market size and is assumed to follow a first order Markov Process, $z_{t+1} = \mu(1-\rho) + \rho z_t + u_t$ and u_t is $i.i.d$ normal with zero mean and standard deviation ν. The parameters (μ, ρ, ν) are chosen to match the empirical log population process we observe across the market. We then use "Tauchen's Method" to discretize the state space. Further, the entry cost κ follows a chi-square distribution with parameter a and the scrap value ϕ follows an exponential distribution with parameter σ. We also assume that the maximum number of firms ever active in a market is N and that in each market there are always E_p potential entrants.

Below is a detailed parametrization of the simulation model:

δ	discounting rate	.9
N	max number of firms	30
Zn	grids for demand shocks	15
Ep	potential entrants	5
μ	intercept of demand process	13
ρ	persistence of demand	.975
ν	s.d of demand process	.35

We use this model to generate data for a cross-section of 750 geographic markets over 5 time periods. This mimics the size of the data set we will use to estimate the model for the dentists and chiropractors. We choose the parameter values to replicate the average values of profit, number of firms, entry rate, and exit rate in the actual data. It also replicates the high degree of persistence in market size that is present in the data.

The following table shows the estimation results for 100 monte carlo repetitions:

Parameters	True Value	Mean estimates over repetitions	Standard deviation over repetitions
σ	2	1.866	0.1572
a	4	3.791	0.2395
θ_1	0.001	0.002	0.0032
θ_2	-0.00059	0.00002	0.0017
θ_3	-0.0068	-0.0018	0.0144
constant	0.1187	0.0862	0.0432

We also report the average value of profit, value of continuation, value of entry, probability of entry and exit and their predicted values below:

	average value	average predicted value
profit	0.1141	0.1129
value of continuation	3.8203	3.5354
value of entry	3.8202	3.5526
probability of entry	0.5131	0.5131
probability of exit	0.1463	0.1452

Although we have only a small number of simulations, the results indicate that the scrap value and entry cost parameters are both within one standard deviation of the true values. The profit function parameters, however, are not very precisely estimated. We will come back to this issue in the estimation results below.[2]

[2] Pakes, Ostrovsky, and Berry (2004) perform a number of simulations of this two-step method of moments estimator treating the profit function parameters as fixed. The estimator very accurately reproduces the true values of the scrap value and entry cost parameters. We have conducted other simulations using different values for the profit function parameters θ than the ones reported here. The ability of the estimator to reproduce the true θ depends on the magnitude of the parameters. When we used larger values for the θ vector, the estimator was very accurate. We have reported these simulation values because the parameter values are close to the magnitude we observe for the estimated profit function. We are conducting further tests to better understand the imprecision of the estimator when the values of θ are small.

4 Data

4.1 Definition of the Market

The data used in the analysis come from US Census Bureau's Longitudinal Business Database (LBD). The LBD contains panel data on all employers in the United States from 1977 through 2002. In this paper, we focus on the measurement and analysis of the entry and exit dynamics in two health care related industries, dentists (SIC 8021) and chiropractors (SIC 8041). We chose these industries because they provide their services in relatively small local markets and because there are external data sources available that allow us to construct a number of different measures of the pool of potential entrants based on occupational and licensing data for dentists and chiropractors.

Throughout the paper, our analysis is limited to the years in which a Census of Services is undertaken - 1977, 1982, 1987, 1992, 1997 and 2002. We restrict the data in this way because we require data on the revenue and costs of establishments and these data are only available in the years in which a Census is undertaken. All establishment-level geographic and industry coding variables used in the definition of markets are taken from the Census of Services data as well.

In order to model the entry and exit behavior of local service industries, we focus our attention on small and isolated markets. We first identified a set of relatively isolated geographic markets by examining maps and locating cities and towns that are away from large population centers. This is similar in spirit to the approach taken by Bresnahan and Reiss (1991). The original list contained roughly 1000 locations in the 46 contiguous states excluding California and Rhode Island. We then matched this list of cities and towns to census geographic codes at the place level and merged them with place-level population data from US Census Bureau.[3] From this list, we identified a set of smaller markets (populations less than 50,000) with consistent place coding in the Census of Services over time. This resulted in a set of 764 census places that will be the basis for the analysis in this paper. The geo-

[3]To construct estimates of the population in each place in 1977, we utilize data from 1970 and 1980 Decennial Censuses on population by place and interpolate the 1977 place-level population. For 1982, we use data from the 1980 Decennial Census and the 1986 County and City Data Book to interpolate the place-level population in 1982. For 1987, we interpolate the place population using data from the 1986 County and City Data Book and the 1990 Decennial Census. For the remaining years, we use the place-level estimates produced by the US Census Bureau Population Estimates Program.

graphic markets represented here cover a much wider range of market sizes than in the studies by Bresnahan and Reiss (1991,1994). The geographic markets are small to mid-sized towns and cities that vary in population from approximately 3,500 to 40,000 people. The markets are generally rural or semi-rural in nature and clearly under-represent markets in the northeast section of the US. For example, only 11 markets are identified in the New England states whereas Texas contains 57 markets.

4.2 Measuring Entry and Exit in Geographic Markets

To measure the entry and exit of establishments, we use the establishment links developed in the LBD. The LBD uses both Census Bureau establishment-level identification numbers and address matching algorithms to develop a panel data set that allows for the measurement of establishment entry and exit and the tracking of continuing establishments over time. Jarmin and Miranda (2002) discuss the measurement issues involved in constructing the LBD. The measure of entry used in this paper is the entry of an establishment into a geographic market. An entrant in a market is defined as an establishment that is not present in a market in period t but is producing in the market in period $t+5$ (the next Census year). [4] Similarly, an exit is defined as an establishment that is in a geographic market in period t and is not in that market in period $t+5$.[5] For each market, we construct the numbers of entering, exiting, and continuing establishments.

The top panel of Table 1 provides an overview of the entry and exit patterns at the national level for dentist and chiropractor offices over the five inter-census periods from 1977 to 2002. Both the number of dentist offices and chiropractor offices has grown steadily over the 25 year time period. This is especially true for chiropractors where the number of offices increases by 383 percent over the period. Overall, entry rates average around .28 over the five-year periods for dentists and almost .67 for chiropractors. The next column presents a measure of producer turnover. The ex-

[4] Some establishments in our data switch geographic codes over time. In particular, a continuing establishment will sometimes switch between a "rest of county" place code and a place code identifying a city. We do not allow these within-county changes in geographic coding to generate entry and exit. In these cases, we always fix the place code to the code that identifies the city and the treat the establishment as continuing in that location over time.

[5] The vast majority of entering and exiting establishments are denovo entrants or establishments that are closing, respectively. This is not true in other industries such as manufacturing where a substantial fraction of establishments may enter and exit a market by changing their product mix. Such product mix shifts are rare in the dentist and chiropractor office data.

cess turnover rate is defined as the sum of the entry and exit rate minus the absolute value of the net entry rate. The excess turnover rate attempts to control for the effect of changing market size or growth on the number of firms operating. It measures the amount of turnover in the number of producers in excess of that required to accomplish the observed net change in the number of producers. In comparison to the previous research that documents establishment entry and exit in the manufacturing sector (Dunne and Roberts (1991)), the excess turnover in dentists is significantly less than what occurs in manufacturing and excess turnover in chiropractors is of a similar magnitude.

The bottom panel of Table 1 shows the same statistics for our sample of 764 markets. Many patterns are similar to the national figures, though, they do differ in a number of important respects. Overall entry, exit and turnover rates of dentists' and chiropractors' offices are somewhat lower in the sample of local markets as compared to the national statistics. This is especially evident in the net entry statistics for dentists where net entry in the local market sample becomes essentially zero in the later periods but remains positive in the national data. Alternatively, the shifts in entry and exit patterns that occur over time in the national statistics occur in our sample of local markets. Periods with high national entry rates appear as high entry rate periods in the local market data.

4.3 Measuring Establishment Profits

In addition to measures of entry and exit, the empirical model requires a measure of the average profits earned by establishments in each geographic market and time period. We use information on revenue, payroll and legal form of organization from the Census LBD to construct a measure of establishment profitability. Unfortunately, the Census of Services does not collect data on expenses other than payroll for dentist and chiropractor offices and we rely on external data sources to estimate other expenses as a share of office revenue. For the offices of dentists, we use aggregate information from the American Dental Association (ADA) and the Census Bureau's Business Expenses Survey (BES) to estimate the share of other expenses in total revenue. These data sources report that expenses other than payroll are approximately 35% of a dentist's office revenues. For the offices of chiropractors, we rely on aggregate data from the BES for industry 804 (Offices of Other Health Practitioners) that contains chiropractors. Based on the BES data, we estimate that other expenses account for 37% of a chiropractor's office revenues.

In order to construct a measure of profit, two other important features of the industries must be accounted for. First, the tax status of a firm will affect how key data items are reported. For sole proprietors and partnerships, the owner receives compensation as net income and not as payroll. For these legal forms of organization (LFO), firm pre-tax profits (net income) are revenue minus payroll minus estimated expenses. For professional service organizations (corporations), the owning dentist(s)/chiropractors are typically paid part of their compensation as a component of payroll. We want to net out this compensation of dentists from payroll in order to have similar profit measures across firms with different LFO status. One can see clearly this difference in payroll reporting across LFO types in our data. For dentist offices in 1997, the ratio of payroll to revenue averages .25 for the sole proprietorships and partners and .49 for professional service organizations. A similar pattern holds for chiropractor offices (.18 vs .38). In order to adjust our profit measures for this feature in the data, we use aggregate tax data to measure the share of payroll going to the owners of incorporated firms. For dentist offices, we estimate the share of payroll going to officers of the corporation as 40% in the beginning of our time period, rising to 50% by the end of our time period. This rise in the dentists' share reflects the fact that dentists real compensation has risen substantially over time (American Dental Association (2003)). For chiropractor offices that file as professional service organizations, we estimate the share of payroll going to owners as 50% of total payroll across the entire time period. These adjustment to payroll make the ratio of adjusted payroll to revenue similar across LFO types.

The second issue we need to address deals with the fact that the number of owner-practitioners will vary across medical offices and thus the level of firm profits will vary with the number of owner practitioners. Based on 1997 dentist data, for sole proprietors the ratio of the number of owners to offices is one to one; for partnerships there are roughly 1.8 owner-dentists per partnership; and for professional service organizations there are roughly 1.35 dentists per practice. In order to make our profits comparable across offices of different scale, we normalize the profits per office by the average number of practitioner-owner across the LFO types. The same type of pattern occurs in offices of chiropractors and we construct a similar adjustment. Thus, our final measure of profit will be the profit per owner-practitioner.

In summary, we calculate profits per owner by using census data on establishment revenue and payroll with three adjustments. First, we estimate expenses besides payroll for each office based on aggregate tax data. Second, we adjust the payroll data

for corporations to net out the compensation to the owner-practitioners. Third, we adjust the per establishment profits to account for the fact that different types of firms will have differing numbers of owner practitioners. Finally, we convert all the profit data to 1983 constant dollars by deflating by the CPI. Using this method to construct profits for each office, we construct the average profit of an establishment in a market by taking the average of all offices producing in a market. The last column in each of the panels in Table 1 report mean profit per owner practitioner in 1983 constant dollars. For dentists, there is a trend toward increasing profits. This pattern and the magnitudes of profits are consistent with ADA studies of the revenues, expenses, and net income of dentists.[6] The data on chiropractors shows overall lower profits and lower profit growth in comparison to dentists. The data that represents the sample of local markets shows similar time-series patterns in the profits compared to national markets, but overall lower profit levels.

4.4 Measuring the Number of Potential Entrants

Our empirical model requires that we measure the number of entrants relative to the pool of potential entrants in each geographic markets. There are several ways to approach measurement of the entry pool and in this project we have used two different definitions. The first definition sets the number of potential entrants into a geographic market in a time-period equal to the maximum number of different establishments that appear in the market over time minus the number of establishments already in operation. The rationale behind this definition is that in each geographic market we observe all potential entrants being active at some point in time. In each time period the pool of potential entrants is the set of establishments that are not currently active. This definition has the advantage that it can be constructed using only data that is present in the Census LBD. It will also tend to covary positively with the population of the geographic market and the actual number of entering firms, resulting in an entry rate that is roughly constant across market sizes (this is summarized below). The disadvantage of this measure is that it is affected by the overall growth in market size and the number of establishments over time. Since the number of establishments has increased over time due to exogenous growth in

[6] Using data from the ADA on net income in 1986, we estimate that net income for dentists in private practice averaged about $67,700 in 1986 (measured in 1983 dollars) which is very close to our estimate in Table 1 for 1987. For 1997 we estimate the net income of dentists based on ADA sources at approximately $96,100 (in 1983 dollars). So our estimate for 1997 ($91,300) appears a little low by comparison.

population, this measure is likely to overestimate the number of potential entrants, and thus underestimate the entry rate, in the early years of the sample.

As an alternative to this measure we exploit data from the ADA, Federation of Chiropractic Licensing Boards (FCLB) and Bureau of Health Professionals (BHP) to estimate the number of non-owner practitioners in an area that could potentially enter each geographic market. In the case of dentists, industry sources report that new dentists offices are usually established by dentists that are working in existing dental practices. Few new graduates start new practices on their own right after dental school (Weaver, Haden and Valachovic, (2001)). Using these external data sources, we measure the number of dentists that exceed the number of dental offices in the county surrounding each of our geographic markets. We use this number as our estimate of the pool of potential entrants in each geographic market.[7] In the case of chiropractors, we use much cruder information from the FCLB and BHP on the ratio of the number of licensed chiropractors to the number of chiropractors' offices to construct the excess pool of entrants available to start new businesses. We also adjust the chiropractor pool for new graduates, since they are a relatively more important source of new entrants than dentists.[8]

5 Empirical Results

5.1 Cross-sectional Patterns With Market Size

We begin by summarizing the market-level patterns of entry, exit, and profitability, with particular emphasis on how the patterns differ across geographic markets of different sizes. Tables 2-5 provide summary statistics for dentists offices and chiropractors offices, respectively, across the 764 geographic markets and 5 time periods, a total of 3820 observations, used in our analysis. As the measure of market size

[7] We also increase the size of the potential entrant pool by a small percentage (5%) of the number of dentists in surrounding counties to account for the fact that there is likely to be some migration of dentists across county lines when establishing new practices.

[8] The number of chiropractors in the United States increased by more than 300% over the period 1977 to 2002, based on statistics from the Bureau of Health Professionals. This reflects the relatively high growth rate in new graduates, especially as it relates to the existing pool of practitioners. To account for this growth in supply, we increase our estimate of the pool of potential entrants, based on the ratio of licensed chiropractors to chiropractor offices, by roughly 25% in each period. This basically assumes that most new graduates consider opening a chiropractor's office after graduating from school.

we use the population in the geographic area and view this as the proxy for the level of market demand. We assign each of our market observations to one of 15 size categories based on market population. The market size cutoffs were chosen to give roughly equal numbers of observations per cell and the population cutoffs will tend to be further apart as the markets get larger. The same size cutoffs were used for both the dentists and chiropractors data. The average population and the number of market-year observations in each size category are reported in the second and third columns of Table 2 and 3. The remainder of Tables 2 and 3 focus on the cross-sectional patterns in the number of establishments and the level of demand, revenue, and profit per producer. Tables 4 and 5 focus on the patterns of entry, exit, and turnover.

Focusing on the summary statistics for dentists in Table 2, we see from the fourth column that, as market size increases, the number of firms also increases. More interestingly, the population per dentist office, column 5, is relatively constant across market sizes. On average, there are between 1400 and 1500 people per dentist office across the 15 market size categories. Comparing the smallest five size classes with the largest five classes, population per esstablishment rises from an average of 1405 to 1477, and increase of 5.3 percent. As discussed in section 2 above, Bresnahan and Reiss (1991) showed that one implication of an increase in competitiveness as markets get larger, is that the average number of customers per firm should rise. They found evidence of this pattern for dentists practices for small markets with 1-3 establishments. There is no evidence of this pattern in our data. One explanation is that our markets tend to have more establishments than the markets examined by Bresnahan and Reiss. Even in the smallest size category, which has an average population of 3,487 people, there is an average of 2.45 establishments in our data. Our markets may have already passed the size level at which the competitive effects of entry are exhausted.

The last two columns of Table 2 summarize the average revenue and average profit per establishment. Campbell and Hopenhayn (2002) have shown that an implication of increased competitiveness in larger markets is that average producer size will increase with market size and they find that average firm sales and market size are positively correlated in many of the retail industries they study. We find that both average establishment revenue and average establishment profits increase with market size. Comparing the averages over the five smallest and five largest size classes, we observe that average revenue per establishment rises 26 percent (from 162.5 to 204.7) and average profit per establishment rises 18 percent (from 60.7 to

71.6). However, given that we find virtually no increase in the average population per practice in large markets it is difficult to reconcile these findings with increased competition in large markets. More likely it reflects an increase in product differentiation among dentists as higher-priced specialists become more common in larger markets. This differentiation would partially insulate the dentists from the competitive effects of larger numbers and be reflected in higher prices and profits for firms. The increase in revenue with market size could also reflect higher costs in larger markets, but we believe this is unlikely. The profit measure does correct for the main source of costs for a dental practice, employee expenses, and the increase in the average value of the profits is roughly comparable to the increase in average revenue. If increased costs were the contributing factor we would observe less or no increase in average profits with market size. Overall, across geographic markets ordered by population, we observe roughly constant demand per establishment but increasing average revenue and average profits.

This pattern contrasts with the pattern reported in Table 3 for chiropractors. The main distinction is that for chiropractors there is a significant increase in the population per establishment as market size increases (column 5). The population per establishment does not increase monotonically across size classes but the upward trend is clear. The average for the five smallest size categories is approximately 5590 people per establishment, while the same number for the five largest size classes is 7363, an increase of 32 percent. This is consistent with a competitive effect of firm entry in larger markets. When compared with dentists, there are also fewer establishments per market. For half of the size categories, which covers markets with up to an average of 10,200 people, there are fewer than two chiropractors per market on average. Even the largest markets have only 4.88 chiropractors, on average, compared with 25.46 dentists. If there is a competitive effect of entry, which dies out after 4 or 5 firms are present in the market, then most of our markets will lie in the range where the effect would be present. For the chiropractors markets, it is also the case that average revenue per establishment and average profit per establishment rise with market size. The five largest size classes have average revenues that are 30 percent higher than the five smallest size groups and average profits that are 20 percent higher. Taken together, the substantial increases in population and revenue per establishment suggest a stronger competitive effect from the increase in the number of firms in this industry than in the dentist industry. The increase in average profits, however, is very similar to what occurs in the dentist markets and suggests that there is probably a role for increased product differentiation among chiropractors in the larger markets.

5.2 The Patterns of Market Dynamics

The cross-sectional patterns discussed in the last section summarize the relationship between market size, number of producers, and average firm profits but do not provide any direct evidence on the patterns of producer turnover. The dynamic theoretical models of industry evolution discussed above have emphasized a second pathway through which competition affects firm profits, in particular, the competition which is provided by the easy entry of new firms. A key parameter in these models is the sunk cost of entry. When this cost is low, potential entrants to a market are a significant source of competitive pressure. For example, in Hopenhayn's (1992) competitive framework, markets with high entry costs will be characterized by low rates of producer turnover. The sunk cost of entry acts as a barrier to entry that insulates the existing firms from competitive pressure. Industry profit and average firm value can also increase when entry costs are large.[9]

Tables 4 and 5 summarize the patterns of producer turnover in the dentist and chiropractor markets. The second, third, and fourth columns of Table 4 summarize the average number of establishments, exits, and entants in different size markets. All three variables increase monotonically with market size. Markets with larger populations have larger entry and exit flows. The next two columns express these flows as a proportion of the number of establishments in operation at the start of a time period. The market exit rate averages .20 across the size classes while the entry proportion averages .25 and these averages vary little across different size markets. A substantial amount of producer turnover occurs as the simultaneous entry and exit of establishments in the same geographic market. The excess turnover rate, reported in column 7, averages .285 across the size classes. This implies that, after controlling for the net expansion or contraction in the total number of firms in the market, the establishments undergoing a transition in or out of operation represent more than a quarter of the number of establishments in operation. The last two columns of Table 4 summarize the entry rate using two different definitions of the pool of potential entrants. The first definition, which uses the number of establishments ever observed in the market, generates an average entry rate of .22. This

[9] There is also a selection effect which depends on the level of the entry cost. When entry costs are high, more low-profit firms will survive and this will tend to reduce industry profit and average firm value. As long as this selection effect is not too strong, the industry profitability will be positively correlated with the magnitude of sunk entry costs.

is because the pool of potential entrants is closely tied to the number of firms in the market, which in turn is highly correlated with the number of entrants. The second definition, which uses information on the number of dentists in surrounding geographic areas, has a similar entry rate on average, but the entry rate increases significantly with market size. This occurs because, as the market size increases, the share of county population in the market rises. Thus, the number of excess dentists in the county (i.e., dentists practicing inside the county but outside the place) will have a tendency to be lower and the resulting pool of potential entrants will be smaller in larger markets.[10]

The summary statistics for the entry and exit of chiropractors are reported in Table 5 and differ in some significant ways from the patterns for dentists. Most importantly, the exit rate, entry proportion, and excess turnover rate are all larger for chiropractors. While the entry proportion will reflect the overall growth in the number of chiropractors during our sample period, the other two measures are less affected by this. In particular, the excess turnover rate averages .36 across the market size classes, which is higher than the .285 observed for dentists. The higher turnover among chiropractors could reflect lower entry costs in this profession. This would also explain their lower average profits per establishment relative to dentists, which was seen in Tables 2 and 3.

Overall, the profit, entry, and exit statistics suggest that a combination of competitive and technological factors interact to produce the market-level outcomes we observe and the importance of each factor differs between the two industries. There is some evidence, particularly for chiropractors, that an increase in market size results in an increase in competition as the number of establishments increases. To isolate this effect we will need to estimate the profit function for producers in each industry, where there is a role for both the number of firms in the market and overall market size to affect profits. The turnover statistics suggest substantial within-market turnover in both industries but a higher degree of turnover among chiropractors. One explanation for this difference is that dentists face higher sunk entry costs in establishing a business and this requires estimates of the entry costs and scrap values faced by a an establishment in each industry. Finally, the flows of simultaneous entry and exit indicate that heterogeneity exists across producers within the same market. This heterogeneity in outcomes could result from differences in the profit

[10] While the two entry rate variables give different patterns of entry, it is difficult to argue one is more appropriate than the other. In the analysis that follows we will estimate the entry and exit model separately using each measure and examine sensitivity of the results.

function, scrap value, or entry cost across producers. In the next section we report econometric results that attempt to isolate these separate effects.

5.3 Estimates of Profits, Entry Costs, and Scrap Values

Estimates of the underlying structural parameters are reported in Table 6 for the dentist and chiropractor industries. As seen in the simulation results reported above, there was some difficulty estimating the profit function parameters jointly with the scrap value and entry cost parameters. This problem was also present in the estimation with the actual data. To simplify the analysis, we estimated the parameters in two steps: the profit function parameters θ were estimated first using the four moment conditions in equation (14) that are based on the profit function errors (this is equivalent to using OLS to estimate the profit function), the scrap value and entry cost parameters, σ and a, were then estimated using the remaining moments in (14) that are related to the entry and exit rates.[11]

We focus first on the parameter estimates for the dentist practices. The two columns correspond to different definitions of the pool of potential entrants.[12] The profit function parameters are statistically significant. The coefficient on market size (S) is positive and the coefficient on the number of producers (N) is negative as expected. Because the coefficient on the interaction term (S/N) is negative, the derivatives of the profit function with respect to N and S will only have the expected sign for a subset of the markets. The derivative with respect to S will be positive as long as there are N>7 establishments in the market, which happens for approximately half of the observations. The derivative with respect to N will be negative only for the three largest market size categories.[13] Overall, the curvature of the profit function is not entirely consistent with expectations. Focusing on the two dynamic parameters, the mean of the distribution of scrap values is 5.78 million dollars. This compares with a mean continuation value VC of 3.81 million dollars. One the entry side, the mean entrant value VE is 3.82 while the mean entry cost is 13.19. Relative to industry data sources, this estimate of the startup cost of a new dental practice appear to be too high. When the definition of the entry pool is changed we observe

[11] We have not made any corrections to the standard errors reported in Table 6 to account for the two-stage estimation of the θ, σ, and a parameters. We will do this in future drafts.

[12] The two data sets differ slightly in the number of observations because 12 geographic markets were dropped under the second definition because the necessary data was not available.

[13] It requires that $S/N^2 < .081$ (where S is measured in thousands of people) and this only occurs for market size categories 13,14,and 15 in Table 2.

an increase in both dynamic parameters and in the average VC and VE as well. The main difference in the two definitions is that, under the second definition, the mean entry rate is lower, .145 versus .227, and thus a higher entry cost is needed to rationalize the lower entry rate. An increase in the entry cost increases the value of being in the industry for both incumbents and entrants. In order to explain the observed exit rate, which is the same in the two data sets, requires a higher mean for the scrap value distribution. The shift from the first to second data set nicely illustrates the way that the model jointly estimates the scrap value, entry cost, and VE and VC values from the observed entry and exit rates.

The parameter estimates for the chiropractor industry allow room for skepticism as well. None of the profit function parameters, except the intercept, are significant. The mean scrap value for a practice is 27.45 or 24.65 depending on the entry definition used. The entry cost has a mean of 33.4 or 30.77 depending on the entry definition. Estimates of both parameters appear to be too large to be credible. One consistency between the two sets of estimates is that the entry rate is lower for the second data set, .188 versus .212 on average, and the scrap value, entry cost, and continuation values are lower in this case. This is the same qualitative shift we observed with the dentist data sets.

There are several issues we will explore in the future as we work to refine and better understand the structural estimates. The underlying assumption that the scrap value follows an exponential distribution greatly simplifies the empirical model but appears to be fairly restrictive in our empirical applications. Once the exit cost becomes too large, further increases have virtually no effect on the probability of exit and the parameter estimates become very unstable. Pakes, Ostrovsky, and Berry (2004) show how to generalize this assumption to allow a more flexible distribution and we will pursue this in the future. A second restrictive assumption is that the profit shocks in a market cannot be serially correlated. This rules out the inclusion of market-specific effects in the profit function. In exploratory work, we observed that market effects are important in the profit function estimation and this may contribute to the relatively unsatisfactory estimates of the profit function parameters in this application.

6 Summary and Conclusion

In this paper we utilize micro data from the Census of Service Industries to measure the patterns of entry and exit for two industries, dental offices and chiropractor offices, over the period 1977 to 2002. The basic data reveal significant differences in the market structure and market performance as market size rises. In the dentist industry the population per firm, which is a proxy for the level of demand faced by each firm, is fairly constant as the market size increases, while the average revenue per firm and average profits per firm rises steadily. This appears most consistent with an increase in the degree of producer heterogeneity and/or product differentiation as market size increases. In contrast, for chiropractors there is a steady increase in population, average revenue, and average profit per firm as market size increases. The first two patterns are consistent with an increase in competition in larger markets, although the rise in profits still suggests a role for increased product differentiation. The patterns of producer turnover also differ between the two industries. The rate of excess producer turnover, the amount of entry and exit that occurs in excess of what is necessary to account for changes in the total number of firms in the market over time, is higher for the chiropractor industry. This finding, together with the finding that the average profit of firms in the industry is lower for chiropractors could be explained by a dynamic model in which the sunk cost of entry was lower for individuals that set up chiropractor pratices.

We then attempt to identify the sources of these patterns by estimating a structural model of entry and exit developed by Pakes, Ostrovsky, and Berry (2004). The model is extremely useful in simplifying the problems involved in estimation of fully dynamic models of entry and exit in imperfectly competitive markets. It allows for a direct competitive effect of the number of producers on the average profit earned by all firms in the market. It allows for heterogeneity among firms in a market in their scrap values and heterogeneity among potential entrants in their entry costs. Using this model we estimate parameters that characterize the distributions of these variables for each industry. Initial estimates of the model indicate higher entry costs for the firms in the chiropractor industry than for new dentists. This pattern is not consistent with our finding of a higher turnover rate among chiropractors but may be an artifact of the distributional assumptions we have made and which we are working to generalize.

One area that requires additional work involves the definition of the pool of potential entrants. Using external data sources from the ADA it may be possible to more accurately identify the number of dentists that are working in multi-dentist

practices. These are the primary source of new establishment entry in this industry. It should also be possible to develop external estimates of the cost of establishing a new practice that we could use to assess the reasonable of our parameter estimates.

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Table 1. Summary Statistics for the Offices of Dentists and Chiropractors

Period	National Statistics									
	Office of Dentists					Offices of Chiropractors				
	# of Establish-ments	Entry Rate	Exit Rate	Net Entry Rate	Excess Turn. Rate (a)	# of Establish-ments	Entry Rate	Exit Rate	Net Entry Rate	Excess Turn. Rate (a)
77-82	84,263	.375	.231	.144	.461	7,825	.946	.335	.611	.669
82-87	96,436	.294	.222	.072	.448	12,609	.872	.302	.570	.603
87-92	103,357	.237	.193	.044	.387	19,806	.615	.258	.357	.516
92-97	107,882	.228	.183	.045	.366	26,887	.426	.313	.113	.625
97-02	112,777	.263	.220	.043	.441	29,936	.496	.351	.145	.701
	Sample Statistics - 764 Geographic Markets									
	Offices of Dentists					Offices of Chiropractors				
	# of Establish-ments	Entry Rate	Exit Rate	Net Entry Rate	Excess Turn. Rate (a)	# of Establish-ments	Entry Rate	Exit Rate	Net Entry Rate	Excess Turn Rate (a)
77-82	6,025	.362	.229	.133	.459	913	.633	.326	.307	.653
82-87	6,832	.230	.207	.023	.415	1195	.607	.272	.335	.544
87-92	6,991	.180	.182	-.002	.359	1592	.451	.221	.230	.442
92-97	6,971	.187	.181	.006	.363	1960	.396	.260	.136	.518
97-02	7,010	.210	.211	-.001	.420	2227	.432	.316	.116	.631

(a) Excess Turnover Rate is the sum of the entry and exit rates minus the absolute value of the net entry rate.

Table 2. Demand, Revenue, Profits per Establishment - Dentist Offices

Market Size Category	Average Population	Number of Markets	Mean Number of Establishments	Population Per Establishment	Mean Revenue Per Establishment (a)	Mean Profits Per Establishment (a)
1	3,487	236	2.45	1423	140.9	54.5
2	5,105	297	3.90	1309	166.3	60.4
3	5,983	410	4.16	1438	158.0	60.4
4	6,998	385	4.98	1405	168.0	62.7
5	7,966	306	5.49	1451	179.6	65.3
6	8,948	231	6.41	1396	175.2	69.3
7	10,233	283	7.22	1417	167.5	61.6
8	11,720	262	7.90	1484	181.5	65.9
9	13,436	288	9.15	1468	186.0	67.0
10	15,935	293	10.95	1455	189.7	67.4
11	19,322	225	14.01	1379	199.3	70.4
12	23,781	207	15.82	1503	195.6	69.2
13	27,776	125	18.12	1533	197.1	69.1
14	32,220	119	23.01	1400	213.9	73.4
15	40,034	163	25.46	1572	217.8	75.7

(a) Thousands of constant (1983) dollars.

Table 3. Demand, Revenue, Profits per Establishment - Chiropractor Offices

Market Size Category	Average Population	Number of Markets	Mean Number of Establishments	Population Per Establishment	Mean Revenue Per Establishment (a)	Mean Profits Per Establishment (a)
1	3,487	236	.52	6706	91.9	40.9
2	5,105	297	.92	5549	109.6	45.9
3	5,983	410	1.01	5924	100.0	42.1
4	6,998	385	1.30	5383	104.1	44.8
5	7,966	306	1.82	4377	105.7	42.9
6	8,948	231	1.97	4542	106.7	43.3
7	10,233	283	1.78	5749	101.8	41.2
8	11,720	262	2.16	5426	110.7	45.9
9	13,436	288	2.42	5552	116.3	47.8
10	15,935	293	2.62	6082	118.4	49.4
11	19,322	225	2.99	6462	139.8	54.6
12	23,781	207	3.32	7163	132.1	51.2
13	27,766	125	3.75	7407	123.4	49.1
14	32,220	119	4.25	7581	140.6	54.3
15	40,034	163	4.88	8204	128.7	50.5

(a) Thousands of constant (1983) dollars.

Table 4. Establishment Turnover by Market Size - Dentist Offices

Market Size Category	Average over Market-Year Observations							
	Number of Establishments	Number of Exits	Number of Entrants	Exit Rate	Entry Proportion	Excess Turnover Rate	Potential Entry Rate1	Potential Entry Rate 2
1	2.45	.57	.59	.26	.27	.28	.21	.16
2	3.90	.80	.91	.21	.26	.23	.22	.19
3	4.16	.79	.90	.19	.23	.22	.21	.16
4	4.98	.96	1.08	.19	.24	.25	.22	.16
5	5.49	1.11	1.23	.20	.26	.26	.21	.17
6	6.41	1.60	1.42	.17	.25	.24	.24	.24
7	7.22	1.49	1.70	.21	.25	.27	.22	.24
8	7.90	1.70	1.90	.22	.25	.30	.22	.25
9	9.15	1.75	2.16	.19	.25	.29	.23	.25
10	10.95	2.16	2.65	.20	.27	.31	.23	.27
11	14.01	2.85	3.62	.21	.26	.34	.23	.27
12	15.82	3.27	3.65	.21	.24	.33	.22	.33
13	18.12	3.63	4.30	.20	.25	.32	.23	.30
14	23.01	4.59	4.73	.20	.20	.31	.22	.26
15	25.46	5.31	5.50	.21	.22	.32	.22	.35

Table 5. Establishment Turnover by Market Size - Chiropractors Offices

Market Size Category	Average over Market-Year Observations							
	Number of Establishments	Number of Exits	Number of Entrants	Exit Rate	Entry Proportion	Excess Turnover Rate	Potential Entry Rate1	Potential Entry Rate 2
1	.52	.13	.27	.25	.22	.19	.18	.10
2	.92	.26	.51	.29	.42	.34	.23	.17
3	1.01	.28	.47	.28	.39	.24	.22	.16
4	1.30	.41	.65	.30	.48	.35	.25	.18
5	1.82	.51	.77	.29	.48	.36	.25	.19
6	1.97	.48	.76	.24	.41	.28	.23	.18
7	1.78	.51	.93	.27	.49	.38	.27	.22
8	2.16	.65	1.04	.32	.54	.45	.30	.21
9	2.42	.65	1.05	.26	.52	.41	.25	.20
10	2.62	.72	1.27	.25	.54	.35	.26	.23
11	2.99	.83	1.49	.28	.67	.41	.26	.26
12	3.32	.84	1.52	.25	.57	.38	.28	.22
13	3.75	1.03	1.79	.26	.55	.43	.26	.22
14	4.25	1.19	2.21	.27	.60	.44	.26	.24
15	4.88	1.39	2.50	.28	.64	.44	.28	.25

Table 6. Estimates of Structural Parameters (standard errors in parentheses)

	Dentist Offices		Chiropractor Offices	
	Entry Pool 1	Entry Pool 2	Entry Pool 1	Entry Pool 2
Profit Intercept	.0643 (0.0011)*	.0641 (.0011)*	.0746 (.0026)*	.0753 (.0026)*
Market Size (S)	.00056 (6.89e-05)*	.00051 (6.95e-05)*	5.59e-05 (.00019)	.00014 (.00019)
Number of Estab. (N)	-.00029 (.00012)*	-.00025 (.00012)*	.00155 (.00089)	.0011 (.00091)
Pop. per Estab. (S/N)	-.0036 (.00051)*	-.0031 (.00054)*	.00117 (.00061)	.00094 (.00062)
Scrap Value Dist.	5.78 (0.290)*	13.55 (1.369)*	27.45 (1.617)*	24.65 (1.617)*
Sunk Entry Cost Dist.	13.19 (0.512)*	29.55 (2.435) *	33.41 (2.861)*	30.77 (2.075)*
Mean $\hat{\pi}$, $\hat{VC}, \hat{VE}$	.064, 3.81, 3.82	.064, 8.61, 8.60	.068, 15.70, 16.87	.068, 14.13, 15.22
GMM Obj.Function	0.080	0.080	0.862	0.859
Number of Observations	3820	3760	3830	3825

* significant at the .01 significance level.