

1 Motivation

- The majority of product markets that economists study are differentiated product markets
- Firms product similar, but not identical products
- Differentiation is often chosen strategically.
- This paper is a study of endogenous differentiation through location choice
- Video retailers- customer is typically within 3 miles of the store
- Strategic incentive for firms to disperse.

- The solution method is a brute force, nested fixed point algorithm.

1. Fix parameter values

2. Compute Equilibrium

3. Maximize likelihood function

- This method has two advantages: statistical efficiency and treatment of omitted variables
- Disadvantages: Coherency conditions (uniqueness of equilibrium) and computationally difficult.
- An alternative approach would be to use the estimators discussed in class.

2 The Model

- Endogenous where to put a video store
- \mathcal{F} is the set of potential entrants
- m is the market
- E is the number of actual entrants
- $l = 0, 1, \dots, \mathcal{L}^m$ is the location
- $l = 0$ is decision not to enter
- Other entry points come from discretizing map
- d_f is i 's entry decision, all entries are zero except for chosen l

- Firms are symmetric and profit takes the form:

$$\Pi_{fl}^m = \mathbf{X}_l^m \beta + \xi^m + h(\Gamma_{.l}^m, n^m) + \varepsilon_{fl}^n$$

- $\mathbf{X}_l^m \beta$ are cost/demand variables and observed proxies
- ξ^m is a market m fixed effect
- $\Gamma_{.l}^m$ parameters for the intensity of competition at location l
- n^m is a vector containing the number of firms in all locations l
- ε_{fl}^n is iid private information, profit shock

$$h(\Gamma_{.l}^m, n^m) = \sum_{k=1}^{\mathcal{L}^m} \gamma_{kl} n_k^m$$

γ_{kl} piecewise linear function of distance

- This simplifies payoffs to

$$\Pi_{fl}^m = \mathbf{X}_l^m \beta + \xi^m + \sum_b \gamma_b N_{bl} + \varepsilon_{fl}^n$$

2.1 Some Comments

- Remark: Why is the decision to enter static
- Remark: it might be natural to constrain model to symmetric equilibrium.
- This might simply analysis of coherency (uniqueness)
- Remark: Can we establish identification in the case of symmetric players.
- The previous identification result in class required asymmetries between agents.
- What about unobserved variables?

- This is the question asked in Brock and Durlauf's ReStud paper and Manski's ReStud paper on the reflection problem.

- Remark: Discretization involves a tradeoff between variance and bias
- Question: Can you consistently estimate the model parameters if the true data generating process is continuous?
- Estimation is done using a nested fixed point algorithm (we will discuss this more in a next section).
- The author discusses how to establish the uniqueness of the equilibrium in the appendix.
- View the model as a system:

$$\Psi(p, X) = p - F(p, X) = 0$$

- Sufficient to show dominant diagonal condition:

$$\frac{\partial \Psi_l(p, X)}{\partial p_l} > 0$$
$$\frac{\partial \Psi_l(p, X)}{\partial p_l} \geq \sum_{k \neq l} \left| \frac{\partial \Psi_l(p, X)}{\partial p_k} \right|$$

3 Data

- Video tapes are homogenous and inexpensive goods, price \$2 to \$4
- Dimensions of differentiation: rental period, inventory of tapes, drop off convenience and distance.
- Average customer only travels 3.2 miles to video store
- 151 cities with populations of 40,000 and 150,000
- Careful to deal with overlapping boundaries
- Locations in the model is population weighted centroid of census tracts

- Obvious question: what about zoning
- Ideally, we would have location specific random effects.
- This is probably too burdensom computationally
- Table 1 summarizes markets
- Note that average distance to competitor is 3.49 miles
- The model uses proxies for costs and demand
- Population, income per capita and business density (presumably a cost shifter for rents/zoning restrictions)

- Video store locations obtained from American Business Disc 1999.
- Remark: this is a potentially useful data source- 14 million business locations
- Advanstar Communications- Video Store Magazine
- SEC 10-K filings for locations
- Figure 2- dispersion of firms and proximity to city center

4 Results

- Table 4- parameter estimates
- Results seem consistent with intuition
- Population and income per capita coefficients have declining magnitudes that makes sense
- ψ parameters increase monotonically
- Parameters for unobserved heterogeneity seem important
- Why not compute the marginal effects endogenizing the equilibrium?

- Model fit- Why not goodness of fit statistic and/or percent correctly predicted?
- Remark: Looking at the parameter estimates, an asymmetric equilibrium may be more appropriate
- There are strong incentives for maximal differentiation where firms coordinate on which firm should enter which location
- A symmetric equilibrium rules out this possibility
- Also, firms may want to collude on locations
- A slight break in simultaneity assumption would probably change the equilibrium quite a bit.
- Simulations explore effects of city growth- area versus population.

- Figure 5 A- points are predicted entry.
- Solid line- entry assuming that distance bands are set to a constant
- Difference between the two lines is due to the fact that spreading out of firms is important for explaining entry.
- Figure 5B- set distance parameters equal to actual values.
- Quantifies strength of spatial competition.