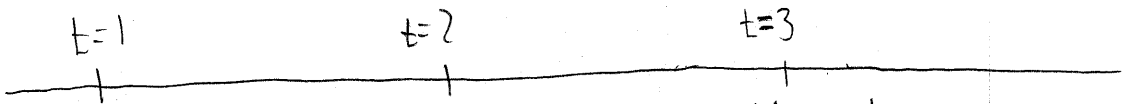
271 midterms

70-80	5
60-69	4
50-59	6
0-49	5

For more on theoretical strategic investment, see Tirole's book

Empirical strategic investment

1]



Incumbent chooses A at cost $c(A)$

Entrant observes fixed cost $E \sim f_E(E)$ Chooses In/Out at cost E to enter

Monopoly $\pi_1^{m*}(A)$

Duopoly $\pi_1^{D*}(A)$

Suppose A is not observable - non-strategic investment

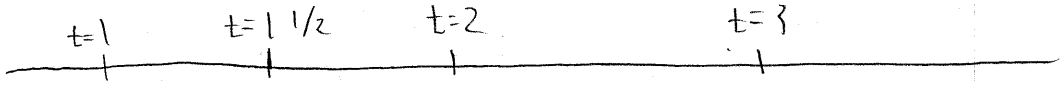
accommodation-only model:

2]

Entrant sees A

accommodation and deterrence

3]



Entrant sees A

In 1]

$$\pi_1(A, \underbrace{A^{e_2}}_{\text{entrant's belief about } A \text{ at } t=2}, A^{e_3}) = \overbrace{F_E(\pi_2^{D*}(A^{e_2}))}^{\text{prob that entry cost is} \leq \text{variable profits (expected)}} \pi_1^{D*}(A, A^{e_3}) + (1 - F_E(\pi_2^{D*}(A^{e_2})))\pi_1^{m*}(A) - c(A)$$

Note that changing A does not affect A^{e_2}, A^{e_3}.

FOCs: (nonstrategic)

$$(A): \quad C'(A^*) = F(\pi_2^{D*}(A^*)) \frac{\partial \pi_1^{cl*}}{\partial A}(A^*, A^*) + [1 - F(\pi_2^{cl*}(A^*))] \frac{\partial \pi_1^{m*}}{\partial A}(A^*)$$

where A^* is the equilibrium value.

FOCs: (accomodation) $A^{e_3} = A$

$$(A): \quad C'(A^*) = F(\pi_2^{D*}(A^*)) \frac{\partial \pi_1^{cl*}}{\partial A}(A^*, A^*) + F(\pi_2^{D*}(A^*)) \frac{\partial \pi_1^{cl*}}{\partial x_2}(x^*(A^*)) \frac{dx_2^*}{dA}(A^*) + [1 - F(\pi_2^{D*}(A^*))] \frac{\partial \pi_1^{m*}}{\partial A}(A^*)$$

(strategic variables)

FOCs: (accommodation and deterrence) $A^{e_2} = A^{e_3} = A$

$$(A): C'(A^*) = F(\pi_2^{D*}(A^*)) \frac{\partial \pi_1^{cl*}}{\partial A}(A^*, A^*) + F(\pi_2^{D*}(A^*)) \frac{\partial \pi_1^{cl*}}{\partial x_2}(x^*(A^*)) \frac{dx_2^*}{dA}(A^*) + [1 - F(\pi_2^{D*}(A^*))] \frac{\partial \pi_1^{m*}}{\partial A}(A^*) - \underbrace{[\pi_1^{m*}(A^*) - \pi_1^{D*}(A^*)] \frac{d\pi_2^{D*}}{dA} f(\pi_2^{D*}(A^*))}_{(4)}$$

(4): entry deterrence motive.
- if $\pi_1^{m*}(A^*) \approx \pi_1^{D*}(A^*)$, not much point in deterring entry
- $\frac{d\pi_2^{D*}}{dA}$ large $\Rightarrow$ investing has a bigger impact
- $f(\pi_2^{D*}(A^*)) \neq 0 \Rightarrow$ nontrivial density

Empirical literature focuses on determining which FOC is determining the equilibrium.

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approach 1: Structural approach: Test which FOC fits better.

Pros: • Most complete analysis of incentives and behavior.
• Only need data on one market.

Cons: • Investments have long-run effects (i.e. $\frac{dx_t^*}{dA_{t-j}} \neq 0$ for some j's s.t. $j > 0$)
• Need to estimate effects under monopoly and duopoly. (Need a counterfactual)
• Need $\frac{d\,\text{ProbEntry}}{dA}$

Example of approach 1: Kadiyali "Entry Deterrence and its Accommodation: A Study of the U.S. Photographic Film Industry" (RAND '96)
• For a number of years, only Kodak sold film in the U.S.

U.S. Film mkt 1970-1990
• Kodak was monopolist from 1970-1979
• Became duopolist in 1980 (Fuji entry)

Structural model with three equations:
• demand curve
• supply curve
• advertising equation

Demand elasticity = -0.64 ("must be pricing too low")
advertising effect on demand is small. ("must be advertising to deter entry.")

Approach 2: Estimate whether $\frac{dx_2^*}{dA} \neq 0$. If this is true, assume firms must invest strategically.

Example: Chevalier 1995 AER, "Capital Structure and Product Market Competition: Empirical Evidence from the Supermarket Industry."

- Leveraged buyouts (LBOs) - management decides it wants to buy the firm.
  - Need cash flow to pay bondholders.
  - Suppose switching costs on consumer side, Raise prices today to get higher current profits.
    - Not good for long-run profits
  - Dynamic collusion (Rotemberg-Saloner) - lower collusive prices
  - Have no cash for expansion
  - Can tell stories going both ways for prices.

There was an LBO wave in the 1980s. a pair of brothers attempted to take over many supermarket chains. In response, many supermarkets responded with LBOs.

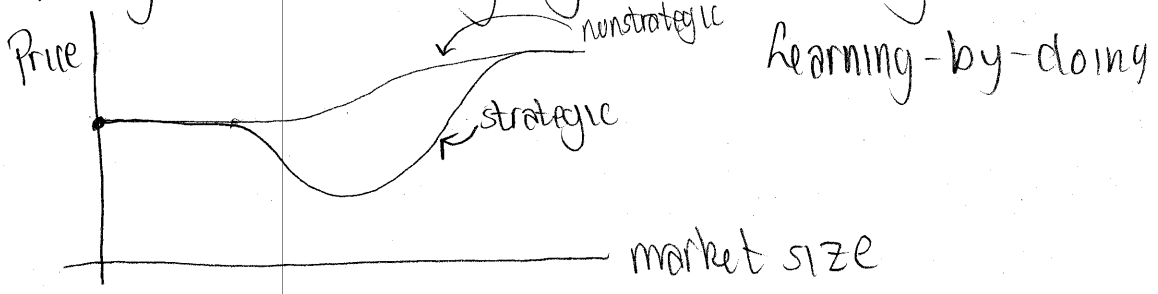
- 85 cities
  - $\%\Delta \text{ total \# stores}_{85\text{-}91} = \eta_0 + \eta_1 \Delta\text{demographics} + \eta_2 \text{concentration} + \eta_3 \underbrace{\text{deviation}_{85}}_{\text{if city had "too many" supermarkets in 85, could expect mean reversion}} + \eta_4 \text{LBO share}_{85} + \varepsilon$

- little results in this model
- Expansion of existing non LBO firms 85-91 $= \gamma_0 + \gamma_1 \Delta$ demographics $+ \gamma_2$ concentration $+ \gamma_3$ Deviations $+ \gamma_4$ LBO share $+ \varepsilon$
  - finds more expansion when LBO share higher
- New entry $= \gamma_0 + \gamma_1 \Delta$ demographics $+ \gamma_2$ concentration $+ \gamma_3$ Deviations $+ \gamma_4$ LBO share $+ \varepsilon$
  - finds more entry when LBO share higher.

Approach 3: Reduced form approach: look for qualitative/quantitative predictions and test these on the data.

Example: Ellison/Ellison "Strategic Entry Deterrence..."

- Strategic investment can give a non-monotone relationship between Δ and market-size
- non-strategic models $\Rightarrow$ monotone relationship.
- Drugs - deterring generic entry



- Direct effect - does larger market size raise benefit-cost ratio?
- Competition effect - larger market size makes duopoly more likely.

- 64 drugs - market size: revenue pre expiration
- strategic investment:
  - Journal advertising
  - Detail advertising
  - Product proliferation.
  - Pricing
- How to test if a curve is monotone?