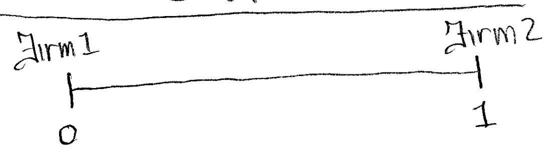
Fisher

- Static vs dynamic
  - Folk thm: anything can happen.
- Generalizing vs exemplifying theory
  - what can happen
  - io has moved away from generalizing theory.
- Collusion as central problem in io.
  - collusion takes a small role in this class
- Criticizes Nash solution concept. Why should firms play the Nash solution?
  - read some io books from the past. Nash eq. puts some discipline on the way certain topics are covered.

Bertrand vs Cournot - we won't deal with these much in this class. Cournot isn't a very good description of how most industries work. It isn't used as much now.

Product Differentiation:

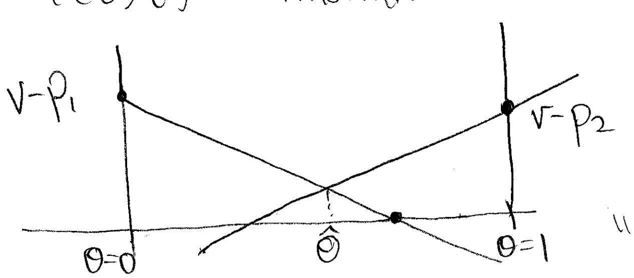


Continuum of consumers. Types $\theta \sim U[0,1]$.

$$u(\theta) = \begin{cases} v - p_i - d(\theta, i) & \text{if buys 1 unit from } i \\ 0 & \text{if doesn't buy} \end{cases}$$

$d(\theta, i)$ "mismatch cost":

Firm 1	Firm 2	
$\alpha\theta$	$\alpha(1-\theta)$	alternative parametrizations
$\alpha\theta^2$	$\alpha(1-\theta)^2$	



all $\theta \le \hat{\theta}$ buy from firm 1
$\theta > \hat{\theta}$ buy from firm 2.

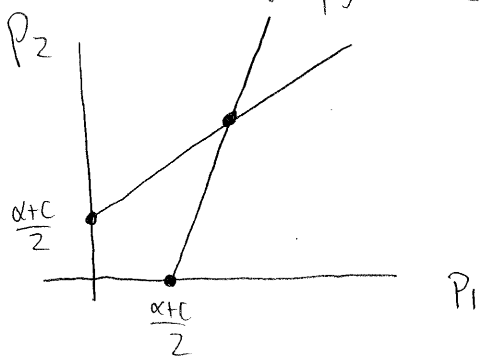
"Market is covered."

$\hat{\theta}$ solves $v - p_1 - \alpha\hat{\theta} = v - p_2 - \alpha(1-\hat{\theta})$

$$\Rightarrow \hat{\theta} = \frac{1}{2} + \frac{p_2 - p_1}{2\alpha}$$

Firm i: $p_i \in \underset{p}{\arg\max} \left\{ (p-c)\left(\frac{1}{2} + \frac{p_j - p_i}{2\alpha}\right)\right\}$

$$\Rightarrow BR_i(p_j) = \frac{1}{2}(\alpha + p_j + c)$$



Solving these equations simultaneously:

$p_1^* = p_2^* = c + \alpha > c$

$\Rightarrow \pi_1^* = \pi_2^* = \frac{\alpha}{2}$

as $\alpha \to 0$, this approaches Bertrand.

Empirical Work

consumer i if buy good j

$$u_{ij} = \begin{cases} v - \alpha p_j + \varepsilon_{ij} & \text{if } i \text{ consumes 1 unit of } j \\ \varepsilon_{i0} & \text{if } i \text{ consumes nothing or purchase outside good.} \end{cases}$$

Type: $\varepsilon_i = (\varepsilon_{i0}, \varepsilon_{i1}, \dots, \varepsilon_{iN})$

Carlton-Perloff (1985) examine this for $v_1 = \dots = v_N$ and ε's independent across i and j and no outside good.

Prop: The symmetric NE is $p^{*(N)} = c + \frac{1}{M(N)} \cdot \frac{1}{\alpha}$

where $M(N) = N(N-1)\int_{\mathbb{R}} F(\varepsilon)^{N-2} f(\varepsilon)^2 d\varepsilon$

where F is the cdf of ε_{ij}.

Note: The α is this model is the reciprocal of the α in the previous model.

Remark: Behavior is sensitive to the distribution of tastes.

Prop: If ε_{ij} has a support which is bounded above or $\lim_{\varepsilon\to\infty} \frac{f'(\varepsilon)}{f(\varepsilon)} = -\infty$, then $p^{*(N)} \to c$ as $N\to\infty$.

- In uniform distribution, $p^{*(N)} - c = O(\frac{1}{N})$
- This assumption holds for normal distribution.

Most common empirically: ε type 1 extreme value

"Logit" model $F(\varepsilon) = e^{-e^{-\varepsilon+\eta}}$

$$\Rightarrow \underbrace{S_j}_{\text{mkt share of good } j} = \frac{e^{V-\alpha p_j}}{\sum_{k=1}^{N} e^{V-\alpha p_k} \underbrace{+1}_{\text{if have outside good}}}$$

- This does not have the property that $\lim_{\varepsilon\to\infty} \frac{f'(\varepsilon)}{f(\varepsilon)} = -\infty$.

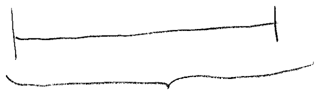
- In this model, $p^{*(N)} = c + \frac{1}{\alpha}\frac{N}{N-1}$
- The results are sensitive to assumptions about distribution of types.

These are all versions of $\frac{p-c}{p} = -\frac{1}{\varepsilon}$

- In Hotelling model, $\frac{p-c}{p} = -\frac{1}{\frac{dQ}{dp}\frac{p}{Q}} = -\frac{\overbrace{Q}^{=\frac{1}{2}}}{\underbrace{\frac{dQ}{dp}}_{=-\frac{1}{2\alpha}} p} = \frac{\alpha}{p}$

$\Rightarrow p - c = \alpha \Rightarrow p = c + \alpha.$

Everything depends on $\frac{dQ}{dp}$. Does it get bigger or smaller as N increases?



if this is bdd, then as N gets large, the distance b/t firms gets small $O(\frac{1}{N})$, so $\frac{dQ}{dp}$ gets very large.

Vertical Differentiation

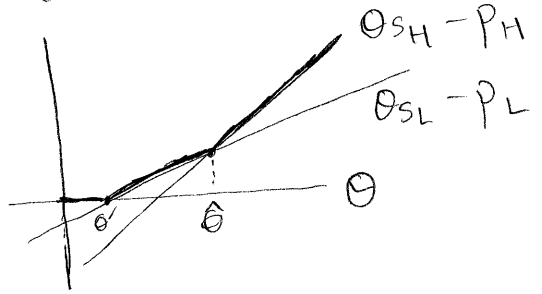
Two firms produce qualities s_L and s_H, $s_H > s_L$

Consumers have types $\theta \sim U[\underline{\theta}, \overline{\theta}]$

$$u(\theta) = \begin{cases} \theta s_i - p_i & \text{if buys from firm } i \\ & \text{if not buy} \end{cases}$$

- assume $\overline{\theta} \geq 2\underline{\theta}$ and that $c + \frac{\overline{\theta} - 2\underline{\theta}}{3}(s_H - s_L) \leq \underline{\theta} s_L$

consider the simultaneous move game: p_H and p_L are chosen



If $\theta > \hat{\theta}$, buy good H
$\theta' < \theta \leq \hat{\theta}$, buy good L
$\theta \leq \theta'$, buy nothing

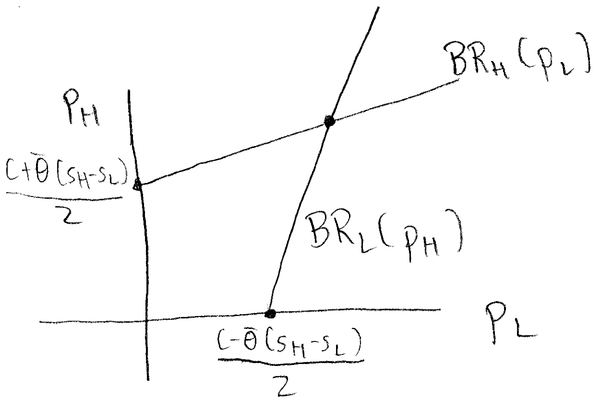
assume prices are such that $\theta' < \underline{\theta} < \hat{\theta} < \bar{\theta}$.

- "Market is covered"

Then $D_H(p_L, p_H) = \bar{\theta} - \hat{\theta} = \bar{\theta} - \frac{p_H - p_L}{s_H - s_L}$

since $\hat{\theta}$ solves $\hat{\theta}s_H - p_H = \hat{\theta}s_L - p_L$

also, $D_L(p_L, p_H) = \hat{\theta} - \underline{\theta} = \frac{p_H - p_L}{s_H - s_L} - \underline{\theta}$



$BR_H(p_L) = \underset{p}{\arg\max}\,(p-c)\left(\bar{\theta} - \frac{p_H - p_L}{s_H - s_L}\right)$

$\Rightarrow BR_H(p_L) = \frac{1}{2}(p_L + c + \bar{\theta}(s_H - s_L))$

$BR_L(p_H) = \frac{1}{2}(p_H + c - \underline{\theta}(s_H - s_L))$

$p_L^* = c + \frac{\bar{\theta} - 2\underline{\theta}}{3}(s_H - s_L) \geq c$ since $\bar{\theta} \geq 2\underline{\theta}$

$p_H^* = c + \frac{2\bar{\theta} - \underline{\theta}}{3}(s_H - s_L) > c$

<u>Roughly</u>:

1. $p > c$ usually
2. price increases in $\bar{\theta} - \underline{\theta}$ and in $s_H - s_L$

<u>Next week:</u> Empirical paper by Bresnahan about the auto industry

Switching Costs

Endogenous taste differences.
Two periods : $t=1,2$
Disutility of consuming from different firm at $t=2$.
(with or without differentiation) └ cost of s

No differentiation:

2^{nd} period: $p \geq c+s$ can be v or can be mixed eq.
eq $p^* = v$
MC of serving customer at $t=1$ is $c-(v-c) = 2c-v$
1^{st} period: set $p^* < c$ to get captive customers

(*) Paper below Bresnahan: Empirical
(*) Fudenberg and Tirole - price discrimination in second period.

Klemperer and Myerson next Wednesday