An Economic Theory Masterclass

Part III: Market Power

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Market Power

- Competitive paradigm assumes that price taking behavior
- With vastly many (a continuum) of firms or consumers, then this makes sense, since it is infeasible to impact them.
- If firms act knowing that they can impact prices —namely, have **market power**.
- We argue that market power is socially inefficient, and then predict how it changed the competitive outcome.

Barriers to Entry

- Q: Why only a few firms in an industry? A: barriers to entry!
- **Technical Barriers to Entry**
  - Roughly, *minimum efficient scale* (minimum of AC) is large
    - eg. aircraft makers like Boeing, Airbus, or airlines like Delta.
  - Ownership of *unique resources* is an important barrier to entry
    - Real estate agents own the "multiple listing service" (MLS)
    - De Beers, world diamond cartel, owns mineral deposits.
    - Fancy ski resorts own a special location.
  - *Special knowledge* of low cost technique by few firms like Coke.

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John Pemberton

Special recipe?
9mg cocaine per glass

Barriers to Entry

- **Network externalities** sustain Facebook, Twitter (MLS?)
- **Legal Barriers to Entry**
  - Government may create a monopoly, via a *franchise* (gas, electric, phone, utility, post office, cable) with large fixed costs
  - FDR's *National Industrial Recovery Act* sought to stop "ruinous" / "cut-throat" competition by insisting on code of fair competition" (Great Depression lasted over a decade)
  - To prevent theft of intellectual property, it gives a firm a *patent* or give someone a *copyright* to a book.
- **Legal or mystery cartel**
  - Colleges empower the NCAA with a collegiate sports franchise.
  - Eyeglass cartel: Luxottica owns LensCrafters, Pearle Vision, Sears Optical, Target Optical, 80% of brands.
- **Noncompete Agreements**
  - 18% of workers are bound by a noncompete agreement
  - Jimmy Johns prohibited its sandwich makers from working for a competitor within two miles of a Jimmy Johns for two years.
- **Illegal Barriers to Entry**
  - Criminal enterprises guard their sales territory by violence.

Monopoly

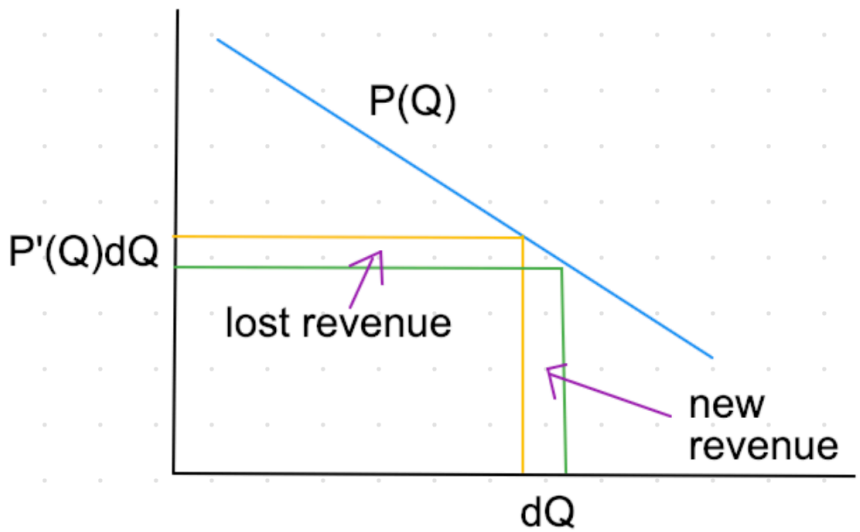
- Profits if seller faces a downward sloping demand curve:

$$\Pi(Q) = R(Q) - C(Q) \equiv P(Q)Q - C(Q)$$

- FOC:

$$R'(Q) = P(Q) + \boxed{\text{QP'(Q)}} = C'(Q)$$

- gains P on last units & loses $|P'(Q)dQ|$ on inframarginal units
- $\not\exists$ $\boxed{\text{boxed term}}$ in $R'(Q)$ with perfect competition
- This privately profitable consideration is socially inefficient: transfer of firm profits to consumer surplus is welfare neutral.
- *Monopoly quantity is less than the competitive level*
- SOC: $\Pi''(Q) \leq 0$
- i.e. MC is steeper than MR



Inverse Elasticity Rule

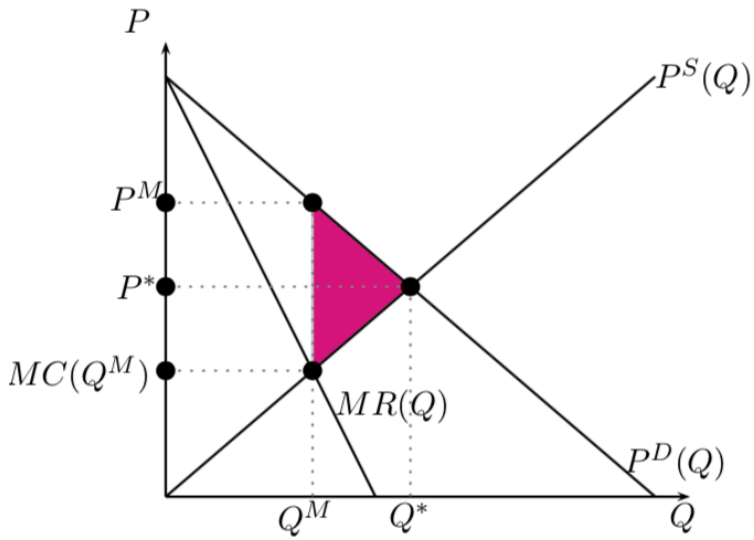
- Rewriting the FOC

$$P(Q)\left[1+\frac{QP'(Q)}{P(Q)}\right]=C'(Q)\Rightarrow P(Q)\left[1-\frac{1}{|\epsilon|}\right]=C'(Q)$$

- This brings us to the *inverse elasticity rule*

$$\text{Lerner index}=L=\frac{P(Q)-C'(Q)}{P(Q)}=\frac{1}{|\epsilon|}$$

- Mcdonalds varies prices to learn elasticities and set prices
- The *inverse elasticity* measures **market power**. It vanishes with perfect competition, and explodes with a captive market



How to Consult for McDonald's

- A *monopolist never sells for any price along the inelastic portion of his demand curve*, namely, where $|\epsilon| < 1$.
  - He can raise his revenue and reduce his costs by selling less:

$$R'(Q) = P(Q) + QP'(Q) = P(Q)[1 + 1/\varepsilon] < 0 \qquad \text{if} \quad 0 > \varepsilon > -1$$

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- The demand for Gaussian information is logarithmic for small unit prices: $Q(p) = -A \log p$ for $p > 0$ small
  - Its elasticity is $\epsilon = -Q'(p)p/Q = 1/Q < 1$, and thus it is never optimal to set a constant unit price.
  - Source: Keppo, Moscarini, and Smith (2008)

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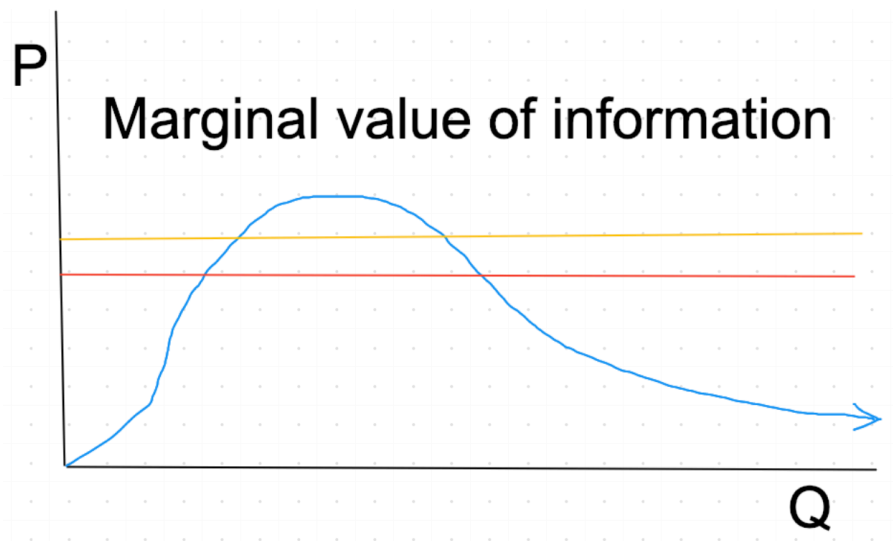
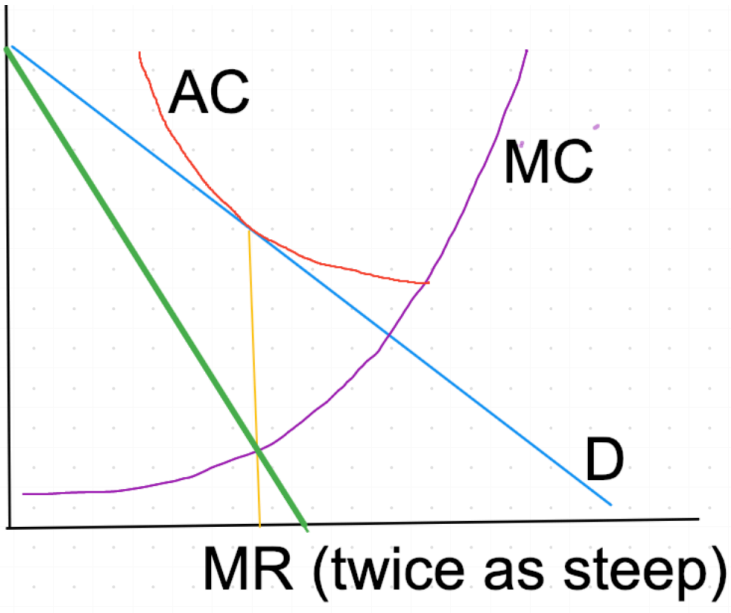
  - Can you guess the demand for information from this plot?



Profit versus Market Power

- Market power $\not\Rightarrow$ high profits
- Why? Profits also reflect fixed costs.
- *A firm can have high market power and yet zero profits.*

$\Rightarrow$ tangency of the average cost and demand curves.



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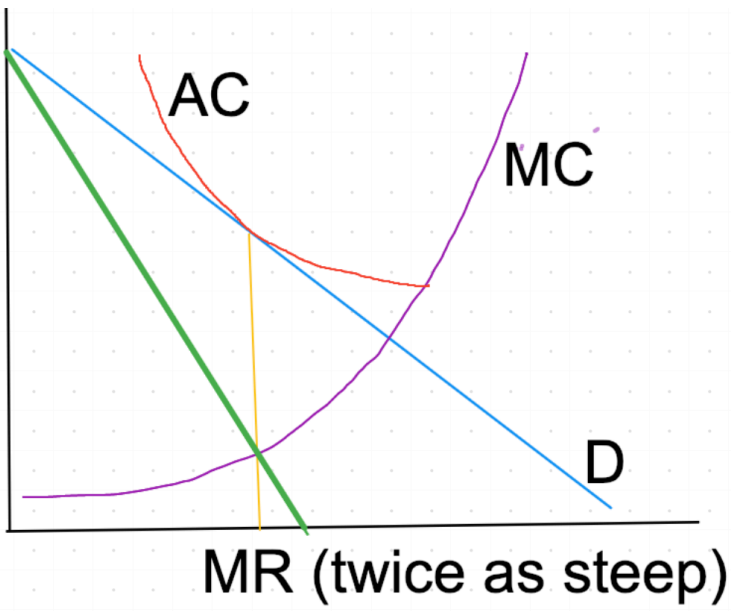


Monopsony

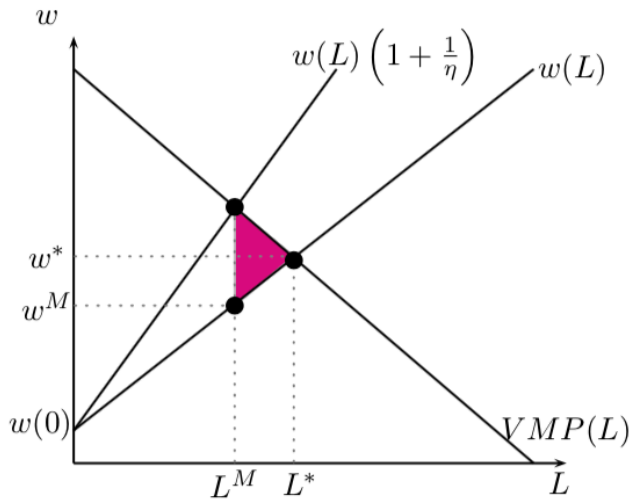
- Market power on the buying side reduces purchases.
- Assume a rising labor supply but a competitive output market
- Rising labor supply wage $w(L)$, namely with $w'(L) > 0$.
- Production function $f(L)$, but a fixed price p for output.
- FOC:

$$w(L) + Lw'(L) = Pf'(L)$$

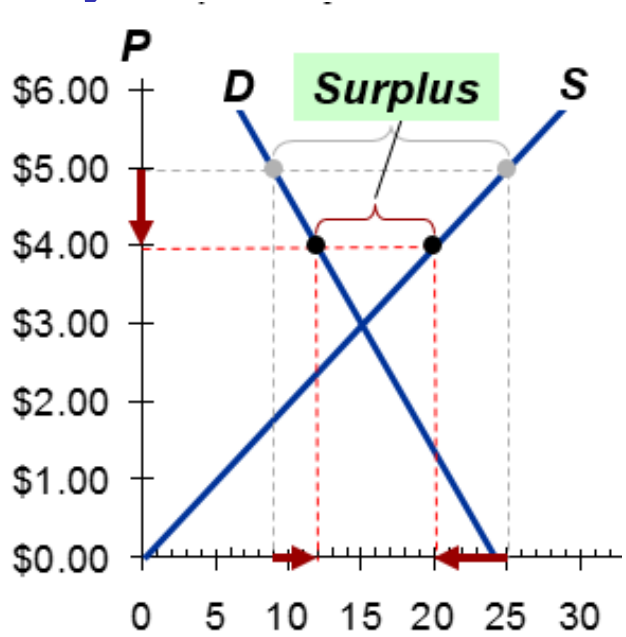
- Inverse elasticity rule:

$$VMP(L) = w(L)\left(1 + \frac{1}{\eta}\right) \quad \rightarrow \quad \frac{VMP(L) - w(L)}{w(L)} = \frac{1}{\eta}$$

- PS Joan Robinson coined the phrase monopsony (below)



Price Setting Monopoly



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$$\$4 \times 12 = \$48 > \$3 \times 15 = \$45$$

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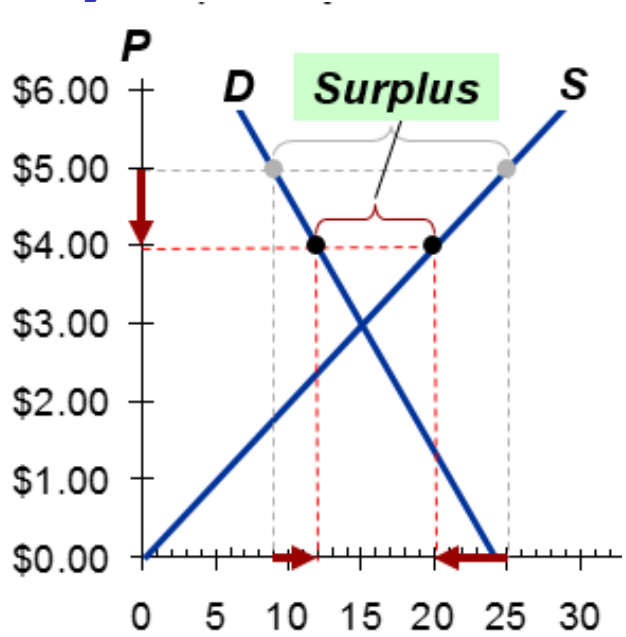

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- Theorem: Cartel sellers choose a higher than equilibrium price.
- Proof: The social planner maximizes $\int_0^Q [P_D(t) - P_S(t)]dt$
  $\Rightarrow$ Planner solves the FOC $P_D(Q^*) - P_S(Q^*) = 0$.
- The cartel maximizes $QP_D(Q)$
  $\Rightarrow$ Cartel quantity $\hat{Q}$ solves the FOC $P_D(\hat{Q}) + \hat{C}P'_D(\hat{Q}) = 0$.
- Clearly $Q^* > \hat{Q}$.

Cornering the Market

= Owning enough of an asset (but not all) to control the market, buying low and selling high

- Static models cannot make sense of this. It requires deception
- Anderson and Smith (AER, 2013) "Dynamic Deception" tell a dynamic private information story (sequential equilibrium)

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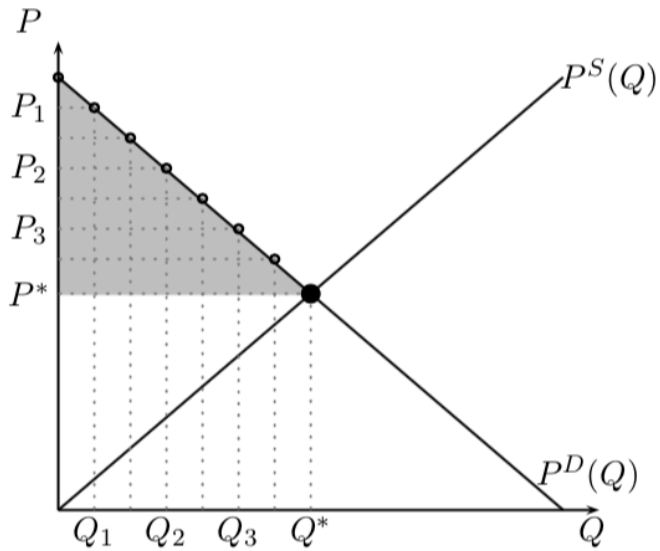
- Dynamic Duos Who Tried to Corner the Market
  - Black Friday (1869)
    - James Fisk and Jay Gould tried to corner the gold market on the New York Gold Exchange
    - Government gold hit the market, and ended it
  - Seigel and Kosuga tried to corner the onion market
    - They bought over 98% of all onions in 1956
    - Trading in the US onion futures market has since been banned
  - Silver Thursday, March 27, 1980
    - Hunt brothers tried to corner the silver market
    - bought over half of all silver silver on margin (now banned).
    - In four months, silver prices rose from \$11 / ounce in September 1979 to nearly \$50 before collapsing to below \$11
  - endings of "Trading Places" (1983) and "Wall Street" (1987) parallel the Waterloo legend

Price Discrimination

- Monopolists need not employ constant linear prices
- **Price discrimination**: charging different prices to different consumers, or different prices for different quantity demands
- **First degree price discrimination**: personalized prices
- This is efficient, as no positive surplus trades are eliminated.
- The seller wishes to maximize surplus, since she gets all of it!



Banning Price Discrimination

- Country A has *most favored nation* status from country B if A has the best tariff treatment that B awards any nation.
  - All 159 WTO members receive Most Favored Nation status
  - MFN precludes price discrimination.
- Discussion on healthcare often include MFN provisos!

Second Degree Price Discrimination

- **Second degree price discrimination**: seller charges a different price for different quantities consumed
  - **two part tariff**, involving a fixed fee for the right to trade at a linear price, like Disneyland tickets
  - quantity discounts (frequently flyer or buyer programs)

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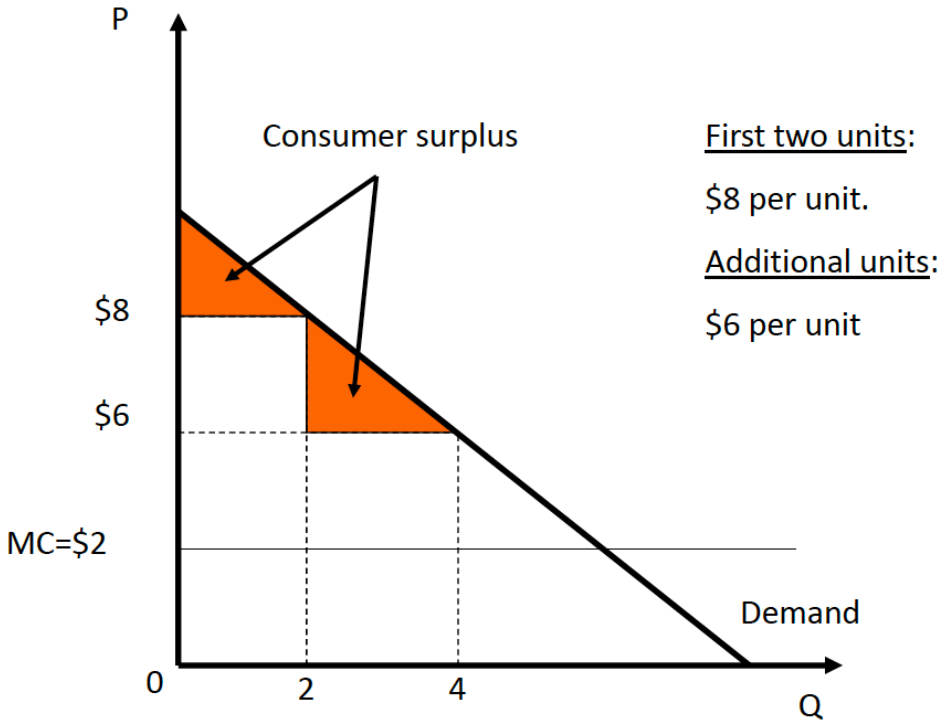
  - quantity discounts (frequently flyer or buyer programs)
  - Why? Second degree price discrimination captures some of the consumer surplus, due to strictly convex preferences



  - useful when different consumers cannot be distinguished

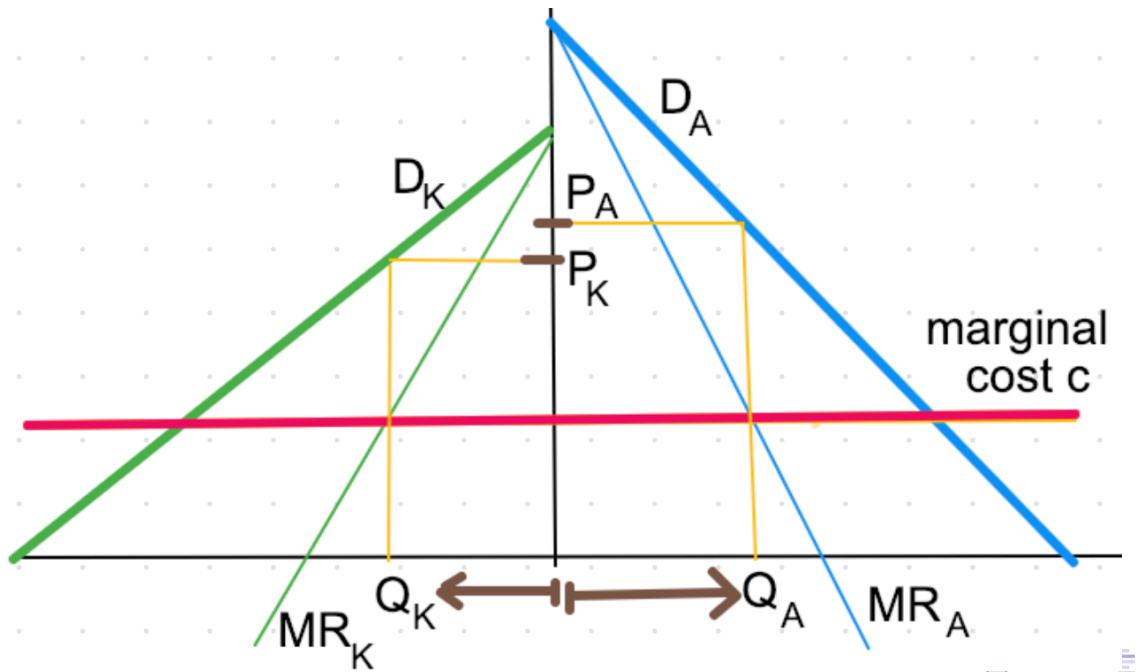
Third Degree Price Discrimination

- **Third-degree price discrimination**: a seller charges a different price to different consumer groups.
  - Even using grocery scan cards gives the store information to adjust prices, knowing who tends to buy what goods together $\Rightarrow$ combine second and third degree price discrimination
  - Sometimes it is ruled out: not allowed to charge different prices for men and women except for life insurance

Movie Ticket Pricing Example

- For example, imagine a constant marginal cost $c > 0$, and demand curves $P_A(Q)$ and $P_C(Q)$ for adults A and children C.
- With no interaction between these groups, separately apply our inverse elasticity rule for each group
- The more inelastic group is charged a higher price:

$$\frac{P_A}{P_C} = \frac{1 - |1/\epsilon_C|}{1 - |1/\epsilon_A|}$$



The Cartel as a Multiplant Firm

- $n < \infty$ firms face demand $P(Q)$, where $Q = \sum_{i=1}^{n} q_i$
- Cost functions $C_i(q_i)$ for firm $i = 1, 2, \ldots, n$
- Competition: every firm i solves $C_i'(q_i) = P$.
- If the firms act as a monopoly — an illegal **cartel** — they act as a multiplant firm, choosing outputs q_i to maximize joint profits:

$$\max_{\{q_i\}_{i=1}^{n}} \left(P(Q)Q - \sum_{i=1}^{n} C_i(q_i) \right) = \max_{\{q_i\}_{i=1}^{n}} \left(R(Q) - \sum_{i=1}^{n} C_i(q_i) \right)$$

- First order conditions for this common objective function:

$$R'(Q) = P(Q) + QP'(Q) = P(Q) + Q\frac{\partial P(Q)}{\partial q_i} = C_i'(q_i) \quad \forall i$$

- Cartel examples: OPEC (44% of world oil production), de Beers Diamonds (was 90% market share, now 33%), Quebec Maple Syrup, Sinaloa Drug Cartel

How Chiseling Erodes the Cartel

- But firms do not share a common objective function!
- Each firm sees that its marginal revenue $>$ its marginal cost:

$$R_i'(Q) = P(Q) + q_i \frac{\partial P(Q)}{\partial q_i} > P(Q) + QP'(Q) = R'(Q) = C_i'(q_i)$$

- So each firm wants to increase production, and marginally "chisel" at their quota.
  - Cartels keep awesome accounting production records to stop this, and these records in many cases have been found by law enforcement and used to prosecute the cartels
  - This idea, which brought down Al Capone, is the plotline of "The Untouchables" (1987) — with Sean Connery, Kevin Costner and probability professor Patrick Billingsley

How Chiseling Brings us to Cournot

- Marginal revenue falls in Q_i until no one wishes to chisel.

$\Rightarrow$ $P + q_i P'(Q) = C_i'(q_i)$ for all i, namely, the first order condition for

$$\max_{q_i} P(Q)q_i - C_i(q_i)$$

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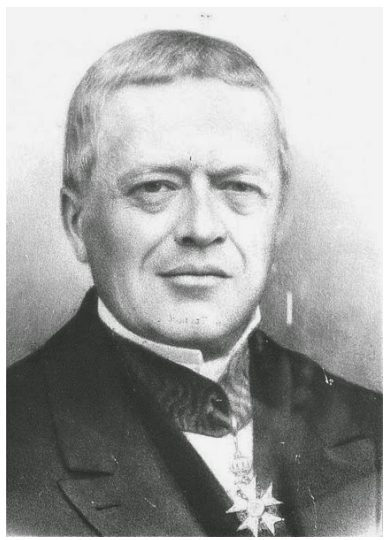
- Antoine-Augustin Cournot "Recherches sur les principes mathmatiques de la théorie des richesses" (1837)
  - first to define and draw a demand curve (without foundation)
  - profit-maximization: marginal cost equals marginal revenue
  - "Cournot Nash Equilibrium" — an accidental coincidence?



Example: Cournot Oligopoly Example

- Each of n firms has constant marginal cost $c \in (0, 1)$
- Demand $P(Q) = \alpha - Q$.
- **Competition**
  - $c = P(Q) = \alpha - \sum_{j=1}^{n} q_j \Rightarrow q_i = \frac{\alpha - c}{n}$, $P = c$
- **Cartel**
  - $\max_Q P(Q)Q - cQ = (\alpha - Q)Q - cQ$.
  - FOC: $\alpha - 2Q = c \Rightarrow Q = (\alpha - c)/2$ and $P = (2 - \alpha + c)/2$.
  - The price - marginal cost markup is $(P - c)/P = \frac{2-\alpha-c}{2-\alpha+c}$
- **Cournot Oligopoly**
  - Each firm i solves:

$$\max_{q_i} \left(\left(\alpha - \sum_{j=1}^{n} q_j \right) q_i - c q_i \right)$$

  - FOC $\alpha - 2q_i - \sum_{j \neq i}^{n} q_j = c$ for all i
  - A Foundation for Perfect Competition: Equilibrium quantity and price are approximately competitive with many firms:

$$q_n^* = \frac{\alpha - c}{n+1} \quad \text{and} \quad P_n = \frac{\alpha/n + c}{\alpha/n + 1} \downarrow c \text{ as } n \to \infty$$

Cournot Oligopoly Approaches Competition

- USA Antitrust history:
  - 1890 Sherman Act banned "every contract, combination, or conspiracy in restraint of trade" and "monopolization, attempted monopolization, or conspiracy or combination to monopolize"
  - 1914: Federal Trade Commission Act created the FTC
  - 1914 Clayton Act banned mergers / acquisitions that "substantially lessen competition" create a monopoly.
- Herfindahl index of market power is $H = \sum_i s_i^2 \equiv \sum_i (q_i/Q)^2$
  - FTC uses H, since industry profits are

$$\sum_i (p - c_i) q_i = \sum_i \frac{p - c_i}{p} p q_i = \sum_i \frac{1}{\varepsilon} \frac{q_i}{Q} p q_i = \frac{Q}{\varepsilon} p \sum_i s_i^2$$

where the second equality follows by the inverse elasticity rule

Stackelberg Quantity Leadership

- Cournot (1837): simultaneous actions and anticipates Nash
- Stackelberg (1934): sequential actions, and anticipates SPNE
- EXAMPLE:
  - Demand $P(Q) = \alpha - Q$ and marginal costs $c \in (0, 1)$
  - Leader moves, then follower.
- BACKWARD INDUCTION. We first maximize follower's profits:

$$\max_{q_F}(\alpha - q_F - q_L)q_F - cq_F \Rightarrow (\alpha - 2q_F - q_L) - c = 0$$

- Follower's best reply is $\beta(q_L) = \max(0, (\alpha - c - q_L)/2)$
- We then maximize leader's profits

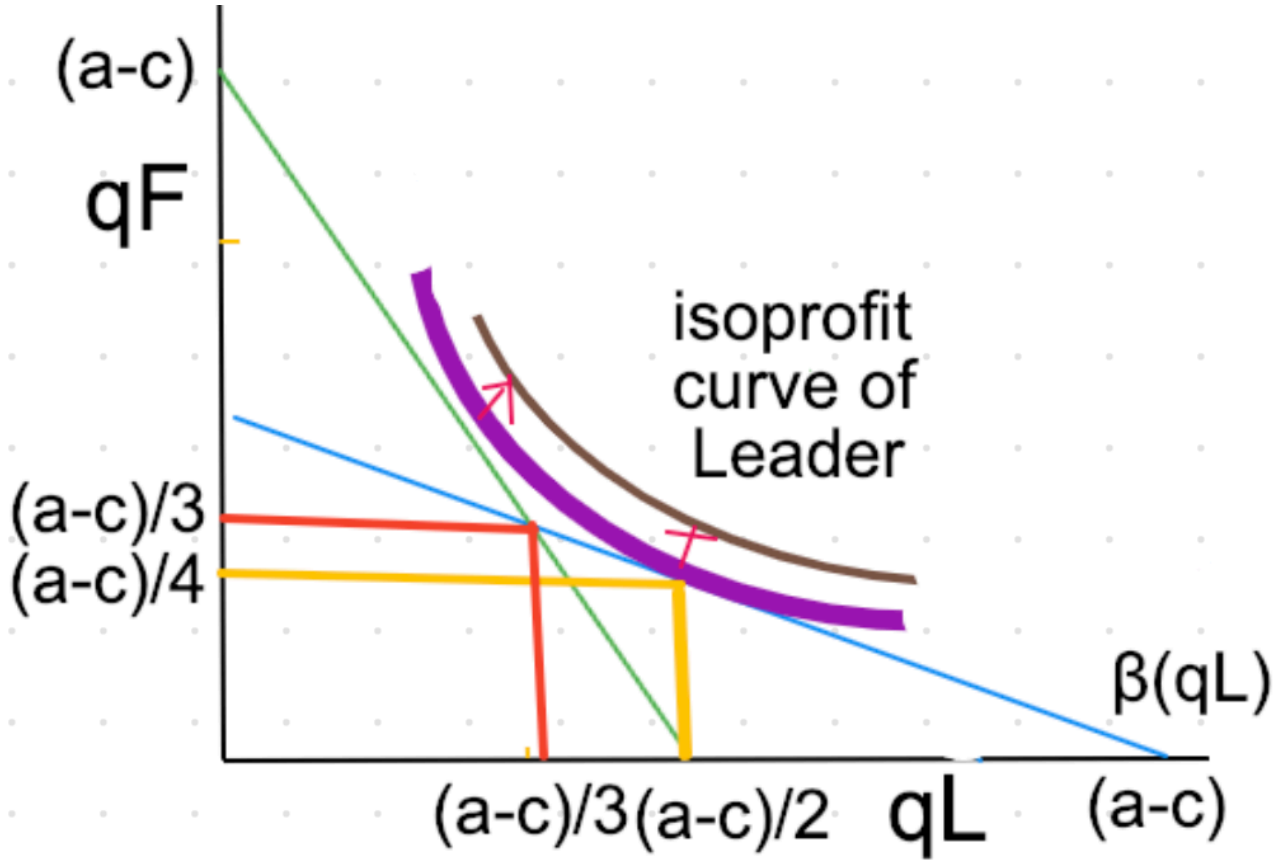
$$\begin{cases} (\alpha - q_L - \frac{\alpha - c - q_L}{2})q_L - cq_L & \text{if } q_L \leq \alpha - c \\ (\alpha - q_L)q_L - cq_L & \text{if } q_L > \alpha - c \end{cases}$$

- Leader's profits $(\alpha - c)q_L/2 - q_L^2/2$ have FOC $q_L^* = (\alpha - c)/2$

$\Rightarrow$ Follower's optimal output $q_F^* = \beta(q_L) = (\alpha - c)/4$

- $q_L^* + q_F^* = 3(\alpha - c)/4 > 2(\alpha - c)/3 =$ total Cournot output
- Market profits $(\alpha - c)^2/8 + (\alpha - c)^2/16 < 2(\alpha - c)^2/9$

Quantity Leadership with a Competitive Fringe

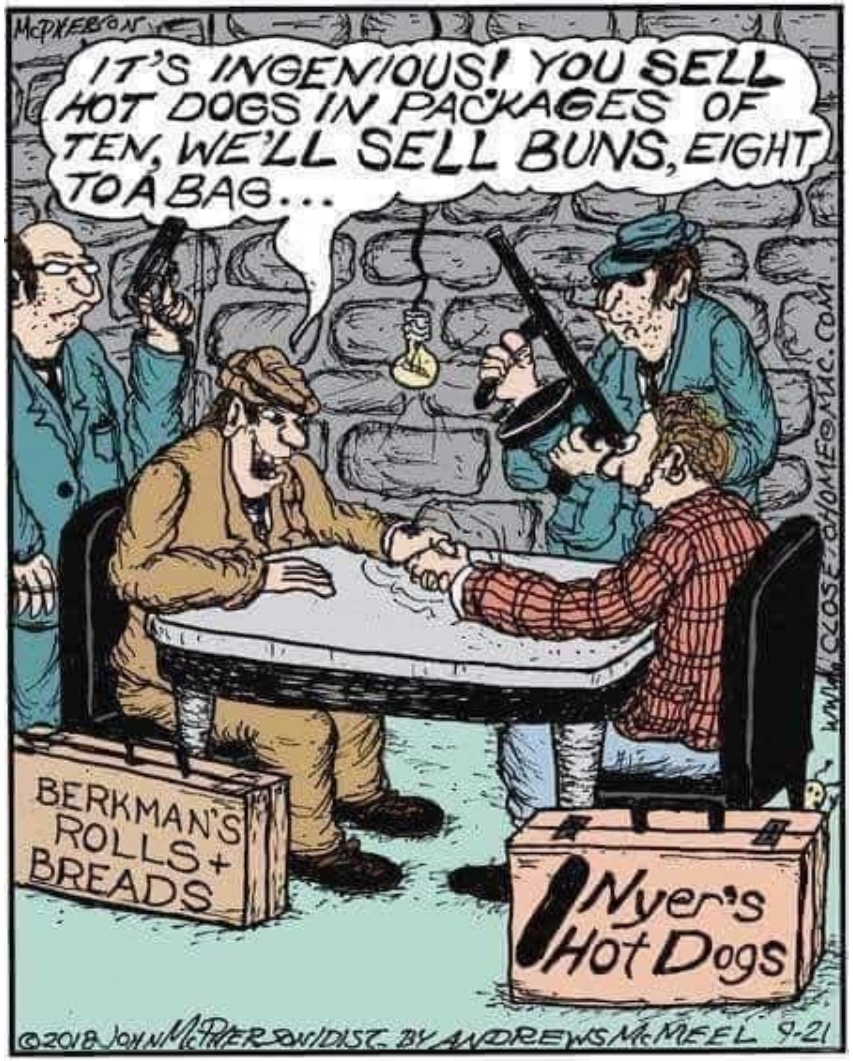


- Market games are quasi coordination game, and so have a first mover advantage
- Note: second mover might well be a competitive periphery that takes the residual demand!!

Bertrand and Bertrand Nash

- Bertrand price competition with homogenous goods: perfect competition with just two firms
- Kreps and Scheinkman (1983): In a two stage game, if firms first choose capacities, and then engage in Bertrand price competition, they will end up at Cournot.
- Bertrand-Nash price competition with heterogenous goods: firms can each earn profits
  - Deans seek to limit rounds of negotiations to avoid paying market wages
- What happens when monopsony buyer of labor buys from a union, i.e. a monopoly seller of labor?

Father of the Bride Collusion



On September 21, 1932, in a dank basement in Sheboygan, Wisconsin, one of the greatest conspiracies of all time is formed.

- Great Light Bulb Conspiracy