The Natural Monopoly Problem

Now that We are Better With Costs

- Show a natural monopoly in action and how it can harm society.
    - This is about welfare.
    - Efficient production and pricing produces negative profits.
- How a natural monopoly can transform to perfect competition with sufficient scale.
- How with small scale that markets could flip flop from monopoly to competition.
- Some highly theoretical solutions
    - Two-part tariff
    - Ramsey Pricing
    - Loeb-Magat
    - Franchise Bidding

More Realistic Solutions

- Regulation of some kind: Cost of service, incentive, Yardstick competition, etc.
    - These include elements of the "Highly theoretical solutions".
- Public Ownership

Why Realistic?

- Regulation is subject to adverse selection (asymmetric information) and moral hazard (Can change behavior after the fact).
    - Mostly about effort to reduce costs.
- Realized cost, outputs, some quality measures, and price are verifiable but costs are hard to disentangle.
- The firm can exit.
- The regulator may be self-interested or may try to maximize social welfare.

Natural Monopoly

We Will Show with assumption of one price:

- Having a natural monopoly does not guarantee positive profits and production.
- They produce less than the socially optimal output.
- The socially optimal output produces negative profits.
- They reduce consumer surplus and induce deadweight loss

CS/PS Sidebar

- Key welfare measure in economics
    - Engineer made it up
    - Marshall popularized it.
    - Periodically engineers rediscover, but disappointed that it is >100 years old.
- CS: Difference between what you are willing to pay and what you did pay, for all purchases.
- PS: Difference between what you sold it for and what you were willing to sell, for all sales.

Natural Monopoly

We Will Show with assumption of one price:

- Introduce the idea of minimum efficient scale (MIS)
- Show how with low demand, we can best be served by one firm.
- High demand, multiples of MIS can be competitive and have competition induced low costs.

Costs with Sub and Super additivities

We Will Show with assumption of one price:

- Sometimes one firm and sometimes more can produce at lowest cost.
- Sometimes the low cost solution produces the highest price
- Sometimes the high cost solution produces the lowest price.

A Two-Part Tariff Fix

We Will Show Graphically under the assumption of full information and no adverse selection:

- You can provide a lump-sum subsidy to the firm in exchange for marginal cost pricing and achieve efficient production.
- You can achieve a similar result with a two part tariff, $A + pq$
    - A compensates for fixed cost
    - p compensates for marginal cost

- Heterogeneity makes this hard. Example industrial and residential consumers but leads to the Ramsey Pricing idea.
    - Ramsey is not two-part but does deal with heterogeneity.

For Those Interested in the Math

- Gross Surplus: $S(q, \theta)$
- Customer type: $\theta \in [\underline{\theta}, \overline{\theta}]$
- Objective for the just participating type, θ:
  $S(q(p, \theta*), \theta*) - A - pq(p, \theta*) = 0$
- Simplifying assumption that uses price as an addition to constant MC.
- Not shown: constraint to collect enough revenue to cover fixed cost.

$$\max_{A,p} \int_{\theta*(A,p)}^{\overline{\theta}} [S(q(p, \theta), \theta) - A - pq(p, \theta)] \, dg(\theta) d\theta$$

Ramsey Pricing

The problem:

- You need to collect total taxes, or revenue in our case, of a certain known amount.
- Several types of agents, with different demands and sensitivity to price changes.
- Figure out how to collect the revenue/tax so that the deadweight loss is minimized.

Ramsey, Frank P. "A Contribution to the Theory of Taxation." The Economic Journal 37.145 (1927): 47-61.

- Solved here specifically and more generally for even dealing with a variety of social welfare functions.
- It is one of the most elegant papers in economics.

Figure 11.10 in the Book

Has a few simplifying assumptions.

- Linear demands
- Two types of agents Y and X.
- Same quantity demanded at the joint MC of 20.
- **Regulator/Tax authority knows MC and demands.**
- Left is a equal increase in price.
- Right is equal decrease in quantity demanded.
- Just assume they did the P and Q math right.

Question: What is the deadweight loss in both cases? Is the revenue collected really the same?
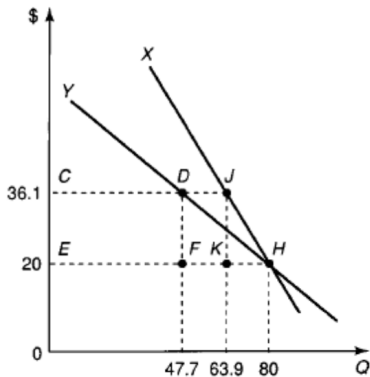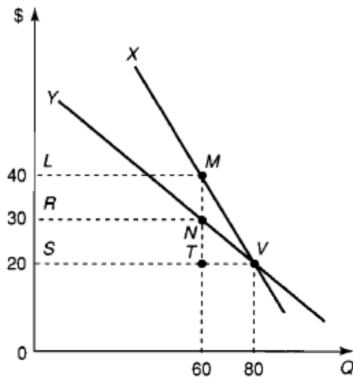
Example from Book

Whole different idea on fair being about Q and not P.

What if you don't know costs but you know demand can you still get the firm to produce the effiecient output?

- Yes, give them a subsidy equal to consumer surplus.
- Collect the tax from other revenue sources.
- Aligns profit maximizing interest with welfare (in this market only) interest.
- Batshit crazy?

- Without the subsidy, MR and AR are different and firm profit maximizes where MR (Not shown) equals MC. Price is high.
- With the subsidy, AR is also MR. The firm profit maximizes where $MR = AR = MC$, i.e., efficiently.
- Same result as 1st degree price discrimination, i.e., personalized prices.
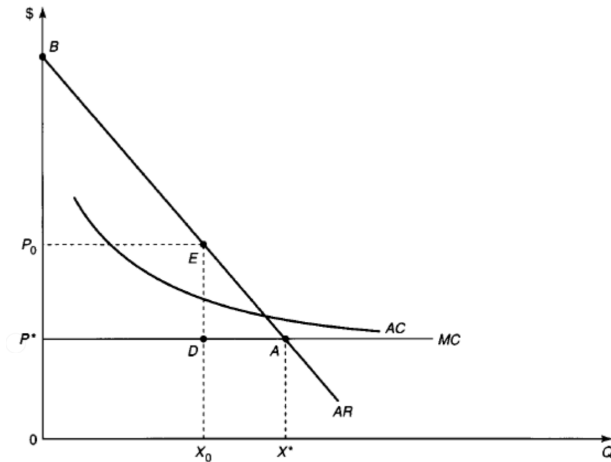
Problems for Our Practical Solution Regulation

Franchise Bidding.

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