

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: $\theta \in [\underline{\theta}, \bar{\theta}]$
- 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.

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

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

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.

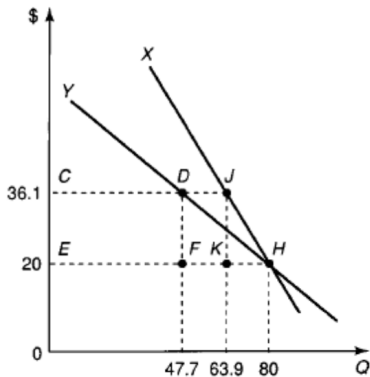
Figure 11.10 in the Book

Has a few simplifying assumptions.

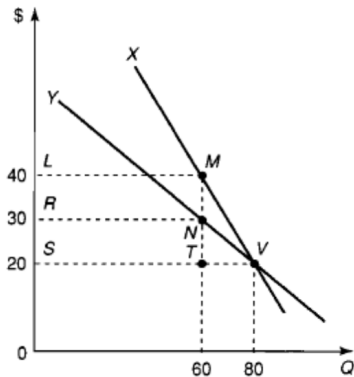
- Linear demands
- Two types of agents Y and X.
- Same quantity demanded at the joint MC of 20.
- **Regulator/Tax authority knows MC and demands.**
- Left is a equal increase in price.
- Right is equal decrease in quantity demanded.
- Just assume they did the P and Q math right.

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

Example from Book



(a)



(b)

What Do you Think?

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

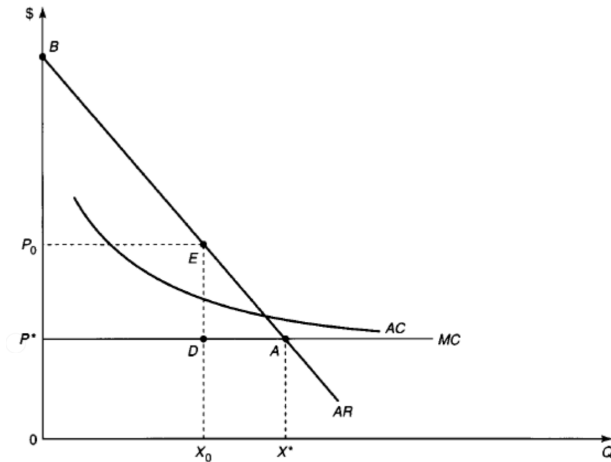
What if you don't know costs but you know demand can you still get the firm to produce the efficient output?

- 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?

Explanation of Diagram

- 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.

Lobe-Magat



Problems for Our Practical Solution Regulation

- The Averch–Johnson Effect
- Incentive to increase demand
- Lock-in of long-term assets
- . . .

Next Up

The Law