

# Monopoly

---

Javier Tasso

# Contents

Demand, Revenue & Profits

Profit Maximization

Price Discrimination

Natural Monopoly

# Demand, Revenue & Profits

---

# Demand and Inverse Demand

Demand:  $q_d(p)$       Inverse Demand:  $p(q)$

- Example:  $q_d(p) = 12 - p$  or  $p(q) = 12 - q$ .
- If I set the price, the demand will pin down the quantity.
- If I set the quantity, the inverse demand will pin down the price.
- It's irrelevant which one I choose. What I'm choosing indeed is a point on the demand curve.

# Total Revenue

$$TR = p(q) \cdot q$$

- As a function of the quantity, but you can always express it as a function of the price.
- Recall that TR is maximum when elasticity is equal to 1.
- Example.

# Marginal Revenue

$$MR = \frac{\Delta TR}{\Delta q}$$

- For a competitive firm, marginal revenue is constant and equal to the price.
- For a monopoly, marginal revenue is not constant.
- MR is decreasing: If I want to sell an extra unit I need to lower the price.
- TR is maximum when MR equals 0.

# Profits

$$\text{Profits} = \text{TR} - \text{TC} = p(q)q - \text{TC}(q)$$

- Note that price is not constant: It depends on how many units you choose to sell through the inverse demand.
- Profits as a function of the quantity, but one may express profits as a function of the price.

# Profit Maximization

---



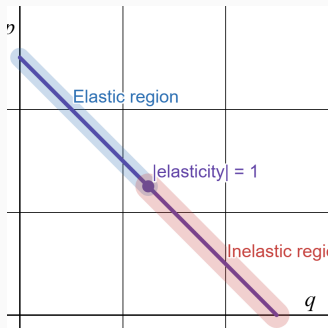
# Profit Maximization: Condition

$$MR = MC$$

q	p	TR	TC
0	12	0	5
1	11	11	5.5
2	10	20	7
3	9	27	9.5
4	8	32	13
5	7	35	17.5
6	6	36	23
7	5	35	29.5
8	4	32	37

- Usual condition. Example.
- Whenever MR is greater than MC, keep selling. Stop if MR is lower than MC.
- Note that the monopolist does not maximize total revenue.
- Sell 4 units at a price of \$8 per unit.

# Profit Maximization: Elasticity



- Because the monopolist stops before TR is maximum, it locates itself in the elastic region. Reason:
  - Assume you are in the inelastic region.
  - You can do better by increasing the price, because quantities do not fall that much.
- The more (relatively) inelastic the demand, the higher the price the monopolist can sustain.

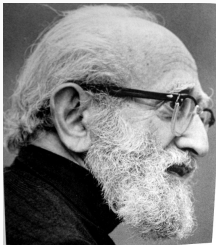
# Lerner Index: Mark-up

$$\text{Mark-up} = \frac{p - MC}{p}$$

- Measures market power.
- How much more the firm is charging above its marginal cost.
- Competitive firms set  $p = MC$ . So their mark-up equals 0.
- The index ranges from 0 to 1.

# Lerner Index: Inverse Elasticity Rule

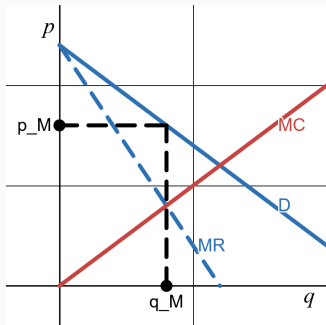
$$\frac{p - MC}{p} = \frac{1}{|\epsilon_d|}$$



Abba P. Lerner

- The monopolist optimal choice is such that the Lerner index equals the inverse of the elasticity of demand.
- Choose higher prices for (relatively more) inelastic demands.
- Due to Abba P. Lerner.

# Graphical Illustration

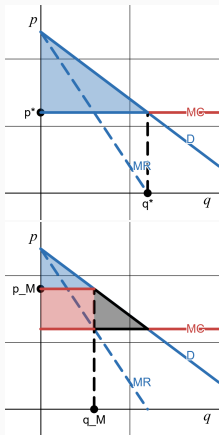


- $MR = MC$  pins down the quantity that maximizes profits.
- Recover the price from the demand curve.
- Because  $MR$  decreases and  $MC$  increases (or it's constant), we can always pin down the optimal quantity.

# Dead-Weight Loss

- The efficient situation is when  $p = MC$ .
- But the monopolist sets  $p > MC$ .
  - It'd be socially desirable to produce more units: They are values at  $p$ , but they cost  $MC$ .
  - Monopoly power prevents this to happen.
- This creates a dead-weight loss that can be represented by our usual Harberger's triangle.
- DWL relative to the benchmark of perfect competition.

# Perfect Competition vs Monopoly



- Example.
- Top: Assume firm behaves competitively and sets  $p = MC$ .
- Bottom: Assume firm behaves as a monopolist.
- A monopoly extracts consumer surplus, but generates a DWL in the process.

# Price Discrimination

---



# Motivation

**Price Discrimination.** When a seller charges different prices to different consumers for the same good or service.

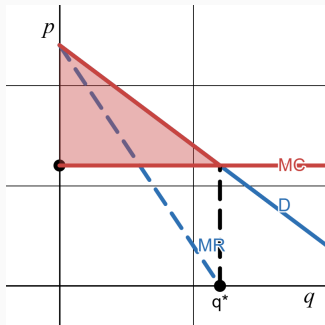
- So far we assumed that all units are sold at the same price.
- Monopolist would be better off if it could, somehow, sell different units at different prices.

# 1. First Degree or Perfect Price Discrimination

Sell the good to each consumer at the maximum price they are willing to pay.

- Assumes the seller knows each consumer and their willingness to pay.
- Not realistic.
- This would be the ideal situation for a monopolist.

# 1. First Degree PD II



- A monopolist that can perfectly discriminate will produce the efficient quantity and extract all the consumer surplus.
- Price discrimination improves efficiency, but it's worse for consumers.
- Example.

## 2. Second Degree Price Discrimination

A seller charges different prices for different quantities or versions of a product, allowing consumers to self-select based on their preferences.

- Now the seller doesn't know consumers' willingness to pay, but designs packages such that consumers self select to them.
- Bulk discounts. These are an example of non-linear pricing.
- Example.

### 3. Third Degree Price Discrimination

A seller charges different prices to different groups of consumers.

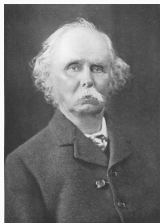
- Based on observable characteristics.
- Example: student discounts, different prices based on location.
- Different groups have different demand elasticities. Charge a higher price to that group with more inelastic demand.

# Natural Monopoly

---

# Examples

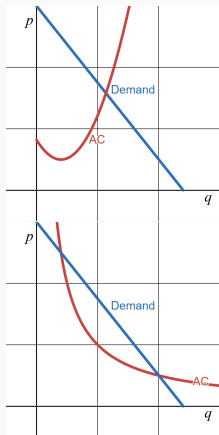
*“One of the most interesting and difficult applications of the theory of monopolies is to the question whether the public interest is best served by the allotment of a distinct basin to each great railway, and excluding competition there. For the proposal it is urged that a railway can afford to carry two million passengers, or tons of goods, cheaper than one million: and that a division of the public demand between two lines will prevent either of them from offering a cheap service.”*



A. Marshall

- Alfred Marshall on Natural Monopolies.
- More examples: Utilities companies (electricity transmission and more), communication infrastructure (postal services and more).

# Market Size vs Average Cost

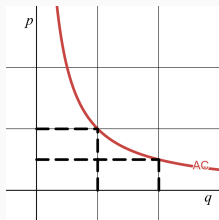


- If market is large relative to AC, it's more likely we see a competitive market.
  - Top figure.
  - It's more efficient that many firms produce the good at their efficient scale.
- If market is small relative to AC, it's more likely we see a monopoly.
  - It's more efficient that a single firm produces all the units at a lower AC.



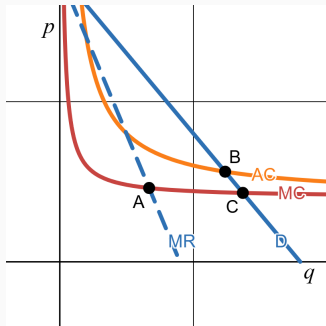
# Definition

**Natural Monopoly.** An industry in which multi-firm production is more costly than production by a monopoly.



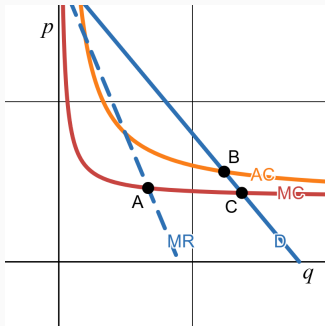
- Average Cost decreases.
- High fixed cost.
- Two reasons: AC always decreases OR AC eventually will increase, but the size of the market is too small.

# 1. Leave the Monopoly Alone



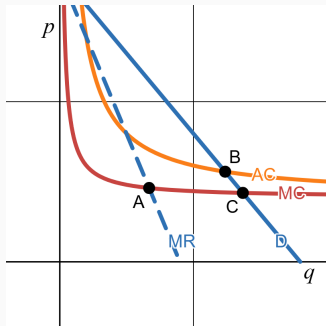
- Point A where  $MR = MC$ .
- Monopoly has market power and makes positive profits.
- We let it be because we understand it's efficient that production is conducted by a single firm.

## 2. Regulate: Competitive Outcome



- Point C, where  $p = MC$ .
- With a price ceiling, we force the monopoly not to have market power.
- Issue: Monopoly makes a loss. We need to tax consumers to subsidize it.
- Another issue: what's the marginal cost?

### 3. Regulate: Break-Even Point



- Point B, where  $p = AC$ .
- With a price ceiling, we force the monopoly to set a price equal to its average cost.
- Issue: What's the average cost?
- This policy doesn't need a subsidy.

# Summary

Demand, Revenue & Profits

Profit Maximization

Price Discrimination

Natural Monopoly