Final Study Guide

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Market Equilibrium

Demand and Supply

- **Demand function**: relates quantity demanded to price, e.g.

$$q_D = 12 - 2p$$

- **Inverse demand function**: relates price to quantity demanded, e.g.

$$p = 6 - 0.5q_D$$

  - Describes the ordinary graph of the demand curve:

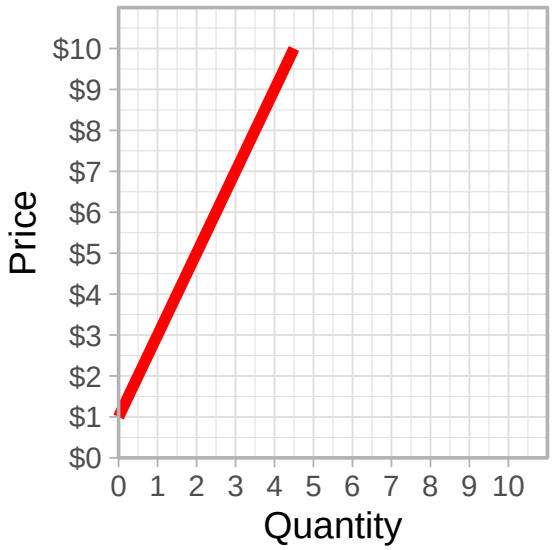
- *Choke price*: price where demand crosses the vertical axis ($q_D = 0$)
- Can always obtain inverse demand function by solving for p in the demand function
- **Supply function**: relates quantity supplied to price, e.g.

$$q_S = 0.5p - 0.5$$

- **Inverse supply function**: relates price to quantity supplied, e.g.

$$p = 1 + 2q_S$$

  - Describes the ordinary graph of the supply curve:



- *Choke price*: price where demand crosses the vertical axis ($q_D = 0$)
- Can always obtain inverse demand function by solving for p in the demand function

Equilibrium

- Equilibrium exists at a unique price p^* where $q^* = q_D = q_S$
- p^* can always be found by setting original Demand function and Supply function

$$\begin{aligned} q_D &= q_S \\ 12 - 2p &= 0.5p - 0.5 \\ 12 &= 2.5p - 0.5 \\ 12.5 &= 2.5p \\ 5 &= p^* \end{aligned}$$

- Knowing p^*, can plug into either Demand function or Supply function to find q^*:

$$
\begin{aligned}
q_D &= 12 - 2p \\
q_D &= 12 - 2(5) \\
q^* &= 2
\end{aligned}
$$

Disequilibrium: Surplus and Shortage

- **Shortage** (excess demand), a price below p^*, $q_D > q_S$
  - buyers will bid price upwards
- **Surplus** (excess supply), a price above p^*, $p_D < q_S$
  - sellers will lower asking prices

Consumer and Producer Surplus

- Consumer Surplus = Max WTP (Demand)$ - pˆ*$
- Producer Surplus = p^*− Min WTA (Supply)$
- Area of Triangle = $\frac{1}{2}bh$
- Elasticity (in equilibrium) affects surplus:
  - *More* elastic:
    - less benefit from this particular exchange (have other options, etc)
    - less distance between Max WTP or Min WTA (choke price) and market price
    - less surplus
  - *Less* elastic:
    - more benefit from this particular exchange (have few options, etc)
    - greater distance between Max WTP or Min WTA (choke price) and market price
    - more surplus

Efficiency of Markets

- Entrepreneurship, arbitrage, markets as a process
- Role of prices in coordinating information and incentives

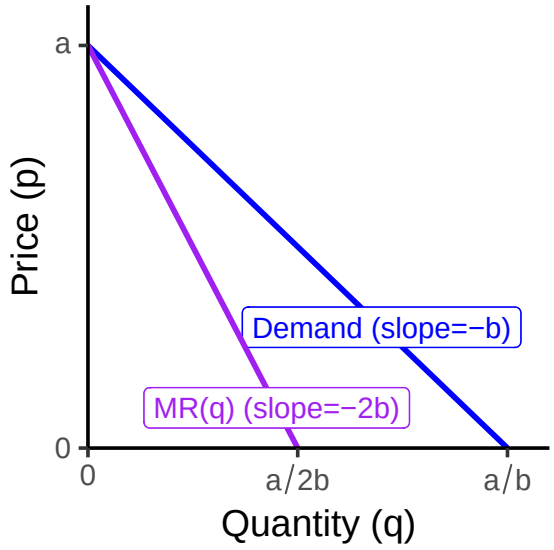
- **Allocative efficiency**: allocate resources to highest-valued uses
  - maximum consumer and producer surplus
- **Pareto efficiency**: no improvements exist that would make at least one person better off without making another person worse off
- Markets are efficient when they
  1. Are competitive
  2. Can reach equilibrium
  3. Have no externalities

Monopoly

Features

1. Firm's products may have few close substitutes
2. Barriers to entry, making entry costly
3. Firm is a "price-searcher": can set optimal price p^* in addition to quantity q^*

Marginal Revenue, Markup, and Price Elasticity



- Inverse demand: $p = a - bQ \implies$ Marginal revenue: $MR(q) = a - 2bq$

Price Elasticity	$MR(q)$	$R(q)$
$\|\epsilon\| > 1$ Elastic	$+$	Increasing
$\|\epsilon\| = 1$ Unit	0	Maximized
$\|\epsilon\| < 1$ Inelastic	$-$	Decreasing

- Size of markup depends on **price elasticity of demand**
  - $\downarrow$ price elasticity: $\uparrow$ markup

- **Lerner Index** measures market power as % of firm's price that is markup above (marginal) cost

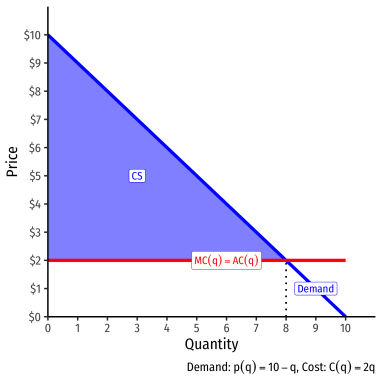
$$L = \frac{p - MC(q)}{p} = -\frac{1}{\epsilon}$$

  - In perfect competition, $L = 0$ (as $p = MC$)
  - As $L \to 1$, more market power

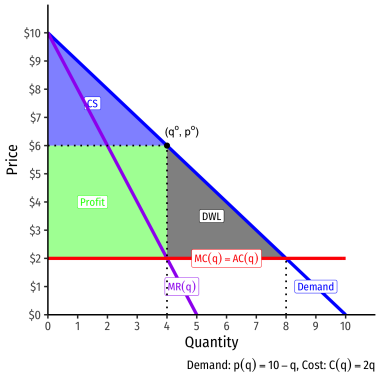
Profit-Maximization Problem Solution

1. Produce the optimal amount of output q^* where $MR(q) = MC(q)$
2. Raise price to maximum consumers are WTP: $p^* = Demand(q^*)$
3. Calculate profit with average cost: $\pi = [p - AC(q)]q$
4. Shut down in the *short run* if $p < AVC(q)$
   - Minimum of AVC curve where $MC(q) = AVC(q)$
5. Exit in the *long run* if $p < AC(q)$
   - Minimum of AC curve where $MC(q) = AC(q)$

Consequences of Market Power



- In a *competitive* market in long run equilibrium:
  - **Economic profit** is driven to \$0
  - **Allocatively efficient**: $p = MC(q)$ (goods produced until $MB = MC$)
  - **Productively efficient**: $p = AC(q)_{min}$, otherwise firms would enter/exit
  - Consumer surplus and producer surplus is maximized



- If that same market were monopolized:
  - Monopolist sets $MR(q) = MC(q)$, raises price to Max WTP (Demand)

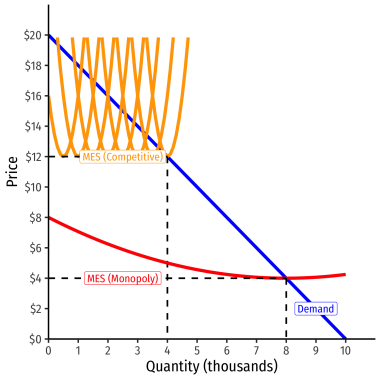
  - Restricts output and raises price, compared to competitive market
  - Earns monopoly profits ($p > AC$)
  - Loss of consumer surplus
  - **Deadweight loss** of surplus destroyed from lost gains from trade
- Rent-seeking
  - "prize" of monopoly is monopoly profits
  - firm(s) willing to invest resources to compete for the privilege to be a monopoly (e.g. lobbying for barriers to entry, preventing competition, etc)

Sources of Market Power

1. Control over a key resource
2. Barriers to entry

- ex: occupational licensing, intellectual property rights, anticompetitive regulation, etc.

3. Economies of scale/**natural monopoly**



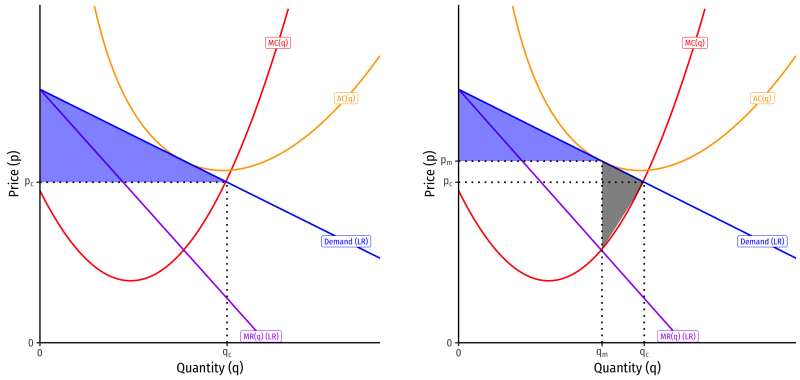
- One firm with greater economies of scale can produce more at a lower cost than competition
  - Often regulated by government - force the monopolist to act closer to a competitive outcome ($p = MC$)

Pricing Strategies

- Goal of price-discrimination is to charge different prices to different customers to convert consumer surplus into profit for firm
- To engage in price discrimination, two conditions:

1. Firm must have market power
2. Firm must be able to prevent arbitrage/resale

- 1st-degree price discrimination: firm charges each customer their max WTP
- 3rd-degree price discrimination: firm segments market into multiple groups based on demand/elasticity differences
  - charge higher price to less-elastic group
  - charge lower price to more-elastic group
  - must be able to separate customers into groups by identifiable characteristics before sale
- 2nd-degree price discrimination: firm can't identify customer type beforehand, offers different options



  - tying: lower price on "base" good, raise price on refills
  - bundling: combine multiple goods into a package and prevent sale of individual components of bundle

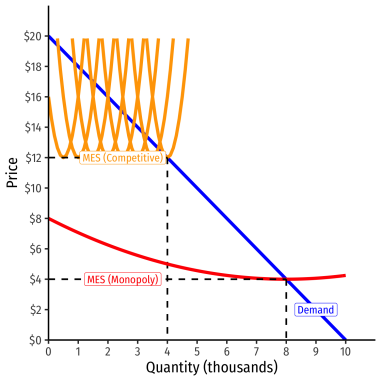
Monopolistic Competition

Features

- Firms have some market power

1. Firms selling imperfect substitutes
2. No Barriers to entry
3. Firm is a "price-searcher"

- In the short run, modeled like a monopoly



- In the long run, no barriers to entry $\implies$ competitive entry pushes π to 0
  - demand for each firm's product decreases & becomes more elastic until $p = AC$ for each firm
- Compare to perfect competition (left)
  - Lower output and higher price, less consumer surplus, some deadweight loss
  - Worse than perfect competition, but better than monopoly

Oligopoly

- Industry with few sellers

- Firms are strategic and interdependent
- Prisoner's Dilemma: game where each player faces an incentive not to cooperate, but all players are better off if they all cooperate

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	10, 10	0, 25
	Defect	25, 0	5, 5

Figure 1: Prisoner's Dilemma example

- **Nash equilibrium**: outcome where each player has no incentive to switch strategies
  - In the example above, it is (Defect, Defect)
- **Cartel**: firms colluding to raise prices together and split monopoly profits
  - Not a Nash equilibrium! Each player has an incentive to break the agreement and Defect

Comparing Industries

Industry	Firms	Entry	Price (LR Eq.)	Output	Profits (LR)	Cons. Surplus	DWL
Perfect competition	Very many	Free	Lowest (MC)	Highest	0	Highest	None
Monopolistic competition	Many	Free	Higher ($p > MC$)	Lower	0	Lower	Some
Oligopoly (non-cooperative)	Few	Barriers?	Higher	Lower	Some	Lower	Some
Monopoly1 (or cartel)	1	Barriers	Highest	Lowest	Highest	Loweset	Large

Contestable Markets

- Markets are **contestable** if:
  1. There are no barriers to entry or exit
  2. Firms have similar technologies (i.e. similar cost structure)
  3. There are no sunk costs
- Threat of entry $\implies$ Nash equilibrium is the competitive outcome, $p = MC$ with just 1 firm!