

COMM 295

2018W1 Midterm Review Package

By Raymond Situ

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Supply & Demand

Demand/Supply

2 types of changes can occur:

- Change in quantity demanded/supplied - MOVEMENT along curve due to change in price
- Changes in demand/supply - SHIFT of the curve due to another factor

Factor other than price affecting demand:

- Income
- Consumer Tastes
- Price of Related Goods
- Population
- Consumer expectations
- Government regulations

Factor other than price affecting supply:

- Cost of production
- Weather pattern
- Technology
- Government regulation
- Expectation about future prices
- Number of producers

Market Demand

- Sum of the individual demand curve in the market
- E.g. 2 consumers. Market demand is sum of the quantities of both consumers at a given price



Supply & Demand

The demand function for Commerce Meme Program (CMP) memes is $Q_d = 4P - 10$. The supply is represented by $Q_s = 7P - 40$. What is the price and quantity of memes sold at equilibrium.



Elasticity

Price Elasticity of Demand:

- Measures the percentage change in quantity demanded due to a percent change in price
- Usually a negative number
 - As price increases, quantity demanded decreases
 - As price decreases, quantity demanded increases
- When elasticity > 1 , the good is price elastic: $\% \Delta Q > \% \Delta P$
- When elasticity < 1 , the good is price inelastic: $\% \Delta Q < \% \Delta P$
- Flatter demand curve means elastic. Horizontal curve is completely elastic
- Steeper demand curve means inelastic. Vertical curve is completely inelastic
- Even with a linear demand curve the price elasticity of demand is NOT the same at all points along the curve because it is calculated using %.

Point Elasticity:

$$E_P^D = \frac{\% \Delta Q}{\% \Delta P} = \frac{dQ/Q}{dP/P} = \frac{P}{Q} \frac{dQ}{dP}$$

Arc Elasticity:

$$\frac{\% \Delta Q}{\% \Delta P} = \frac{(Q_2 - Q_1)/Q_1}{(P_2 - P_1)/P_1}$$

Mid Point: Replace Q_1 and P_1 in the denominators of the Arc Elasticity formula with the midpoint.

Income Elasticity of Demand:

- Goods consumers regard as “necessities” tend to be income inelastic.
 - E.g. medicine.
- Goods consumed regard as “luxuries” tend to be income elastic.
 - E.g. Luxury brands and expensive restaurants (Miku)

Cross-Price Elasticity of Demand:

- Measures the percentage change in the quantity demanded of one good that resulted from a percent change in the price of another good.
- Complements: Cross-price elasticity of demand is negative for complement goods.
 - E.g. when the price of cars increases, quantity demanded of tires decrease.
- Substitutes: Cross-price elasticity of demand is positive for substitute goods.
 - E.g. when the price of butter increases, quantity demanded of margarine rises.



Production & Cost

Measures of Productivity:

- Average Product of Labor: $AP_L = Q/L$
- Average Product of Capital: $AP_K = Q/K$
- Marginal Product of Labor: $MP_L = dQ/dL$ (assuming K is constant)
- Marginal Product of Capital: $MP_K = dQ/dK$ (assuming L is constant)

Returns to Scale:

- Original function $Q = F(K, L)$
- Increase both inputs by a factor of c (where $c > 1$)
- New function $Q' = F(cK, cL)$
- If $Q' > cF(K, L)$ then there is increasing returns to scale.
- If $Q' < cF(K, L)$ then there is decreasing returns to scale.
- If $Q' = cF(K, L)$ then there is constant returns to scale.

Cost:

- Marginal Cost (MC): the cost of producing one more unit of Q.

$$MC = \frac{\partial C}{\partial Q} = \frac{\partial VC}{\partial Q}$$

- Assuming only labor input as variable (and K fixed), $MC = (w)(dL/dQ) = w/MP_L$ where MP_L is the marginal product of L.

$$AC = \frac{C}{Q} = \frac{FC}{Q} + \frac{VC}{Q} = AFC + AVC$$

The MC curve always crosses the ATC curve at the minimum ATC.



Production & Cost

The average variable cost of producing memes is given by $AVC = 6 + 0.04q$. The total cost of producing 100 memes is 1375.

Find the:

- marginal cost
- fixed cost
- total cost of producing 50 memes.

A CMP's production function is $Q = 7L^{0.5}K^{0.5}$. What kind of returns to scale does CMP have?



Competitive Market & Profit Maximization

What makes a market perfectly competitive?

1. Price Taking: The individual firm/buyer sells/buys a very small share of the total market output and, therefore, cannot influence market price.
2. Product Homogeneity: The products of all firms are perfect substitutes.
3. Free Entry and Exit: No costs that make it difficult for a firm to enter or exist an industry.
4. Perfect Information: Buyers and sellers have perfect information.
5. Low Transaction Costs: There are low transaction costs of buying and selling

Profit for the firm: $\pi(q) = R(q) - C(q)$

A firm decides how much output to sell to maximize its profit.

Output Decision:

- Profit is maximized at the level of output where marginal profits is zero (or when there is no further room for increasing profits by producing more).
- $\text{Max } \pi = R - C$
- $MR - MC = 0 \rightarrow MR = MC$

$$\frac{\partial \pi}{\partial q} = \frac{\partial R}{\partial q} - \frac{\partial C}{\partial q} = 0$$

- For a competitive firm, $MR = P$, and so profit maximization occurs where $P = MR = MC$.

Short Run Shutdown Decision:

If $P > AVC$, **produce** even at a loss.

- In the short run, firms can avoid variable costs (VC) such as labor costs by shutting down but not the (sunk) fixed cost (such as rent)
- If $P > AVC$, revenue can cover all of VC and a portion of FC. As a result, by producing, firm's loss $< FC$.

If $P < AVC$, then **shut down**.

- In this case, the firm cannot cover even its VC. By producing, loss $> FC$.
- If it shuts down, loss = FC.

Long Run shutdown Decision:

If $P < ATC$, then shutdown.

- In the long run shutting down, loss = 0.



Competitive Market & Profit Maximization

CMP's short run inverse demand function is given by $p = 150 - 2q$. Their cost function is $C = 1600 + 50q$. What is the profit maximizing quantity and price? Should CMP shut down in the short run? (sad reacts only)

What happens in the long run?



Monopoly & Pricing with Market Power

Monopoly:

- As a single supplier, a monopolist faces the entire (downward sloping) market demand.
- However, MR is not equal to price as the monopolist must reduce price to sell more (due to downward sloping demand).

Pricing with Market Power

- Perfect price discrimination: Monopolist charges the maximum price that each consumer is willing to pay.
- Multi-Group price discrimination: Splitting consumers into two or more groups based on their demand curve and charging different prices to each group.

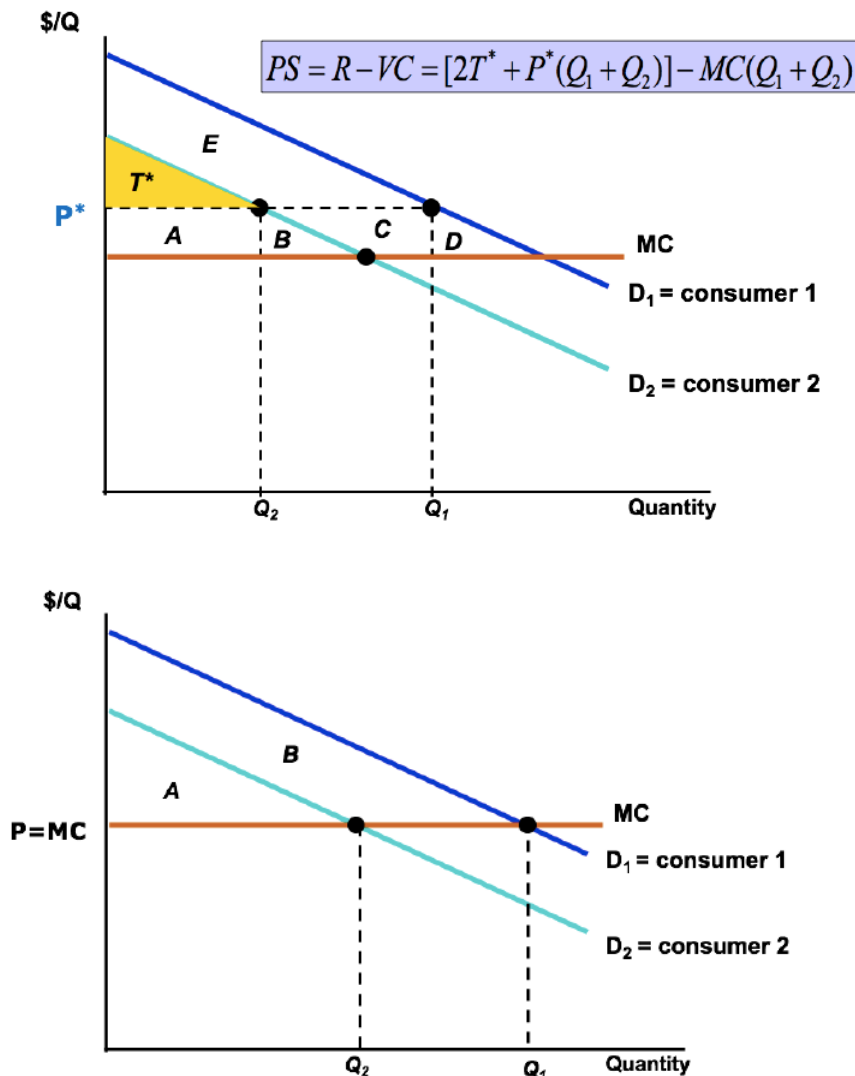
$$MR_1 = MR_2 = MC$$

$$P_1(1 + 1/E_1) = P_2(1 + 1/E_2) \quad \text{then} \quad \frac{P_1}{P_2} = \frac{(1 + 1/E_2)}{(1 + 1/E_1)}$$

- Quantity-Based price discrimination (or non-linear price discrimination): Charging different prices based on the quantity
- Two-Part Tariff: Charging an entry fee and a usage fee
 - Identical consumer:
 - Single consumer:
 - usage fee of $P = MC$
 - entry fee = entire CS
 - Many consumers:
 - usage fee of $P = MC$
 - entry fee = entire CS / (# of consumers)
 - Different Consumers:
 - charge same entry fee:
 - usage fee $P > MC$
 - entry fee = CS of the consumer with lower demand
 - charge different entry fee:
 - usage fee $P = MC$
 - entry fee = CS of the consumer



Monopoly & Pricing with Market Power



- Bundling: Selling products together in sets
 - Pure bundling: works when there is negative correlation between the demands of consumers. Lower price but increases number of consumers.
 - Mixed bundling: works when demands are not perfectly negatively correlated (and/or when costs are sufficiently high).
- Peak Load Pricing: Charging more when high demand, used when there is a capacity constraint
 - Increase profits and spread demand off peak time



Monopoly & Pricing with Market Power

Two consumer groups: junior students and senior students.

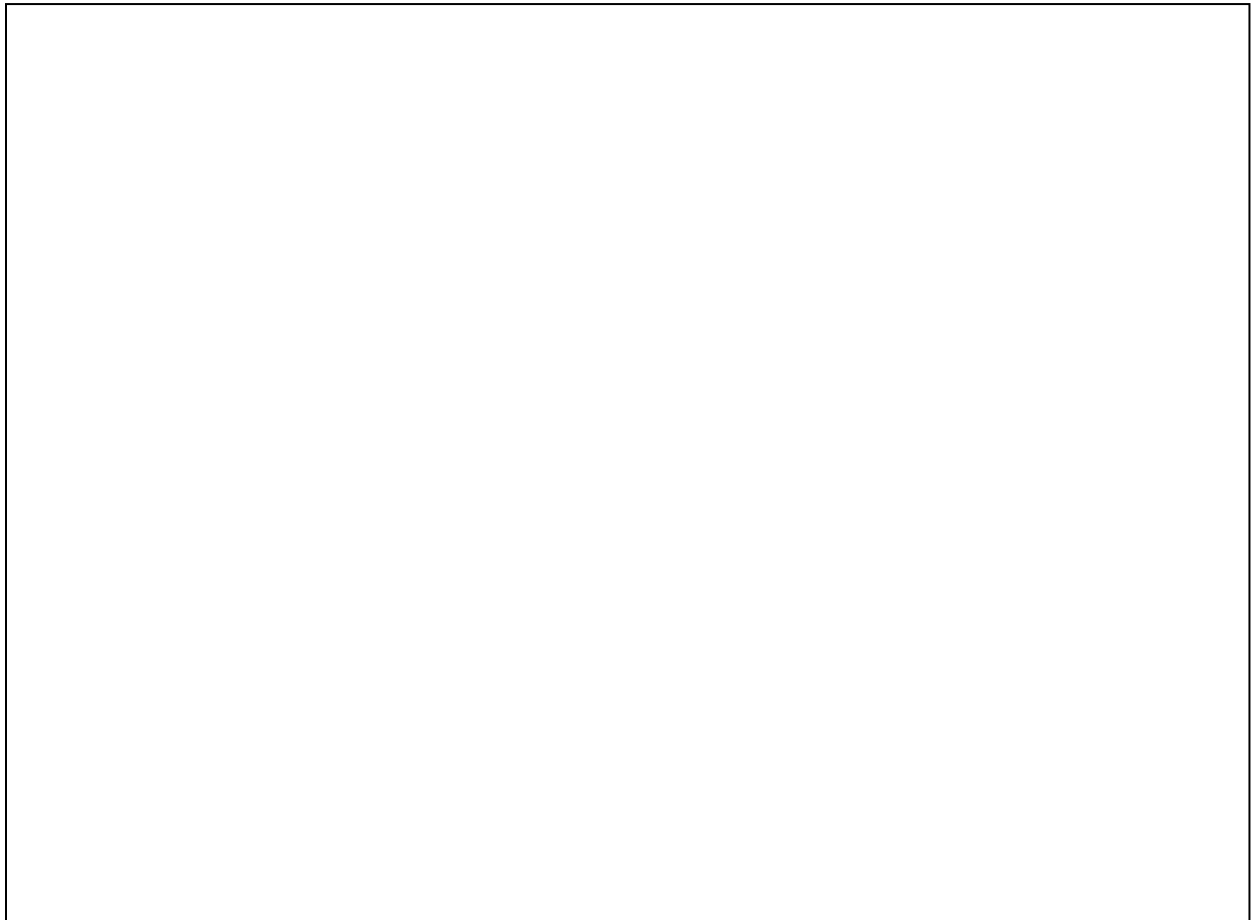
$Q_{\text{Junior}} = 1700 - 40P$

$Q_{\text{Senior}} = 300 - 10P$

There are 110 junior students and 60 senior students.

The marginal cost of memes is \$10 and CMP wants to apply a two-part tariff pricing scheme with a usage fee of \$15/meme.

Assume we must charge the same entry fee for both groups.



Oligopoly

Cournot Duopoly: two firms compete in choosing quantities (more realistic)

Bertrand Duopoly: two firms compete in choosing prices

Solving Cournot Model:

1. Find MR equation of each firm
- Remember to use the Q_A for Quantity of Firm A but the Price equation uses Q which is equal to $Q_A + Q_B$
2. Set $MR = MC$ for both firms
3. Solve for Q_A and Q_B using the 2 questions.
4. Use Q to find price



Oligopoly

Two firms in a cournot duopoly have an inverse demand of $P = 500 - 50Q$ and a cost function of $C = 20Q$. Find the equilibrium price, the quantity produced by each firm, and the profit of each firm.



Game Theory

Static Game:

- each player acts once and at the same time

Dynamic Game:

- Stackelberg: Sequentially, one player goes first followed by the other
- Cournot: Repeatedly, multiple rounds of the game

When at least one player has a dominant strategy then the outcome is a unique Nash equilibrium.



Game Theory

What is the nash equilibrium?

Firm A	Firm B			
		Large	Small	None
	Large	4, 4	12, 8	16, 9
	Small	8, 12	16, 16	20, 18
	None	9, 16	15, 20	18, 18

