COMM 295

2018W1 Midterm Review Package

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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.

Since equilibrium is where $Q_d=Q_s$, equate the two functions 4P-10 and 7P-40 and solve for P
4P-10=7P-40
30=3P
P=$10

Using P, plug the value in and solve for Q_d or Q_s

Q_d=4($10)-10
Q_d=30 tickets

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 $Q' = F(cK,tL)$
- 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:

- fixed cost
- total cost of producing 50 memes.

1375 = FC + 10(100)
FC = 375

TC(50) = 375 + [6 + 0.04(50)]50 = 775

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

This production function exhibits constant returns to scale. The sum of the exponents of labor and capital are equal to 1. To confirm I increased L and K by a factor of some arbitrary constant c.

$Q' = 7(cL)^{0.5}(cK)^{0.5}$
$Q' = 7(c^{0.5})(L^{0.5})(c^{0.5})(K^{0.5})$
$Q' = (c^{0.5})(c^{0.5})7(L^{0.5})(K^{0.5})$
$Q' = c(7(L^{0.5})(K^{0.5}))$
$Q' = cQ$

The new quantity has increased by a factor of c, the same amount that L and K were increased by.

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).
- Max $\pi = R - C$
- MR – MC = 0 -> 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)

Profit-maximizing quantity: MR = MC

Revenue = pq	Cost = 1600 + 50q
= (150 -2q)q	MC = 50
= $150q - 2q^2$	
MR = 150 – 4q	

MR = MC	p = 150 – 2q
150 – 4q = 50	p = 150 – 2(25)
4q = 100	p = 150 - 50
q = 25	**p = 100**

Cost = 1600 + 50q

Variable cost = 50q

AVC = ______

AVC = 50

P > AVC. The firm earns profit on each unit and should produce to reduce its economic loss.

What happens in the long run?

ATC = 1600/q +50.

P = 100 and Q = 25 from part a)

P ATC

100 < 1600/25 + 50

100 < 114

P < ATC the profit-maximizing decision would be to shut down in the long run.

Monopoly & Pricing with Market Power

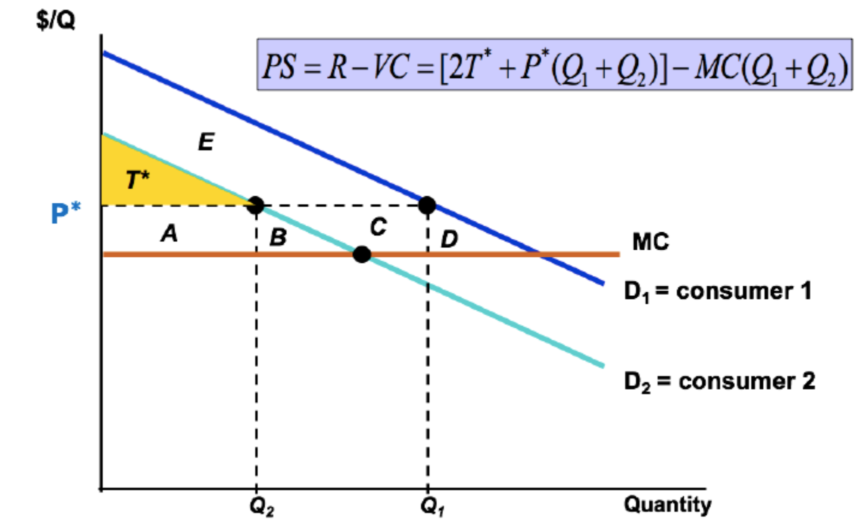
Monopoly:

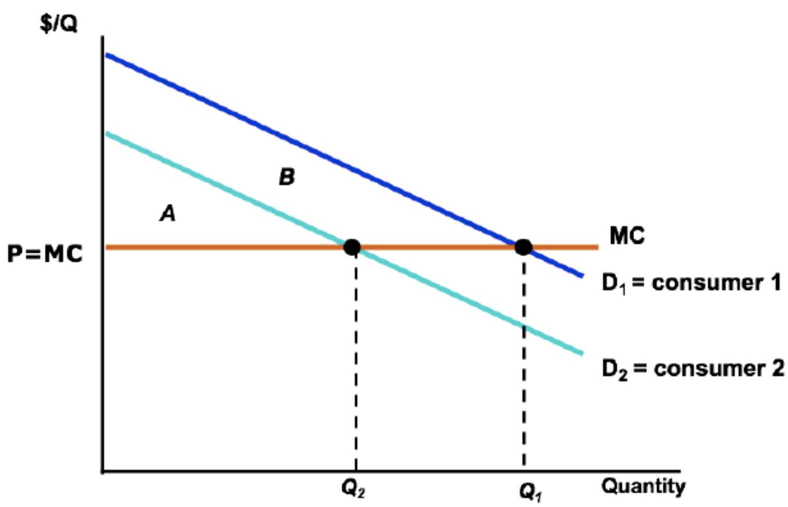
- As a single supplier, a monopolist faces the entire (downward sloping) market demand.
- However, MR is not equal to price as the monopolist must reduce price to sell more (due to downward sloping demand).

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.
  $MR_1 = MR_2 = MC$
  $$P_1(1 + 1/E_1) = P_2(1 + 1/E_2) \quad then \quad \frac{P_1}{P_2} = \frac{(1 + 1/E_2)}{(1 + 1/E_1)}$$
- 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 Junior = 1700 – 40P

Q 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 tarrif pricing scheme with a usage fee of $15/meme.

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

Q junior = 1700 – 40(15) = 1100
Q senior = 300 – 10(15) = 150

Inverse demand function of junior: $P = 42.5 - Q_J/40$
Inverse demand function of senior: $P = 30 - Q_S/10$

CS junior = 0.5(42.5-15)(1100) = 15,125
Entry fee junior = 15,125/110 = 151.25

CS senior = 0.5(30-15)(150) = 1,125
Entry fee senior = 1,125/60 = 18.75

Entry fee = 18.75 per consumer

Profit = PQ + entry fees – C(Q)
= 15*(1,100+150) + 18.75*170 – 10*(1,100+150)
= 9437.50

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.

1. Find MR equation. $R_A = PQ_A = (500-50(Q_A+Q_B))Q_A$ $= 500Q_A - 50Q_A^2 + 50Q_AQ_B$ MR_A $= \partial R_A/\partial Q_A = 500 - 100Q_A - 50Q_B$ MR equation will be identical for Firm B
2. MR = MC $500 - 100Q_A - 50Q_B = 20$ $100Q_A = 480 - 50Q_B$ $Q_A = 4.8 - 0.5Q_B$ By symmetry $Q_B = 4.8 - 0.5Q_A$
3. Solve the system of equation $Q_A = 4.8 - 0.5(4.8 - 0.5Q_A)$ by substitution $Q_A = 2.4 + 0.25Q_A$ $Q_A = 3.2$ Therefore $Q_B = 3.2$ as well and $Q = 6.4$
4. Use Q to find the solution P = 500-50(6.4) = 180 Profit = 180*3.2 – 20*3.2 = 512 Price = 180 Quantity produced by each firm = 3.2 Profit of each firm = 512

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

Answer = (Small, None)