Managerial Economics

BASIC OLIGOPOLY MODELS

BSA 102

November 11, 2024

ONLINE: 1:00-2:30PM

OLIGOPOLY

- Each firms holds a significant share of market that their actions can greatly impact competitors and influence overall market conditions.

- Is a market structure where a small number of firms dominate an industry.

- The product may be standardized or differentiated.

OLIGOPOLY MODELS

A. The Cournot Model

B. The Bertrand Model

C. Stackelberg Model

THE COURNOT MODEL

1. There are few firms in the market and many buyers.
2. The firms produce homogeneous products.
3. Competition is in the form of output.
4. Barriers to entry exist.
5. Each firms aims to maximize profit.

- **Focus**: Quantity Competition

- **Assumptions**:
  - Firms compete by choosing output quantities rather than prices.
  - Each firm decides its output based on the expected output of competitors.
  - Firms choose their production levels simultaneously.

- **Outcome**:
  - The equilibrium is reached when each firms's chosen output is optimal
  - Prices are set based on the total quantity produced by all firm.
  - Generally, the equilibrium price is a Cournot oligopoly is higher that in perfect competition but lower that in a monopoly.

Two Telecom: Telecom A and Telecom B

Demand Function: The market price *P* for mobile data depends on the total quality *Q* provided by both companies combined.

Given:

P = Price (for mobile date)
Q = Quantity (total Quality provided)
P = 300 - Q
C = 50 (cost per GB of data produced)

Where:

Q = *qA* + *qB*, the total quantity of data (GB) supplied by both firms.
qA is the quantity produced b Telecom A and qB is the quantity produced by Telecom B.

Cost Function: Each firms incurs a constant cost of 50.00 pesos per GB of data produced, so the cost function for each firm is:

C(*q*) = 50*q*

Two Telecom: Telecom A and Telecom B

Goal : To find each firm's optimal (best) output (quantity) and the resulting market price in a Cournot Model equilibrium, where each firm chooses its output based on the expected output of other firm.

Step 1: Set up the Profit Function of Each Firm

Each firm's revenue is its revenue minus its cost.

Revenue for Telecom A:

Market price P depends on the total quantity $Q = qA + qB$, so:

$$P = 300 - (qA + qB)$$

Therefore, the revenue for Telecom A (which sells qA units) is:

$$= \text{Revenue}A = P \times qA = (300 - qA - qB) \times qA$$

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Step 1: Set up the Profit Function of Each Firm

Each firm's revenue is its revenue minus its cost.

Profit for Telecom A:

Profit for Telecom A is its revenue minus its cost:

A = Revenue$A$ - Cost A = $(300 - qA - qB)$ x qA - $50qA$

By simplifying, we get:

A = $(300 - qB)$ qA - $q2A$ - $50qA$
A = (250)qA - q2A - qAqB

Two Telecom: Telecom A and Telecom B

Goal : To find each firm's optimal (best) output (quantity) and the resulting market price in a Cournot Model equilibrium, where each firm chooses its output based on the expected output of other firm.

Profit for Telecom B is:

$$B = 250qB - q2B - qAqB$$

Step B: Derive Each Firms's Best Response (Reaction) Function

To maximize profit, each firm will choose the quantity that maximizes its own profit, taking the other firm's quantity as given. We find the best response function for each firm by taking the derivative of its profits with respect to its own output and setting it to zero (this gives that quantity that maximizes profit)

Two Telecom: Telecom A and Telecom B

Goal : To find each firm's optimal (best) output (quantity) and the resulting market price in a Cournot Model equilibrium, where each firm chooses its output based on the expected output of other firm.

1. **Best Response for Telecom A:**
   - Differentiate A with respect to qA and set to zero:

$$\frac{dA}{dqA} = 250 - 2qA - qB = 0$$

   - Solving for qA:
   $qA = 125 - 0.5qB$

   - This equation is **Telecom B's best response function**.

Two Telecom: Telecom A and Telecom B

Step 3: Find the Cournot Equilibrium Quantities - occurs where both firms are best responding to each other simultaneously. To find this, we solve two best response equations.

1. Substitute $qA = 125 - 0.5qB$ into
   $qB = 125 - 0.5A$:
   $qB = 125 - 0.5\ (125 - 0.5qB)$

2. Expanding and solving for qB:
   $qB = 125 - 62.5 + 0.25qB$
   $0.75qb = 62.5$ (simplify qB - 0.25 to term qB simplifies to 0.75)

$$qB = \frac{62.5}{0.75} = 83.33$$

3. Substitute $qB = 83.33$ back into the equation for qA:
   $qA = 125 - 0.5\ (83.33)$
   $qA = 125 - 41.67$
   $qA = 88.33$
   $qA = 0.5 \times 88.33 = 41.67$

Two Telecom: Telecom A and Telecom B

Step 4: Calculate the Market Price

Substitute the total quantity :
$Q = qA + qB = 83.33 = 83.33 = 166.66$

into the demand function to find the equilibrium price:
$P = 300 - 166.66 = 133.34$

Step 5: Calculate Each Firm's Profit - finally, we can now calculate the profit for each firm using their Quantities and the equilibrium price:

For telecom A:
$A = (P - 50) \times qA = (133.34 - 50) \times 83.33$
***A* = 6,944.5 pesos**

Similarly, for Telecom B:
***B* = 6,944.5 pesos**

Two Telecom: Telecom A and Telecom B

Summary Results:

- **Equilibrium Quantities**: Both Telecom A and Telecom B will produce 83.33 GB of data.
- **Equilibrium Market Price**: The price for mobile data will be 133.34 per GB.
- **Profit**: Each firm earns a profit of approximately 6,944.5 pesos.

COURNOT MODEL

- Is a fundamental concept in microeconomics that describes how firms compete in an oligopoly by choosing quantities to produce.

- It provides a framework for analyzing strategic interactions between firms in markets with a limited number of competitions.

- It considered a market in which there were two firms, A and B that is based on the following assumptions:
    1. There are few firms in the market and may buyers
    2. The firms produce homogeneous products: therefore each firm has to charge the same market price.
    3. Competition is in the form of output.
    4. Barriers to entry exits.
    5. Each firm aims to maximize profit, and assume that the other firms do the same.

KEY FEATURES OF THE COURNOT MODEL

1. Oligopolistic Market - is a structure characterized by a small number of large firms that dominate the industry.

2. Quantity Competition - firms compete by deciding the quantity of goods to produce, rather than directly competing on price.

    2.1 Output Decision
    2.2 Strategic Interactions
    2.3. Market Price

KEY FEATURES OF THE COURNOT MODEL

3. Strategic Interdependence - refers to a situation in which the decisions, actions, or strategies of one party directly influence the outcomes of other parties, and vice versa.

4. Market Price - at which a good or service is bought and sold in a competitive market.

    4.1. Equilibrium Price - where the supply curve intersects the demand curve.
    4.1 Dynamic Price - price can fluctuate based on changes in factors.
    4.3 Transparency - price reflects all available information about the product.

KEY FEATURES OF THE COURNOT MODEL

5. Profit Maximization - is the process by which a firm determines the level of output, pricing or resource allocation that results in the highest possible profit.

    5.1 Total Revenue (TR) - Total income of firm earns from selling.
    5.2 Total Cost (TC) - The total expenses incurred in producing and selling.
    5.3 Profit - The difference between total revenue and total cost:
        Profit = TR - TC
    5.4 Marginal Analysis - Firms maximize profit by analyzing:
        5.4.1. Marginal Revenue (MR) - additional revenue earned from selling one more unit of output.
        5.4.2. Marginal Cost (MC) - additional cost incurred from producing one more unit of output.
        5.4.3. Profit-Maximizing Rule - A firms maximizes profit when:

KEY FEATURES OF THE COURNOT MODEL

6. Nash Equilibrium - a concept where no player can improve their outcome by unilaterally changing their strategy.

    6.1 . Mutual Best Response - Each player’s strategy is the best response to the strategies chosen by others.
    6.2. No Incentive to Deviate - No player an gain a better payoff by changing their strategy alone.

BERTRAND MODEL

- A concept that describes competition between firms that set prices simultaneously for homogeneous goods.

- The assumptions involved in this model are as follows:
    1. There are few firms in the market and many buyers.
    2. The firms produce homogeneous or differentiated products.
    3. Competition is in the form of price.
    4. Barriers to entry exits.
    5. Each firm has sufficient capacity to supply the whole market.
    6. Each firm aims to maximize profit, and assumes that the other firms do the same.

FEATURES OF BERTRAND

1. Homogeneous Goods - products are identical or very similar in quality, features, and performance.

2. Price Competition - a market strategy where businesses focus on attracting customers by offering lower prices than their competitors.

3. Simultaneous Decisions - refer to situations in which two or more parties make choices at the same time.

4. Market Behavior - refers to the actions and interactions of buyers, sellers, and other participants within a market.

STACKELBERG MODEL

- A strategic game in economics that describes a situation of competition in an oligopoly market where firms make decisions sequentially.

Key Features:

1. Leader-Follow Structure
2. Asymmetric Information
3. Sequential Decision-Making
4. Solution Method

PROFIT MAXIMIZATION

- Is the process by which a business or firms seeks to achieve the highest possible profit by adjusting its operations, pricing, and production strategies.

- Is a central concept in business and economics and its about understanding the key factors that influence a firms revenue and costs and finding the optimal balance.

FACTORS OF PROFIT MAXIMIZATION

1. Revenue and Costs :
   Revenue - total income generated by a business form its normal operations.
   Cost - expenses a business incurs in the process of producing goods or services.

2. Pricing Decisions - refers to the process of determining the price at which a business will sell its goods or services.

THANK YOU..!!