

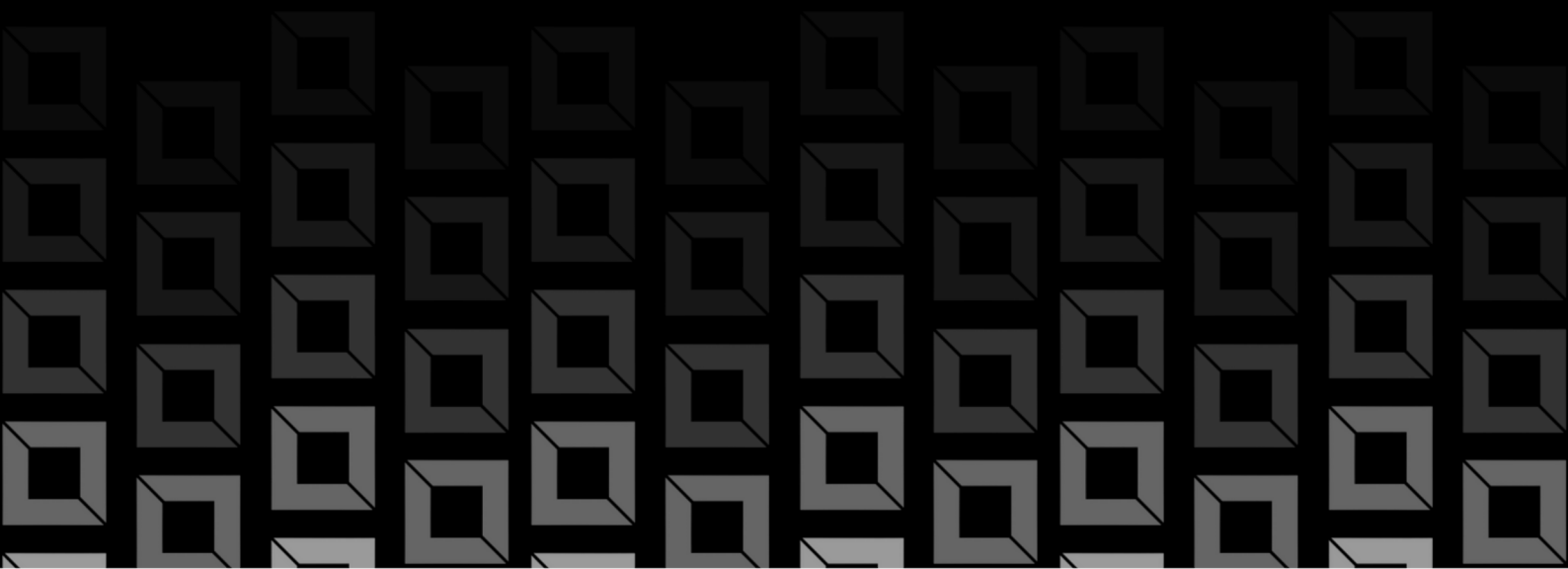


CFA L1 CONCEPTS

ECONOMICS

THE FIRM AND MARKET STRUCTURES (2)

- Oligopoly Models (Part - 1)
- Oligopoly Models (Part - 2)
- Monopoly Characteristics
- Effects of Price Discrimination
- Natural Monopoly
- Pricing Strategy for Market Structures
- Market Concentration



OLIGOPOLY MODELS (PART-I)

- The **kinked demand curve model** is an economic theory that attempts to explain the pricing behavior and stability observed in certain oligopolistic markets.
- It suggests that firms in an oligopoly are hesitant to change their prices in response to cost or demand fluctuations due to the expected **reactions of their competitors.**
- This model assumes that firms believe their rivals will match any price decrease but not necessarily match any price increase.
- The kinked demand curve model is based on the following assumptions:
 - **Rivals' Reactions:** Each firm assumes that if it lowers its price, other firms will match the decrease to avoid losing market share. However, if the firm increases its price, other firms are not expected to follow suit.

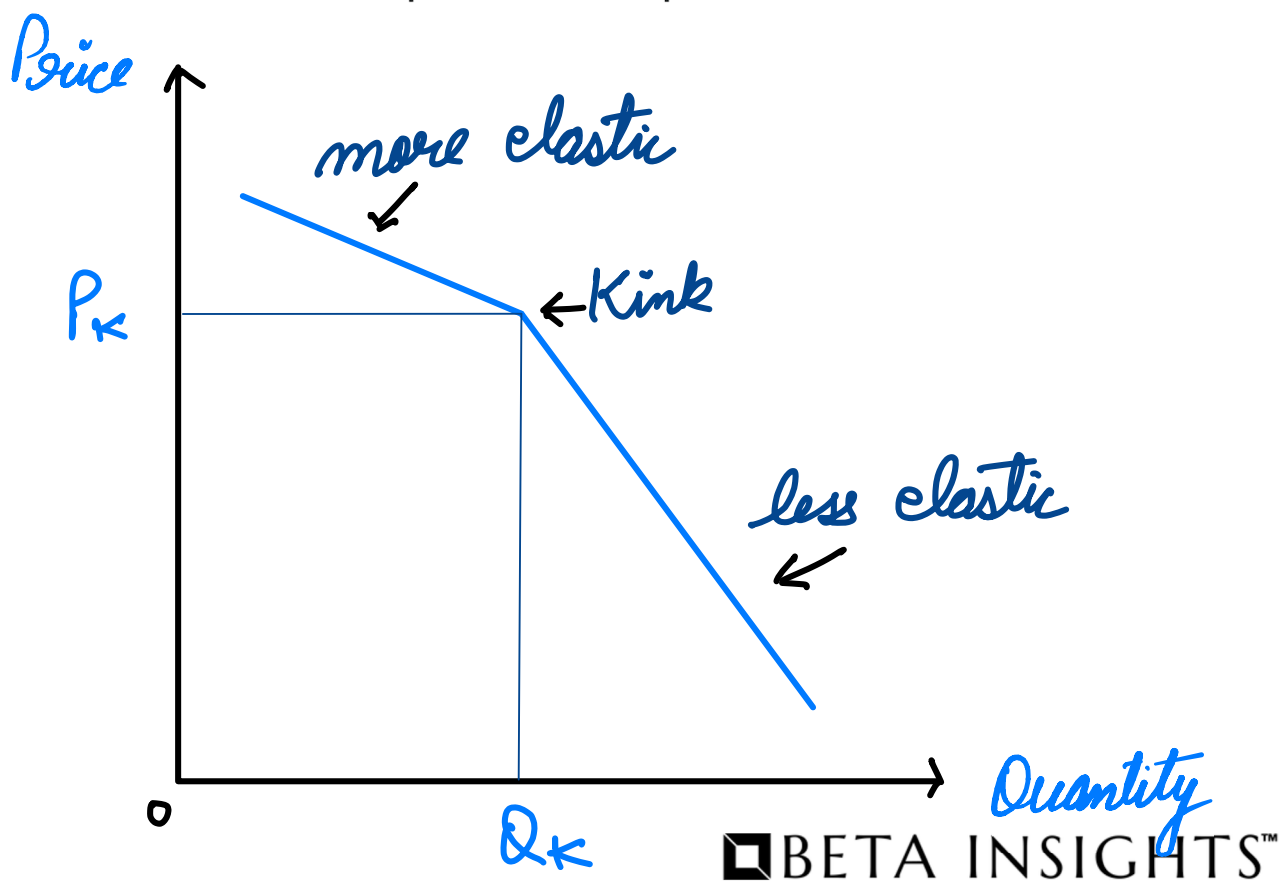
- **Price Rigidity:** Due to the anticipated reaction of rivals, firms believe that changing prices will have a minimal impact on their market share. Therefore, they tend to keep their prices stable even when their costs or demand change.

- Based on these assumptions, the kinked demand curve model proposes the following graphical representation:

- The demand curve facing an oligopolistic firm is **kinked at the current market price**.
- The **demand is highly elastic** (sensitive to price changes) above the prevailing price and **less elastic** (insensitive to price changes) below it.
- Above the kink, the firm faces a relatively elastic demand because it assumes that if it raises its price, its competitors will not follow, causing the firm to lose a significant portion of its market share.

- Below the kink, the firm faces a relatively inelastic demand because it assumes that if it lowers its price, its rivals will match the decrease, resulting in a smaller gain in market share.
- The kinked demand curve model suggests that firms will prefer to maintain stability in prices and output levels rather than engaging in price wars.
- This can lead to price rigidity in oligopolistic markets, as observed in certain industries.
- Let's consider an example of the soft drink industry. Suppose two major companies, A and B.
- Both companies have similar market shares and closely monitor each other's pricing decisions.
- If Company A lowers its price, it expects Company B to match the decrease to prevent losing customers.
- However, if Company A increases its price, it assumes that Company B will not follow suit, resulting in a loss of market share for Company A.

- This behavior creates a kinked demand curve for each firm.
- The demand curve is relatively elastic above the prevailing price (kink) and relatively inelastic below it.
- As a result, both companies tend to maintain stable prices, leading to price rigidity in the industry.
- It's important to note that the kinked demand curve model is a simplified representation of oligopoly behavior and has its limitations.
- It does not consider factors such as collusion or other forms of non-price competition.



- The **Cournot duopoly model** is an economic theory that analyzes the behavior and outcomes in a specific type of oligopoly known as a duopoly.
- It was developed by French economist Antoine-Augustin Cournot in the 19th century.
- The model assumes that there are **only two firms in the market**, and each firm determines its output level independently, taking into account the anticipated response of its competitor.
- Here are the key assumptions and concepts of the Cournot duopoly model:
 - **Two Firms:** The model assumes that there are two competing firms (Firm 1 and Firm 2) in the market. These firms have a significant market share and act strategically to maximize their profits.
 - **Independent Output Decisions:** Each firm decides its level of output independently, taking into consideration the output decisions of its competitor. They choose their output levels simultaneously.

○ **Homogeneous Products:** The firms produce identical or highly substitutable products. This means that consumers view the products as similar and are willing to switch between them based on price differences.

○ **Profit Maximization:** Both firms aim to maximize their profits by setting their output levels strategically. They consider the market demand, their own cost structure, and the expected output of their competitor.

- To understand the Cournot duopoly model, we can analyze the equilibrium using mathematical equations:
- Assume that the market demand function is represented by $Q = D(P)$, where Q is the total market quantity demanded and P is the market price.
- Each firm's cost function is represented by $C(Q_i)$, where Q_i is the output quantity of firm i . The cost function captures the relationship between the output quantity and the cost of production.

- Given these assumptions, the Cournot duopoly model suggests the following steps to determine the equilibrium:

- **Calculate the reaction functions:** Each firm determines its optimal output level by considering the output level of its competitor. The reaction function represents the relationship between the output of one firm and the output of the other firm. For example, Firm 1's reaction function can be represented as $Q_i = R(Q_j)$, where R is a function describing Firm 1's output level as a response to Firm 2's output level.

- **Calculate market price and individual profits:** Once the Nash equilibrium is determined, you can find the market price by plugging the equilibrium output levels into the market demand function. Each firm's profit can be calculated by subtracting its cost function from the revenue obtained based on the equilibrium price.

- An example of the Cournot duopoly model is the market for gasoline, where two major companies dominate the industry.
 - Each company independently determines its output level, considering the expected output of its competitor.
 - They anticipate that their rival will respond to changes in output levels.
 - Based on this information, they choose their respective output levels to maximize their profits.
- The Cournot duopoly model provides insights into how the competition between two firms affects market outcomes, including prices, quantities, and profits.
- It highlights the strategic behavior of firms in oligopolistic markets and the interdependence of their decisions.

OLIGOPOLY MODELS (PART-II)

- The **Stackelberg model** is an economic theory that examines the behavior and outcomes in an oligopoly market, specifically focusing on the leadership role of one firm and the follower behavior of the other firms.
- It was developed by German economist Heinrich von Stackelberg in the 1930s.
- In the Stackelberg model, one firm, known as the leader, takes the initiative and sets its output level before the other firms, known as followers, make their decisions.
- The followers observe the leader's output and adjust their own output levels accordingly.
- This model assumes that the leader has a first-mover advantage and can anticipate and react to the follower's actions.
- Here are the key assumptions and concepts of the Stackelberg model:

- **Leadership-Follower Structure:** The model assumes that there is one leader firm and multiple follower firms in the market. The leader sets its output level first, and then the followers determine their output levels.
- **Sequential Decision-Making:** The leader makes its output decision before the followers. The followers observe the leader's output and act as best responders, adjusting their output levels based on the leader's decision.
- **Homogeneous Products:** The firms produce identical or highly substitutable products. Consumers view the products as similar and are willing to switch between them based on price differences.
- **Profit Maximization:** All firms aim to maximize their profits. They consider the market demand, their own cost structure, and the expected output of their competitors when determining their output levels.

- To understand the Stackelberg model, we can analyze the equilibrium using mathematical equations:
 - Assume that the market demand function is represented by $Q = D(P)$, where Q is the total market quantity demanded and P is the market price.
 - Each firm's cost function is represented by $C(Q_i)$, where Q_i is the output quantity of firm i . The cost function captures the relationship between the output quantity and the cost of production.
- Given these assumptions, the Stackelberg model suggests the following steps to determine the equilibrium:
 - **Leader's decision:** The leader determines its output level by maximizing its profit, considering the followers' reactions. The leader takes into account the market demand, its own cost function, and the expected response of the followers.

- **Follower's decision:** The followers observe the leader's output and respond by determining their optimal output levels. The followers act as best responders and adjust their output levels based on the leader's decision.

- **Calculate market price and individual profits:**

Once the leader and followers' output levels are determined, you can find the market price by plugging the equilibrium output levels into the market demand function. Each firm's profit can be calculated by subtracting its cost function from the revenue obtained based on the equilibrium price.

- An **example** of the Stackelberg model is the market for game consoles, where one dominant company acts as the leader (e.g., Sony PlayStation) and sets its output level first.
- The other companies (e.g., Microsoft Xbox, Nintendo) act as followers and adjust their output levels based on the leader's decision.

- The leader enjoys the advantage of being the first mover and can strategically set its output to maximize its profits.
- The Stackelberg model provides insights into the strategic behavior of firms in an oligopoly and the impact of leadership and follower dynamics on market outcomes.
- It highlights the importance of timing and strategic decision-making in competitive markets.
- **Nash equilibrium** is a concept in game theory that represents a stable state in which no player has an incentive to unilaterally change their strategy.
- In the context of oligopoly, Nash equilibrium refers to a situation where each firm's strategic decision is optimal given the choices of other firms.
- It is a self-enforcing outcome where no firm can improve its position by deviating from its chosen strategy.

- Here are the key aspects of Nash equilibrium in oligopoly:

- **Strategic Decision:** Each firm in the oligopoly chooses its strategy, which can include pricing decisions, output levels, marketing strategies, or product differentiation. These decisions are made with the intention of maximizing their profits.

- **Anticipating Rival Behavior:** Firms consider the likely reactions of their competitors when determining their own strategies. They understand that the actions of one firm will impact the profits and market position of others.

- **Mutual Interdependence:** The strategies of firms in oligopoly are interdependent. Each firm's decision affects the outcomes and payoffs of other firms. They are engaged in strategic interactions, where they carefully consider the actions and reactions of their rivals.

- To understand Nash equilibrium, let's consider an example using a simplified pricing decision in a duopoly (two-firm oligopoly) setting.
- Suppose there are two firms, Firm A and Firm B, competing in the market.
- They have two possible pricing strategies: high price (H) and low price (L).
- The **payoff matrix** represents the profits of each firm based on their pricing strategies.
- Let's assume the following hypothetical payoffs (profits in millions):

	Firm A (H)	Firm A (L)
Firm B (H)	10	20
Firm B (L)	15	5

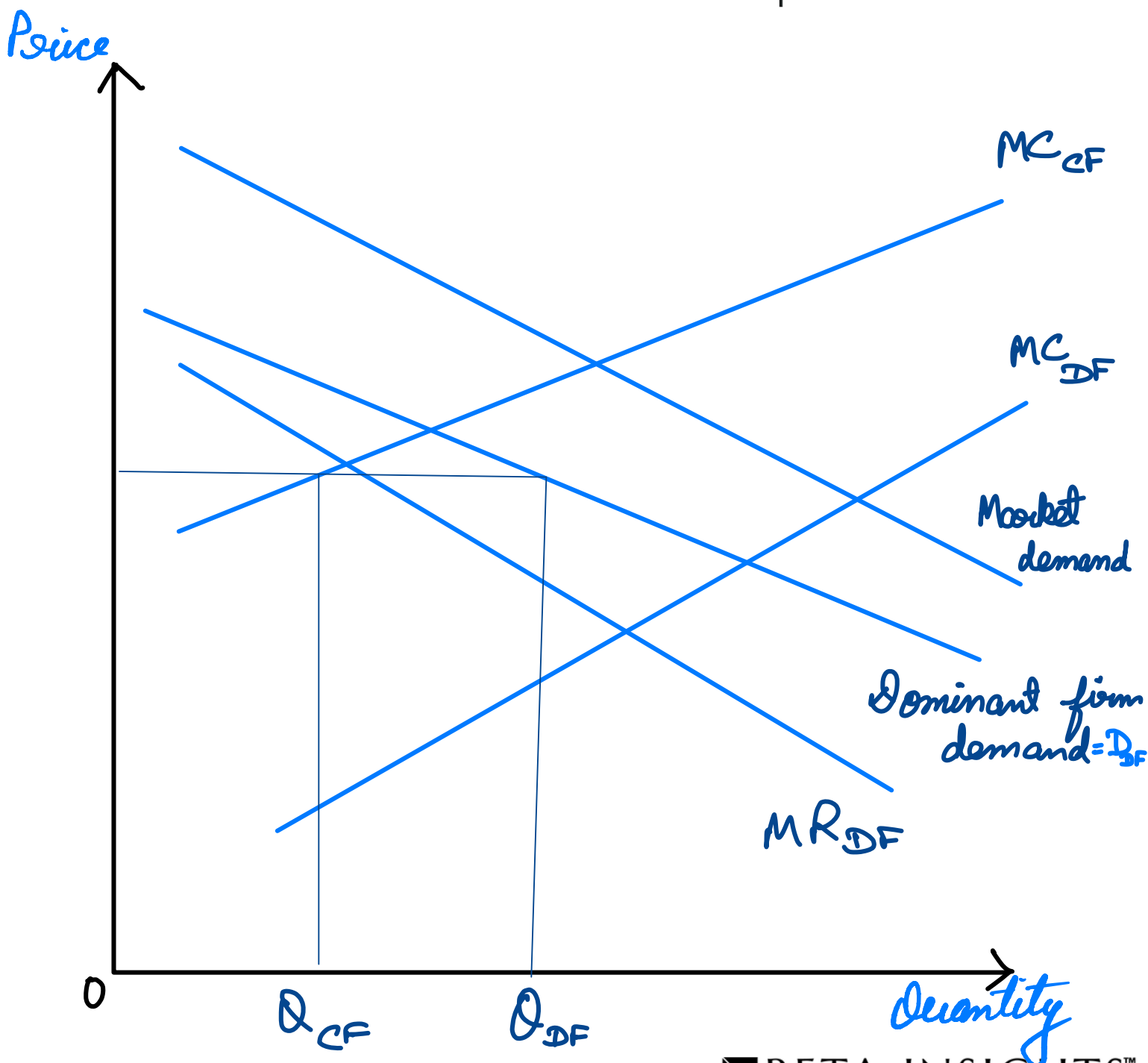
- In this matrix, the numbers represent the profits obtained by Firm A and Firm B based on their respective pricing strategies.
- Nash equilibrium occurs when neither Firm A nor Firm B has an incentive to change its strategy unilaterally.
- In this example, the Nash equilibrium is reached when Firm A chooses a low price (L) and Firm B chooses a high price (H).
- If Firm A deviates and chooses a high price (H), it would earn a lower profit (5 instead of 20) due to Firm B's response.
- Similarly, if Firm B deviates and chooses a low price (L), it would earn a lower profit (10 instead of 15) due to Firm A's response.
- Therefore, both firms have chosen their strategies optimally given the other firm's choice.
- Nash equilibrium provides a stable solution in oligopoly by capturing the mutual best responses of firms.

- It represents a point where each firm's chosen strategy is optimal, considering the strategies of its competitors.
- However, it's important to note that Nash equilibrium does not guarantee the best possible outcome for the overall market or society as a whole.
- It solely focuses on individual firms' decision-making in a competitive environment.
- Nash equilibrium has applications in various oligopoly scenarios, including pricing decisions, product differentiation, advertising strategies, and market entry/exit decisions.
- It provides insights into the strategic interactions and outcomes in oligopolistic markets.
- The **dominant firm model** is a framework where a small number of firms dominate the industry.
- In this model, there is one large, dominant firm and a group of smaller firms that act as followers or fringe competitors.

- The dominant firm has a significant market share and possesses the ability to influence market prices and quantities.
- Under the dominant firm model, the dominant firm assumes the role of a price leader, setting the market price for the entire industry.
- The followers, or fringe firms, are price takers and adjust their output levels accordingly.
- The dominant firm takes into account the reaction of the fringe firms when determining its own output level and price.
- Let's consider an **example** to understand the dominant firm model.
- Suppose there is an oligopoly market for smartphones, and Company X is the dominant firm with a large market share.
- It has established itself as a leader in terms of technology, brand recognition, and market presence.

- The other firms in the industry, such as Company Y and Company Z, are smaller and have limited market shares.
- In this scenario, Company X sets the price for smartphones based on its assessment of market demand, production costs, and the anticipated reactions of the fringe firms.
- It aims to maximize its own profits while considering the potential actions of the followers.
- If Company X lowers the price of its smartphones, it expects that the fringe firms will follow suit to remain competitive.
- Conversely, if Company X raises the price, it anticipates that the followers will maintain their prices to attract price-sensitive consumers.
- The dominant firm takes into account these strategic interactions while making pricing decisions.
- The dominant firm model assumes that the followers have limited market power and must accept the market price set by the dominant firm.

- The followers typically have higher costs and operate at smaller scales, making it challenging for them to compete directly with the dominant firm on price.
- Instead, they may focus on product differentiation, niche markets, or cost-cutting measures to maintain their market positions.



MONOPOLY CHARACTERISTICS

- Monopoly is a market structure where a **single seller** dominates the industry, having exclusive control over the supply of a product or service, and facing **no close substitutes**.
- It allows the monopolistic firm to exert significant **market power**, setting prices and quantities without direct competition.
 - **Single Seller:** A monopoly exists when there is a single seller in the market, controlling the entire supply of a particular product or service.
 - **No Close Substitutes:** The monopolistic firm has no close substitutes for its product, meaning there are no alternative products that can satisfy the same customer needs to a significant degree.

- **High Barriers to Entry:** Monopolies often have substantial barriers to entry, which can include legal restrictions, economies of scale, control over key resources, or patents that prevent competitors from entering the market.

- **Market Power:** As the sole provider, a monopoly has significant market power, allowing it to control the price and quantity of the product it sells.

- **Price Maker:** Unlike in a competitive market, a monopoly has the ability to set the price at which it sells its product or service, taking into consideration the demand and production costs.

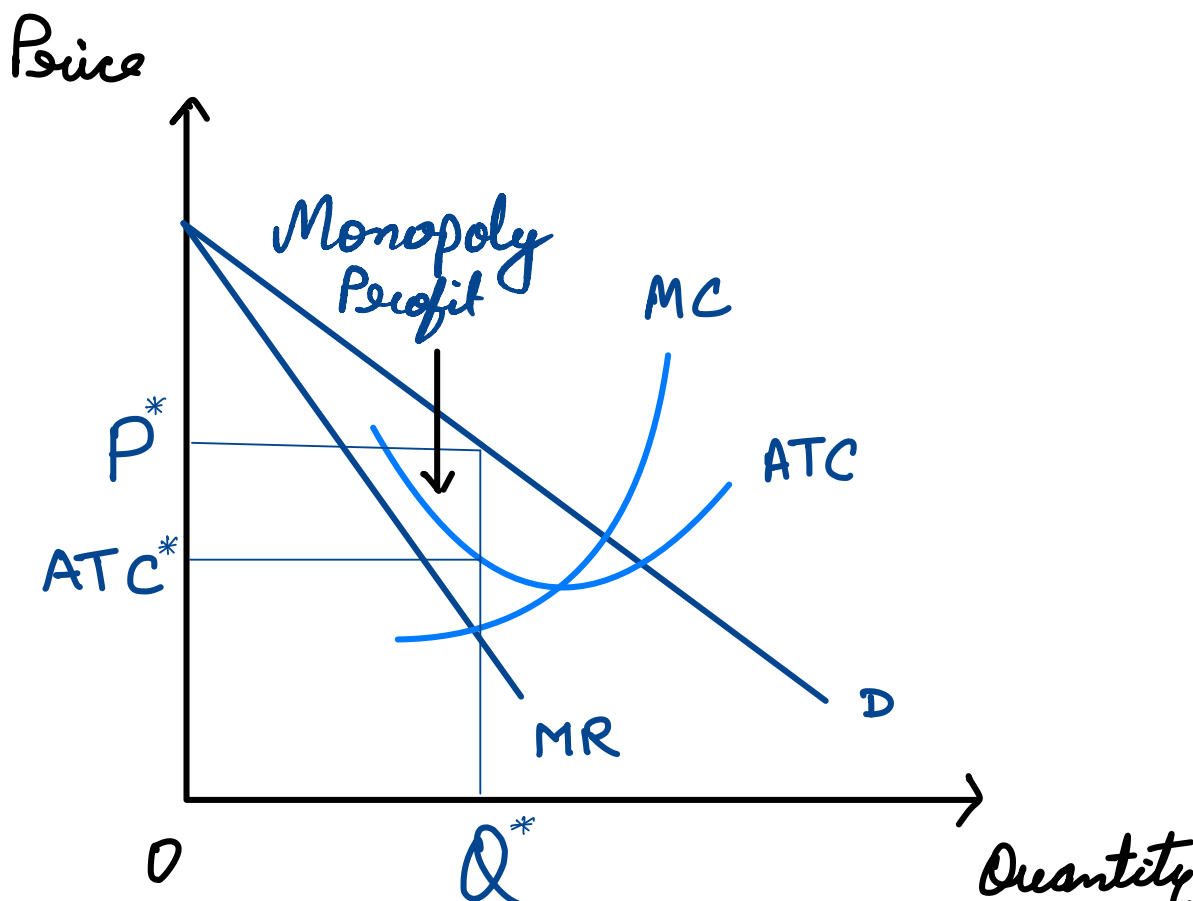
- **Example:** A well-known example of a monopoly is Microsoft's operating system, Windows.
- For many years, Windows dominated the personal computer operating system market, enjoying a near-monopoly position.
- Microsoft had no significant competitors with similar market share and functionality.

- This allowed Microsoft to set prices and dictate terms to consumers and computer manufacturers.
- **Price discrimination** refers to a strategy where a seller charges different prices to different buyers for the same or similar products or services.
- It occurs when a seller can identify and exploit differences in price elasticity of demand among different customer groups.
- There are **three types** of price discrimination:
 - **First-degree price discrimination:** The seller charges each customer their maximum willingness to pay. This type of discrimination requires the seller to have perfect information about each customer's willingness to pay.
 - **Second-degree price discrimination:** The seller charges different prices based on quantity or volume discounts. For example, bulk pricing or pricing tiers for software subscriptions.

- **Third-degree price discrimination:** The seller charges different prices based on segmenting customers into distinct groups with different price elasticities of demand. This is the most common type of price discrimination.

• **Example:** An example of price discrimination is the airline industry.

- Airlines often charge different prices for the same flight based on factors such as the time of booking, flexibility of travel dates, and passenger segment (e.g., business travelers, leisure travelers).



EFFECTS OF PRICE DISCRIMINATION

- Price discrimination under a monopoly can have significant effects on both output and profit.

- Let's delve into each aspect in detail:

- **Output:**

- Price discrimination enables a firm to capture a larger portion of consumer surplus by charging different prices to different groups of customers based on their willingness to pay.
- By segmenting the market and charging higher prices to customers with a relatively inelastic demand (less price-sensitive), the monopolist can extract more revenue from these buyers.
- As a result, the monopolist may increase output compared to a situation without price discrimination because the additional revenue gained from higher-priced segments can offset the decrease in revenue from lower-priced segments.

- Price discrimination allows the firm to serve multiple customer segments, accommodating a wider range of demand and potentially increasing overall production levels.

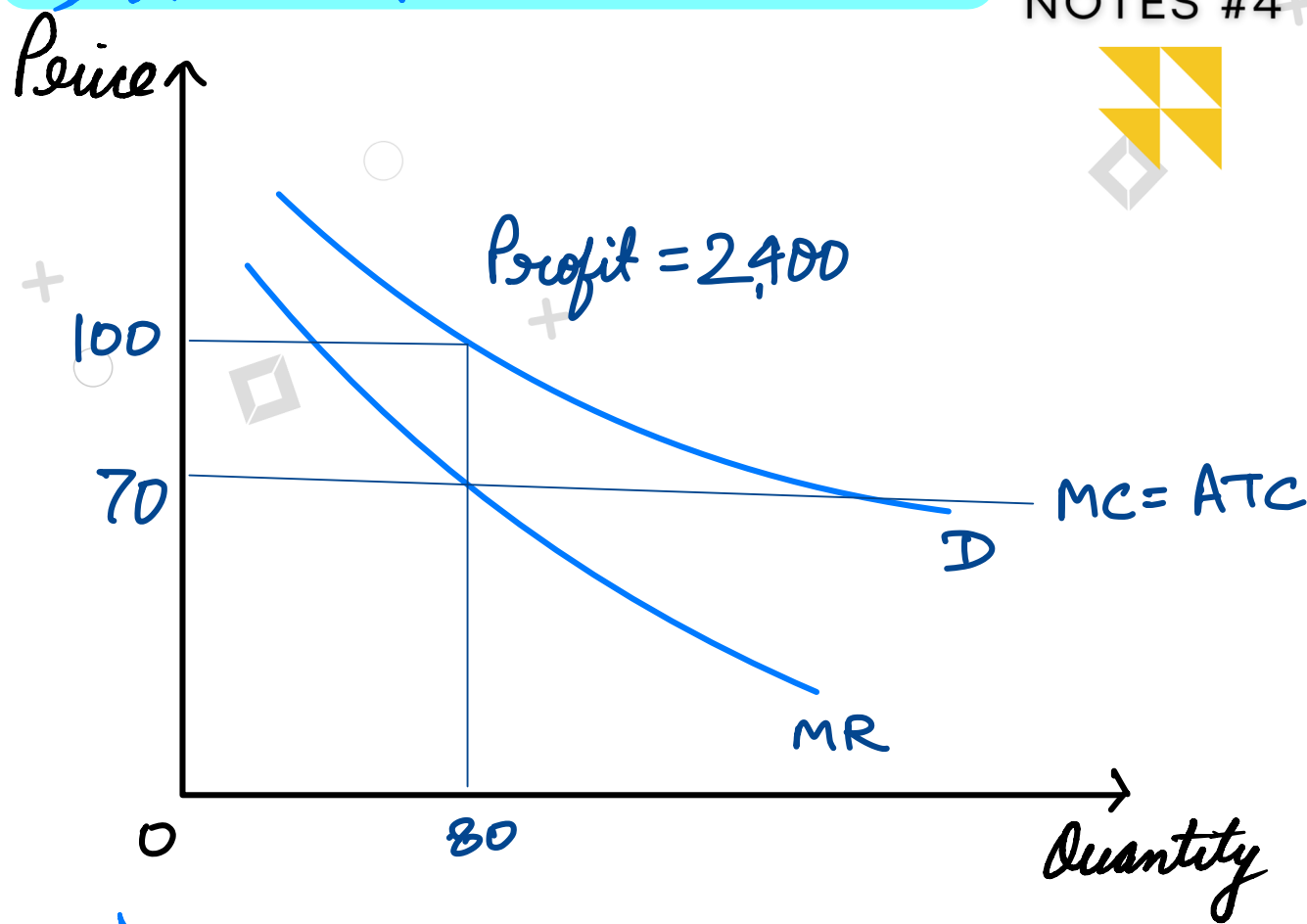
- **Profit:**

- Price discrimination can lead to higher profits for a monopolistic firm compared to a situation with a uniform price.
- By charging different prices based on customers' willingness to pay, the firm can increase its total revenue.
- The monopolist captures more consumer surplus and converts it into additional profit.
- Price discrimination helps to maximize the firm's profit by extracting the highest possible price from customers with a relatively inelastic demand and offering lower prices to customers with a relatively elastic demand.
- In some cases, price discrimination can also reduce the intensity of competition by segmenting the market.

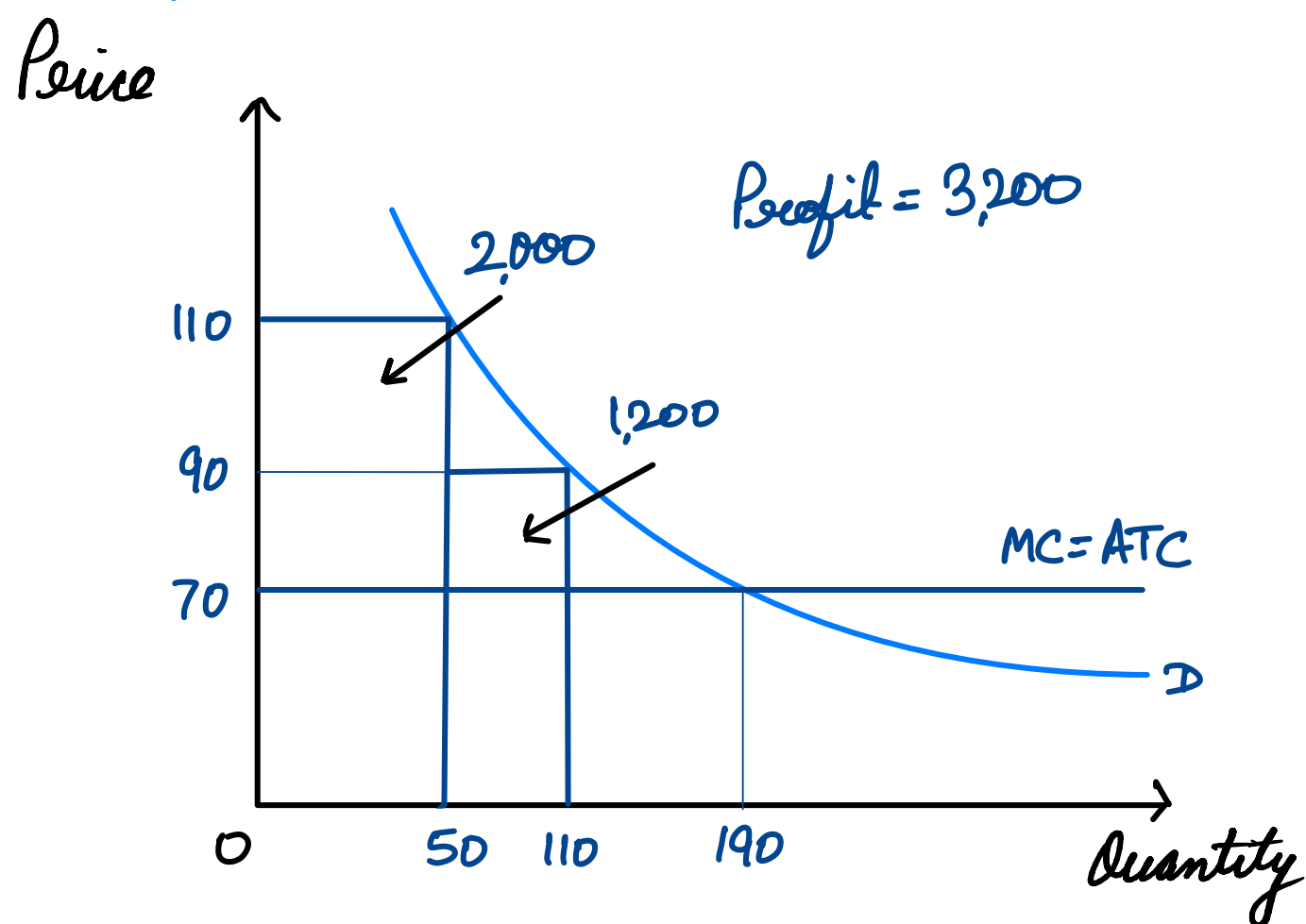
- However, the success of price discrimination in increasing profits depends on the firm's ability to effectively segment the market and accurately identify the different price elasticities of demand across customer groups.
- Overall, price discrimination can lead to higher output levels and increased profits for a monopolistic firm.
- It allows the monopolist to better capture consumer surplus and tailor prices to different segments of the market.
- However, the extent to which price discrimination is beneficial depends on the firm's ability to implement effective segmentation strategies and accurately assess customers' price sensitivities.

a) Without price discrimination

NOTES #4



b) With price discrimination



NATURAL MONOPOLY

- A natural monopoly occurs when a single firm can produce and supply a particular good or service at a lower cost than multiple competing firms.
- It arises due to significant economies of scale, where the average cost of production decreases as output increases.
- In a natural monopoly, it is more efficient to have a single firm operating in the market than multiple firms.
- Key characteristics of a natural monopoly:
 - **Economies of Scale:** The firm experiences decreasing average costs over a wide range of output levels. This makes it more cost-effective for a single firm to produce the entire market output than multiple firms.
 - **High Fixed Costs:** Natural monopolies often require significant initial investments. These create barriers to entry for new entrants to gain market share.

○ **Network Effects:** In some cases, natural monopolies benefit from network effects, where the value of the product or service increases as more customers use it. This reinforces the dominance of the existing firm and makes it harder for new entrants to attract customers.

○ **Regulatory Oversight:** Due to the potential for abuse of market power and lack of competition, natural monopolies are often subject to government regulation to protect consumers and ensure fair pricing and service quality.

- **Example:** A classic example of a natural monopoly is the provision of utilities such as water, electricity, or natural gas.
- The infrastructure required to deliver these services, such as pipelines or power grids, involves substantial fixed costs.

- Once the infrastructure is in place, it becomes more efficient to have a single company operate and maintain it, rather than duplicating the infrastructure with multiple competing firms.
- For instance, consider the electric power industry. Building and maintaining an extensive network of power plants, transmission lines, and distribution systems requires substantial investments.
- Once established, the marginal cost of producing and distributing additional units of electricity is relatively low.
- In this case, it is economically advantageous to have a single utility company providing electricity, benefiting from economies of scale and minimizing duplication of infrastructure.
- To prevent monopolistic abuse, governments often regulate natural monopolies to ensure fair pricing, quality of service & consumer equality.
- Regulation may involve setting price controls, quality standards, or granting licenses with specific obligations.

- It is worth noting that not all monopolies are natural monopolies.
- Some monopolies may arise due to artificial barriers, such as exclusive patents or government-granted privileges, rather than inherent efficiency advantages.
- Average cost pricing and marginal cost pricing are two approaches to regulating natural monopolies to ensure fair pricing and prevent the abuse of market power.
- Let's explore each of them in detail:

- **Average Cost Pricing:**

- It sets the price for the goods or services provided by a natural monopoly equal to its **average total cost (ATC).**
- The objective of average cost pricing is to allow the natural monopoly to cover its costs and earn a reasonable rate of return on its investments while avoiding excessive profits.

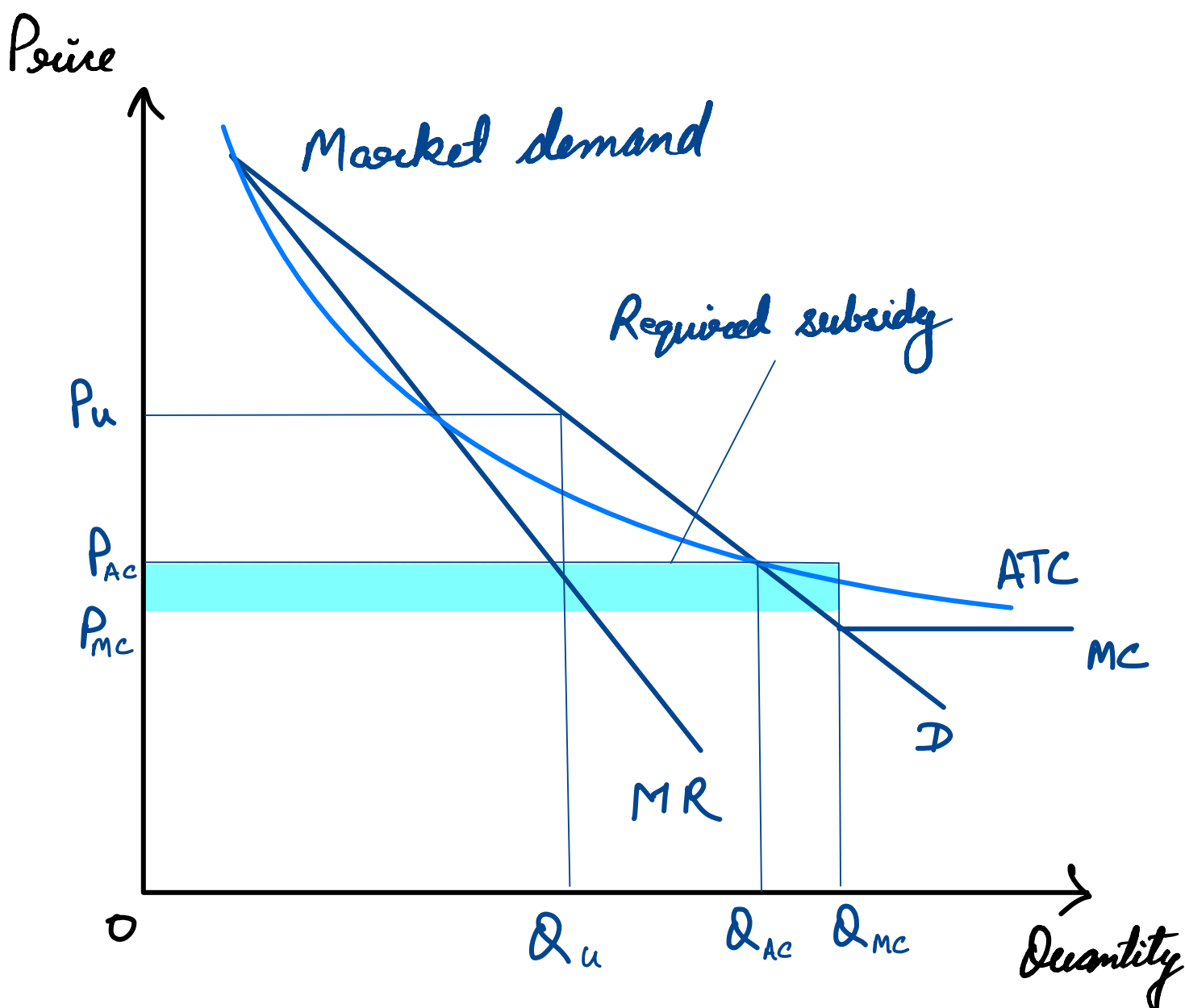
- By setting the price equal to average total cost, the natural monopoly operates on a break-even basis, without generating economic profits.
- This approach ensures that prices are reasonable and affordable for consumers, preventing the monopolistic firm from charging excessively high prices due to its market power.
- However, average cost pricing may not incentivize the natural monopoly to be efficient or innovate since it does not provide any profit margin beyond covering costs.

- **Marginal Cost Pricing:**

- It sets the price for the goods or services provided by a natural monopoly equal to its marginal cost (MC).
- The objective of marginal cost pricing is to achieve allocative efficiency by setting the price equal to the incremental cost of producing an additional unit.

- Marginal cost represents the cost of producing one additional unit of output and reflects the firm's variable costs.
- It excludes fixed costs, which are already covered by the average cost pricing approach.
- By setting the price equal to marginal cost, the natural monopoly maximizes consumer welfare by charging a price that is closer to the true cost of production.
- Marginal cost pricing provides incentives for the natural monopoly to operate efficiently and produce at the socially optimal level of output.
- However, it may not fully cover the fixed costs incurred by the natural monopoly, potentially leading to financial difficulties or underinvestment in infrastructure and maintenance.
- Both average cost pricing and marginal cost pricing have their advantages and limitations.

- Average cost pricing ensures affordability for consumers and allows the natural monopoly to cover its costs, but it may lack incentives for efficiency and innovation.
- Marginal cost pricing promotes allocative efficiency and incentivizes cost minimization, but it may not fully cover fixed costs and could affect the financial viability of the natural monopoly.



PRICING STRATEGY FOR MARKET STRUCTURES

- Pricing strategies vary across different market structures, each with its own characteristics and competitive dynamics.
- Let's explore pricing strategies for major market structures:

- **Perfect Competition:**

- In perfect competition, where numerous small firms compete with homogeneous products, price is determined solely by market forces of supply and demand.
- Pricing strategies focus on setting prices at the prevailing market equilibrium, as individual firms have no market power to influence prices independently.
- Firms in perfect competition typically engage in **price-taking behavior**, meaning they accept the market price and adjust their output levels accordingly.

• Monopoly:

- Monopolies, characterized by a single seller with no close substitutes, have significant market power and can set prices to maximize their profits.
- Pricing strategies for monopolies often involve setting prices higher than marginal cost to maximize profits, taking advantage of their market dominance.
- Price discrimination is another strategy employed by monopolies, where different prices are charged to different customer segments based on their willingness to pay.

• Oligopoly:

- Oligopolies feature a small number of firms that dominate the market.
- Pricing strategies in oligopolies can vary based on the level of competition and interdependence among firms.

- **Collusive Pricing:** Firms may collude to fix prices and collectively maximize their profits.
- + This can take the form of formal agreements (cartels) or informal understandings.
- **Price Leadership:** One firm may act as a price leader, setting the price and other firms follow suit. The price leader often has a dominant market position and sets prices based on the expected reactions of other firms.
- **Non-price Competition:** Oligopolistic firms may compete on factors other than price, such as product differentiation, marketing, innovation, or customer service.

- **Monopolistic Competition:**

- Monopolistic competition features many firms selling differentiated products in a non-collusive environment.
- Pricing strategies in monopolistic competition involve setting prices based on product differentiation and perceived customer value.

- Firms may engage in **price skimming** by setting high initial prices for innovative or unique products and gradually lowering prices over time to reach broader market segments.
- Firms can also use **price bundling**, where multiple products or services are offered together at a discounted package price to incentivize customer purchases.
- It's important to note that these pricing strategies are not exhaustive and the actual strategies adopted by firms can be more nuanced, incorporating elements of multiple strategies or variations specific to their industries.
- Market conditions, consumer behavior, competitive dynamics, and regulatory frameworks also **play a significant role** in shaping pricing strategies in practice.

MARKET CONCENTRATION

- Market concentration refers to the degree of dominance or concentration of market share among a few firms in a particular industry or market.
- It measures the extent to which a small number of firms control a significant portion of the total market sales or output.
- High market concentration indicates a less competitive market, while low market concentration suggests a more competitive market structure.
- **Concentration measures** are quantitative tools used to assess and quantify market concentration.
- They provide a numerical representation of the degree of concentration within a market.
- **N-Firm Concentration Ratio:**
 - It calculates the combined market share or percentage of total sales accounted for by the largest N firms in a market.

- It indicates the proportion of market power held by the top N firms.
- For example, a 4-firm concentration ratio of 60% means that the four largest firms in the market collectively control 60% of the market share or sales.
- Higher concentration ratios imply a more concentrated market with fewer dominant firms, while lower concentration ratios indicate a more fragmented market with several smaller competitors.

- **Herfindahl-Hirschman Index (HHI):**

- The HHI is another concentration measure used to evaluate market concentration. It is calculated by summing the squared market shares of all firms in the market.
- The formula for calculating the HHI is as follows:

$$HHI = S_1^2 + S_2^2 + \dots + S_n^2$$

- where $s_1, s_2, \dots, s_n$ represent the market shares of individual firms in the market.
- The HHI ranges from 0 to 10,000, with higher values indicating greater market concentration.
- An HHI below 1,500 is generally considered indicative of a competitive market, while an HHI above 2,500 suggests a concentrated market.
- The U.S. Department of Justice uses the HHI as a guide to evaluate the competitive effects of mergers and acquisitions.
- The HHI provides a more detailed measure of concentration by taking into account the market shares of all firms, giving greater weight to larger firms.
- It is particularly useful for comparing market concentration over time or across different markets or industries.

liked it?

COME JOIN US

 **Satyam Parashar**

 **Beta Insights™ Professional Academy**

OUR OTHER PROGRAMS

FUNDAMENTALS OF FINANCIAL MODELING

FINANCIAL ANALYST PROGRAM™

INVESTMENT BANKING ANALYST PROGRAM

 **BETA INSIGHTS™**

PROFESSIONAL ACADEMY

 **BETA INSIGHTS™**