

LM01 Firms and Market Structures

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1. Introduction

This learning module covers:

- Breakeven and shut down points of production, and economies and diseconomies of scale.
- Characteristics, demand, supply, optimal price, and output for different types of market structures: perfect competition, monopolistic competition, oligopoly, and pure monopoly.
- Techniques used by analysts to identify what market structure a firm is operating in.

2. Profit Maximization: Production Breakeven, Shutdown and Economies of Scale

Firms can generally be classified as operating in either a perfectly competitive or imperfectly competitive environment.

In a perfectly competitive market,

- The firm faces a perfectly elastic, horizontal demand curve; and it must take the market price of its output as a given. It has no pricing power.
- Its marginal revenue (MR) = average revenue (AR) = price of the product (P).
- Its total revenue (TR) = $P \times Q$. As the firm sells one more unit its TR rises by the exact amount of price per unit.

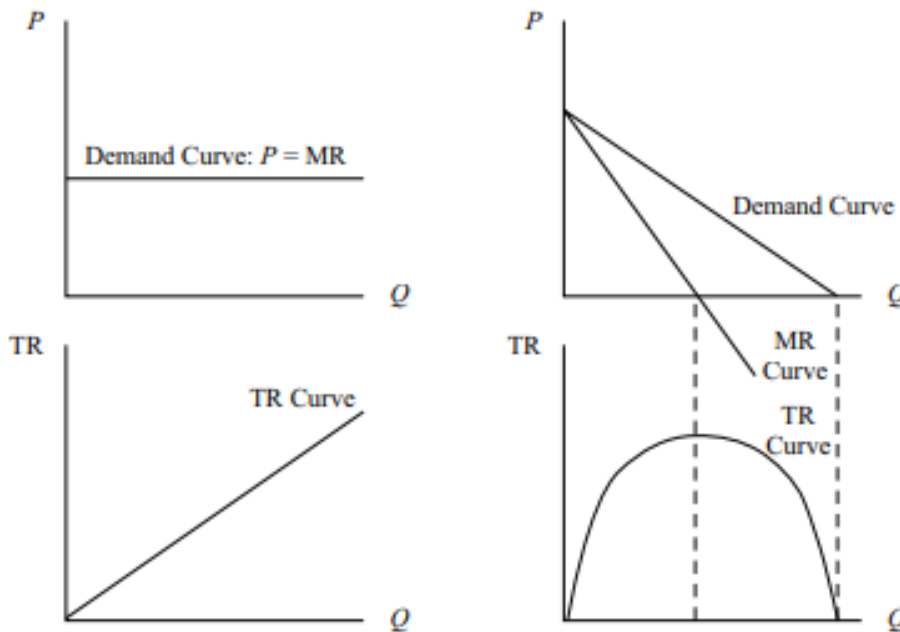
In an imperfectly competitive market,

- The firm faces a downward sloping demand curve. It can set prices, but if it sets a high price the quantity sold is low, to increase sales it has to lower prices.
- MR curve is also downward sloping and lower than the demand curve. It intersects the X-axis at the point where total revenue is maximized.
- The TR curve for such a firm is initially zero, then it increases and subsequently decreases. It increases when MR is positive and demand is elastic. It falls when MR is negative and demand is inelastic. TR is maximum when MR is zero.
- Total revenue increases with greater quantity. However, there is a quantity at which the profit is maximized. Beyond this, any price decrease will result in a decrease in total revenue as the effect of the decrease in price will be greater than the quantity sold.

Exhibit 1 from the curriculum illustrates these concepts.

A. Perfectly Competitive Firm

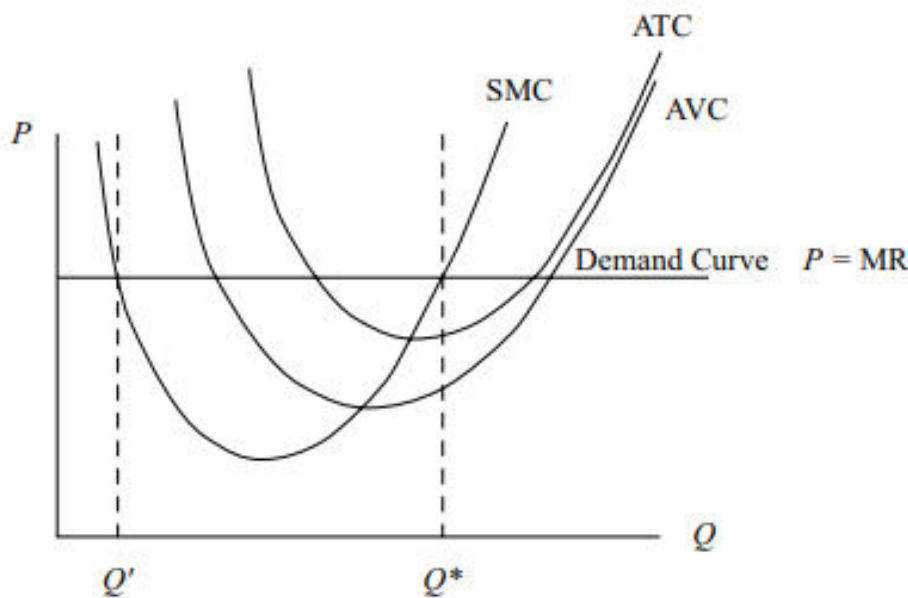
B. Imperfectly Competitive Firm



Profit-Maximization, Breakeven, and Shutdown Points of Production

We now combine the firm's short-run TC (total cost) curves and TR curves to represent profit maximization under both perfect and imperfect competition.

Exhibit 2 from the curriculum shows the profit maximization conditions under perfect competition.



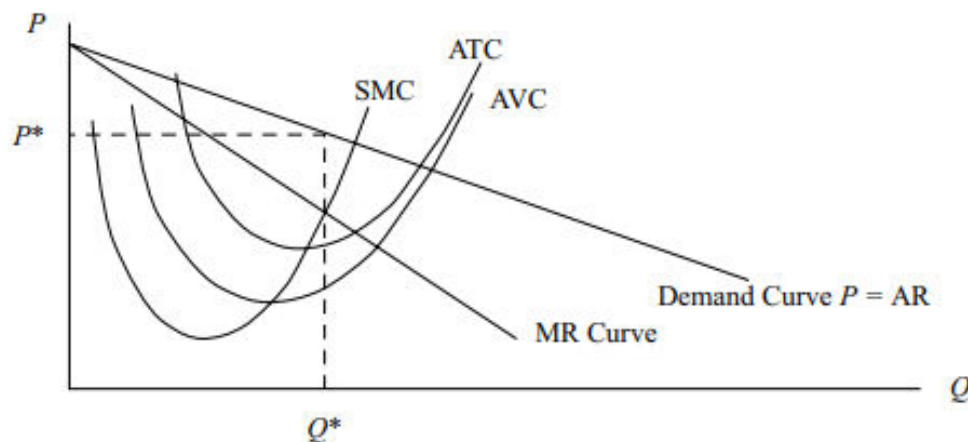
Profit is maximized by producing Q^* , where MR is equal to the short-run marginal cost

(SMC) and SMC is rising. Note that MR is also equal to SMC at Q' , but here the SMC is falling, so this is not the profit-maximizing output level.

If the market price rises, the firm's demand and MR curve will shift up, and the new profit-maximizing output level will be to the right of Q^* . Similarly, if the market price falls, the firm's demand and MR curve will shift down, and the new profit-maximizing output level will be to the left of Q^* .

As shown in the diagram, the firm is currently earning a positive economic profit because the market price is above the average total cost (ATC). This scenario is possible in the short run; in the long run, however, competitors will enter the market to capture some of those profits, and the market price will be driven down to level equal to each firm's ATC.

Exhibit 3 from the curriculum shows the profit maximization conditions under imperfect competition (a monopoly).



Although the MR and demand curves are different, the profit maximization rule stays the same: Find the optimal output level Q^* where $MR = SMC$. Once this optimal output level is found, the optimal price P^* is given by the firm's demand curve.

The monopolist earns positive economic profit because its price exceeds ATC. Since a monopolistic market usually has barriers to entry that prevent competition, the firm can continue to earn positive economic profits in the long run.

Breakeven Analysis and Shutdown Decision

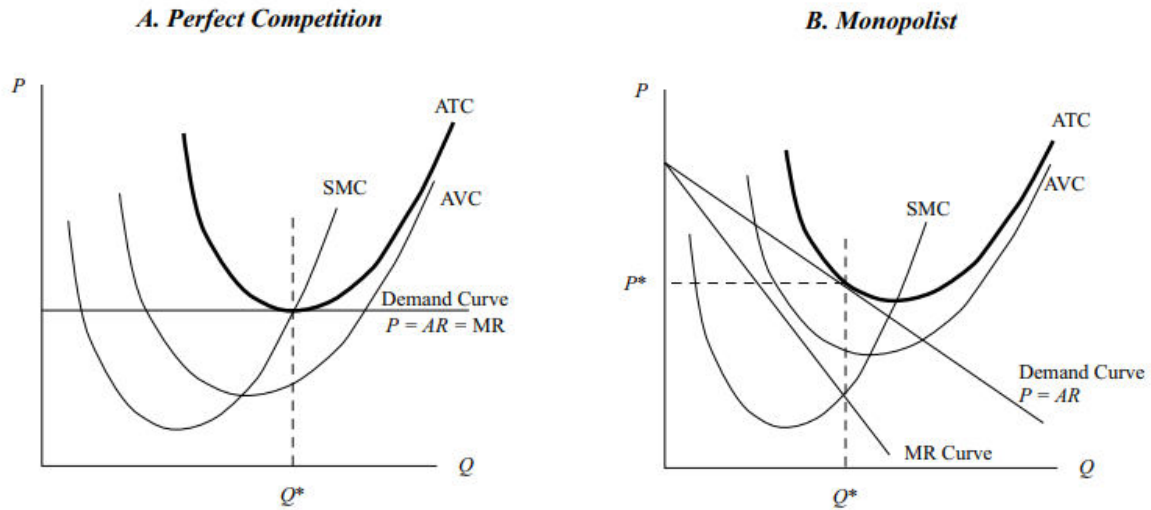
A firm is said to break even under the following conditions:

- total revenue equals total costs ($TR = TC$).
- price (average revenue) equals average total costs ($AR = ATC$).

When a firm is operating at its break-even point, the economic profit is zero. It might still be earning a positive accounting profit.

Exhibit 4 from the curriculum depicts the breakeven scenarios for both perfect competition

and imperfect competition (a monopoly).



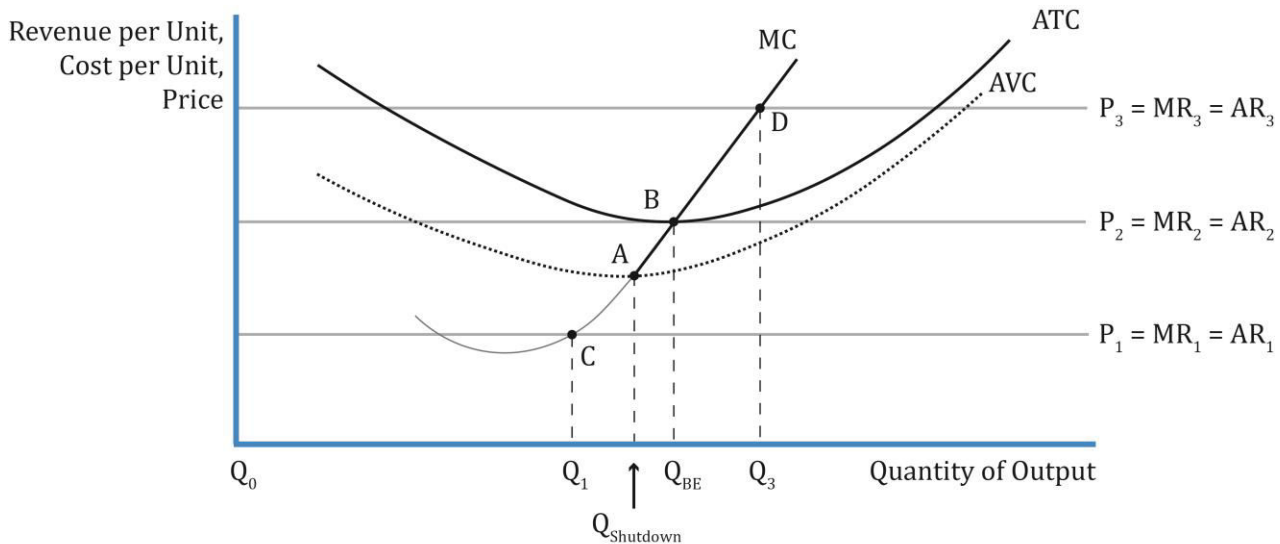
In both scenarios, at the optimal output level Q^* (where $MR = SMC$), the price is equal to the ATC. Hence economic profit = 0 and the firms are breaking even.

The Shutdown Decision

The relationships that show when a firm must operate or shutdown are given in the table below:

Short-run effect of the relationship between price and ATC on a firm		
Situation	Short run	Long run
$TR \geq TC$	Operate	Operate
$TR \geq TVC$ but $TR < TC$	Operate	Exit
$TR < TVC$	Shutdown	Exit

Let us understand a firm’s breakeven and shutdown point using the graph below.



Interpretation of the graph:

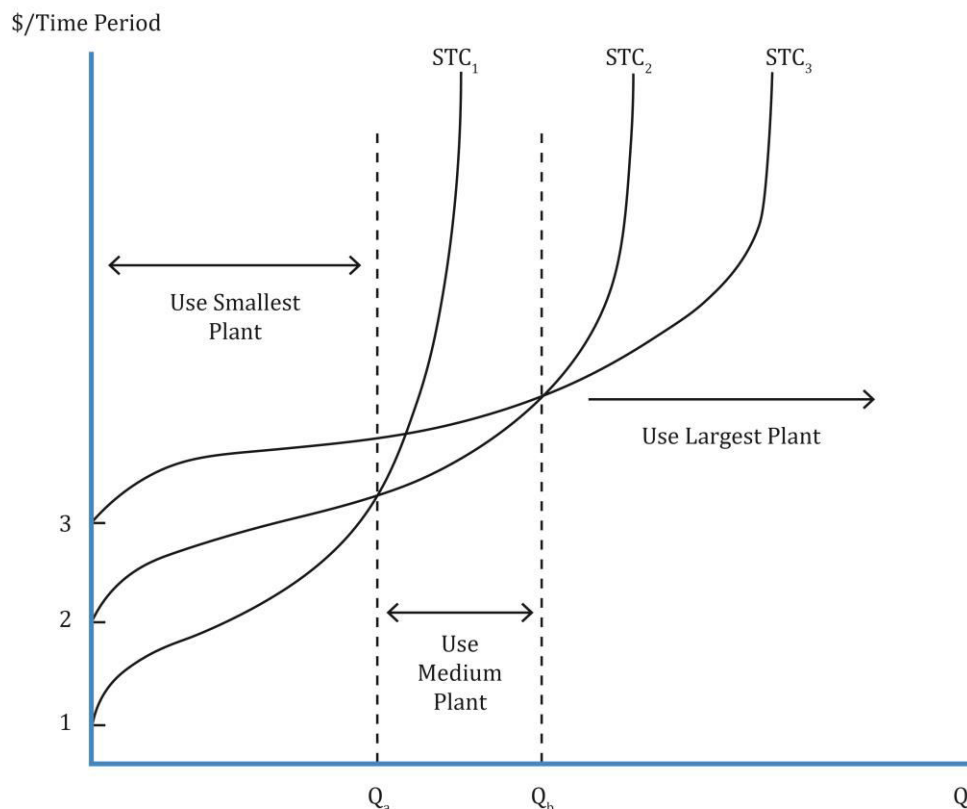
- Assume the price at P_3 is 150. If the competition is perfect, then P_3 is the demand curve and $MR = AR$.
- At any point on the MC between P_2 and P_3 , the firm is profitable because the average revenue is greater than the average total cost.
- The breakeven point is the point where $P = ATC = MC$. Graphically, it is the point where MC intersects ATC . The corresponding quantity is the breakeven quantity, Q_{BE} . Suppose this price is 100.
- Between A and B , the price is greater than AVC . The firm will continue to operate in the short run even though it is not profitable.
- To the left of A , the price is less than AVC . The firm will shut down.

Economies and Diseconomies of Scale with Short-Run and Long-Run Cost Analysis

Economists use two time horizons based on how firms are able to vary the quantity of input: short run and long run. In the short run, at least one of the inputs or factors of production is constant. In the long run, all factors of production are variable.

Short- and Long-Run Cost Curves

The graph below shows a set of short-run total cost curves for each level of capital input.



In the short run:

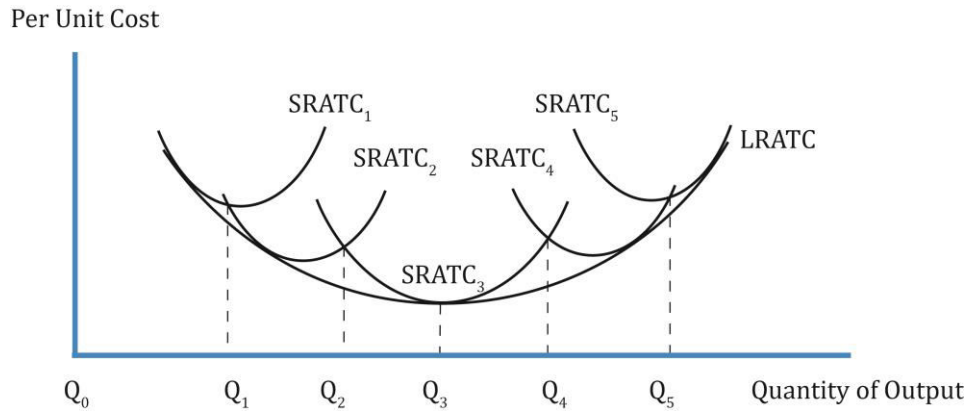
- Typically, where we are considering two factors of production, capital is fixed in the short run and the variable factor is labor. However, when capital changes, we get a new STC curve for each level of capital input.
- The fixed-input constraint along with other input prices determines a firm's short-run total cost curve (STC).

In the long run:

- All factors of production (both labor and capital) are variable.
- Think of the long-run total cost curve (LTC) as a combination of several STCs. By drawing a tangent to the minimum point of all the SRATC curves and connecting them, we get the LTC curve for the firm.
- The LTC is called the envelope curve. It envelops or encompasses all combinations of technology, plant size, and physical capital.

Defining Economies of Scale and Diseconomies of Scale

Each STC curve has a corresponding short-run average total cost curve (SRATC). The STCs for different plant sizes and the corresponding long-run average total cost curve (LRATC) is shown in the exhibit below.



Interpretation of the graph:

- The SRATC defines what the per-unit cost will be for any quantity in the short run.
- The SRATC shifts down and to the right. Note that as plant size increases, the per-unit cost decreases as can be seen in the case of SRATC₃.
- The LRATC is derived from connecting the lowest level of STC for each level of output.
- The shape of the long-run cost curve depends on whether the firm is facing economies of scale or diseconomies of scale.
- **Economies of scale** is the decrease in the long-run cost per unit as output increases. LRATC has a negative slope when there are economies of scale. The portion to the left of Q₃ represents economies of scale.
- Q₃ represents the **minimum efficient scale**. It is the output level at which the long-run average total cost is the lowest and the output is optimal. This portion exhibits constant returns to scale where long-run average total costs do not change as output quantity increases.
- Beyond Q₃, the LRATC goes up. This portion represents **diseconomies of scale**. Here there is an increase in long-run cost per unit as output increases. LRATC has a positive slope when there are diseconomies of scale. The right side of LRATC curve represents diseconomies of scale.

The factors contributing to economies of scale and a lower ATC are as follows:

- Increasing returns to scale: increase in output is relatively larger than the increase in input. The left side of Q₃ shows increasing returns to scale.
- Division of labor/management.
- Technologically/economically efficient equipment that results in increased productivity.
- Effective decision-making.
- Reduce waste and lowering costs through better quality control.
- Bulk purchases resulting in lower prices.

The factors contributing to diseconomies of scale are as follows:

- Decreasing returns to scale: Increase in output is relatively less than the increase in input. The right side of Q_3 shows decreasing returns to scale.
- Higher resource costs due to supply bottlenecks.
- Improper management because of size.
- Duplication of product lines.
- Higher labor costs.

3. Introduction to Market Structures

Analysis of Market Structures

The market is defined as a group of buyers and sellers that are aware of each other, and are able to agree on a price for the exchange of goods and services.

The market structure is classified into the following four categories:

- Perfect competition
- Monopolistic competition
- Oligopoly
- Monopoly

Perfect competition and monopoly are two extremes of the market structure in terms of number of firms and profits with the other types falling somewhere in between.

Factors that Determine Market Structure

The five factors that determine market structure are:

- The number and relative size of firms supplying the product. The higher the number of firms, the higher the degree of competition.
- The degree of product differentiation.
- Pricing power of the sellers. Are they price takers, or can they influence market prices?
- The relative strength of the barriers to market entry and exit.
- The degree of non-price competition.

The table below summarizes the basic characteristics of the four market structures:

	Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly
Number of Sellers	Many firms	Many firms	Few firms	Single firm
Barriers to Entry and Exit	Very low	Low	High	Very high

Product Differentiation	Homogeneous	Substitutes but differentiated	Close substitutes or differentiated	Unique product
Non-price Competition	None	Advertising and product differentiation	Advertising and product differentiation	Advertising
Pricing Power	None. Price taker.	Some	Some to significant	Considerable
Example	Oranges; Milk; Wheat	Toothpaste	Prices of commercial airlines for a given route	Electricity provider/any utility company (water, cooking gas) as they are typically controlled by a government authority

Note: This table is important from an exam perspective.

The most preferred market structure by producers is monopoly/oligopoly because they offer the highest pricing power. The most preferred market structure by consumers is perfect competition as prices are lower.

4. Monopolistic Competition

This is a market where there are many sellers of slightly differentiated products. *Product differentiation* is the key here. Ex: Burgers sold by KFC, McDonalds, Burger King, etc.

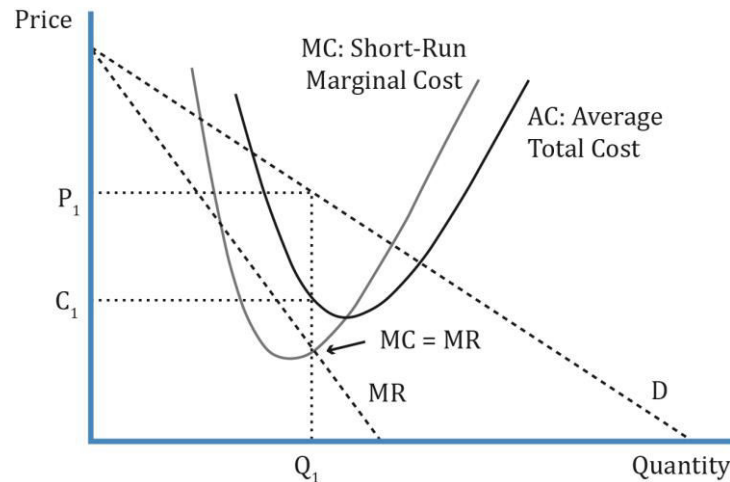
If the firm is able to successfully differentiate the product (e.g. Harley Davidson motorcycles), then the firm acts like a small monopoly.

Characteristics:

- There are a large number of potential buyers and sellers.
- The products offered by each seller are close substitutes for the products offered by other firms, and each firm tries to make its product look different.
- Entry into and exit from the market is possible at fairly low costs.
- Firms have some pricing power.
- Firms differentiate their products through advertising and other non-price strategies.

Demand Analysis in Monopolistically Competitive Markets

The graph below shows the marginal cost (MC), demand and marginal revenue (MR) curve for a monopolistic firm.



- Since the products are unique, a monopolistic firm has a downward sloping demand curve. MR is steeper and lies below the demand curve.
- Let us consider the toothpaste market. If consumers believe using Sensodyne toothpaste will relieve them of toothaches, then they will buy the product. However, the firm will have a downward sloping curve because if the prices are very high, then consumers will not buy the product, and will look for alternatives. Conversely, demand increases when the price decreases.
- Price and quantity demanded are inversely related.
- In the short run, the profit-maximizing quantity is $MR = MC$. This is Q_1 in the graph. The price is then determined based on the demand curve. This is P_1 in the graph.
- Because the product is differentiated, firms have some pricing power and charge what is determined by the demand curve. But each time a new firm enters the market, the demand curves of other firms fall (i.e., they lose a part of the market share). Since there is high competition, the products are often priced closed to each other.
- Demand is elastic at higher prices and inelastic at lower prices.
- Total revenue = $P_1 * Q_1$
- Cost = $C_1 * Q_1$
- In the short run, economic profit = $(P_1 * Q_1) - (C_1 * Q_1)$

Supply Analysis in Monopolistically Competitive Markets

Optimal Price and Output in Monopolistically Competitive Markets

Key points related to supply analysis in the context of monopolistic completion are:

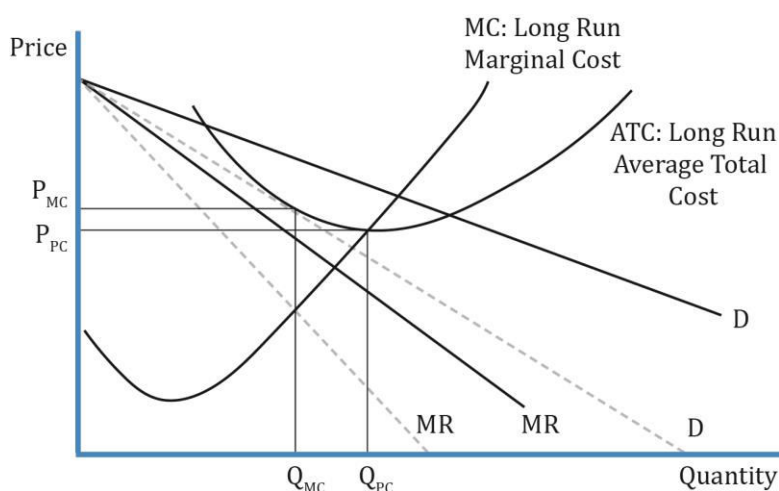
- Output is based on $MR = MC$.
- Price is determined based on the demand curve.
- The supply function is not well-defined in monopolistic competition.
 - Recall that in perfect competition, a firm's output does not affect the price as all units sell at the same price (horizontal demand curve). They are price takers. $P =$

$MR = MC$. But, how much a firm produced was dependent on its MC curve. In the short run, the firm's supply curve was the MC curve above the minimum point of the AVC curve. The MR curve was a flat line and the same as the market price at that point.

- But, in monopolistic competition there is no single price as the firm can set its own price, and does not have to take the price determined by the market. The price here is determined by the demand curve. The firm's supply curve must show the quantity the firm is willing to supply at various prices, which is not shown by the MC curve here. MR is a downward sloping curve. The optimal output is still the intersection of MR and MC.
- Prices are higher and quantity is lower relative to perfect competition.
- Total profit = $TR - TC$.

Long-Run Equilibrium in Monopolistic Competition

The graph below shows the long-run marginal cost (MC), long-run average cost (ATC), demand and marginal revenue (MR) curve for a monopolistic firm.



Interpretation of the graph:

- The solid lines show the original demand and MR curves.
- The dashed lines show the shift in the demand and MR curves when a new firm enters the market.
- Short-run economic profits of existing firms encourage new firms to enter the market as the barriers to entry are low. When new firms enter, the demand curve shifts to the left and the market share of existing firms falls. The number of products in the market increases.
- In the long run, firms will enter and exit until $P = ATC$. At this point, economic profit will be zero and there will no longer be an incentive for new firms to enter the market. Therefore, long-run equilibrium is established.

- Q_{MC} and P_{MC} are the equilibrium quantity and price respectively, for monopolistic competition. Q_{PC} and P_{PC} are the equilibrium quantity and price respectively, for perfect competition. As you can see, the equilibrium price is higher and the quantity is lower for monopolistic competition.

The table below summarizes the similarities and differences between perfect competition and monopolistic competition.

Perfect Competition (PC) vs. Monopolistic Competition (MC)	
Similarities	Ways in which MC is different from PC.
Long-run economic profit is zero	In the long run, profit-maximizing output quantity of MC is lower than PC.
Profit-maximizing output: $MR = MC$	Economic cost in MC includes advertising cost for product differentiation.
	PC is efficient as surplus is maximized. PC: Price = Marginal Cost MC: Price > Marginal Cost Deadweight loss in MC because firms have some amount of pricing power and consumer surplus is lost.
	Prices are lower in PC, but consumers have little variety.

5. Oligopoly

Oligopoly and Pricing Strategies

An oligopoly market has few sellers of a product and many buyers. These sellers are large players in their industry who determine the prices or quantities. For example, credit card companies such as Visa, MasterCard, and Amex.

Characteristics:

- There are a small number of potential sellers.
- The products offered by each seller are close substitutes for the products offered by the other firms and may be differentiated by brand or be homogeneous and unbranded.
- Entry into the market is difficult with fairly high costs and significant barriers to competition.
- Firms typically have substantial pricing power. Since there are very few firms, the pricing decisions are interdependent. Whenever a firm makes a decision, it must take

into account how the competing firms will react.

- Products are often highly differentiated through marketing, features, and other non-price strategies.
- The pricing is strategic and firms in an oligopoly have a temptation to collude.

Demand Analysis and Pricing Strategies in Oligopoly Markets

If firms collude, the total market demand is divided among the individual participants. The firms act like a cartel and decide how to divide the demand, and what price to set for the products in order to maximize profit.

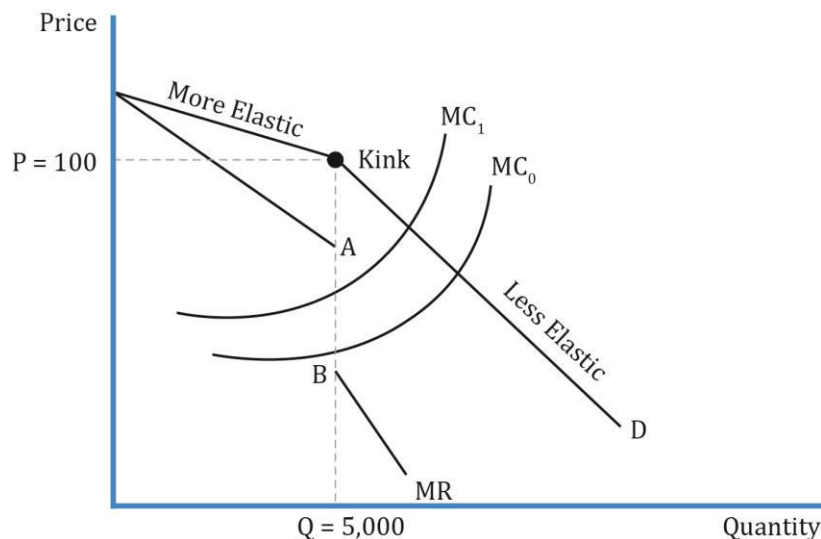
If firms do not collude, each firm faces an individual demand curve and a market demand curve. There are several models that try to explain pricing in oligopoly markets:

- Pricing interdependence
- Cournot assumption
- Nash equilibrium
- Stackelberg model

Pricing Interdependence – Kink Demand Curve

According to this theory, a competitor will not follow a price increase, but will cut prices in response to a price decrease.

Example: Let us assume a town has two cola suppliers: Coke and Pepsi. This type of oligopoly is called a duopoly. Now, assume the initial equilibrium price of 1 liter Coke bottle is 100 and the quantity is 5000.



Effect of price increase: If Coke increases its price from 100 to 105, what will Pepsi do? According to the interdependence theory, Pepsi will not increase the price and consumers will switch from Coke to Pepsi. The quantity demanded of Coke will decrease (see the elastic

portion of the demand curve).

Effect of price decrease: Instead, if Coke decreases the price to 95, then Pepsi will also decrease the price to 95. The quantity demanded of Coke will increase when the price decreases, but not by much because there is no substitution effect. Consumers do not switch from Pepsi to Coke as both are selling at the same price. To the right of the kink, the demand curve is inelastic.

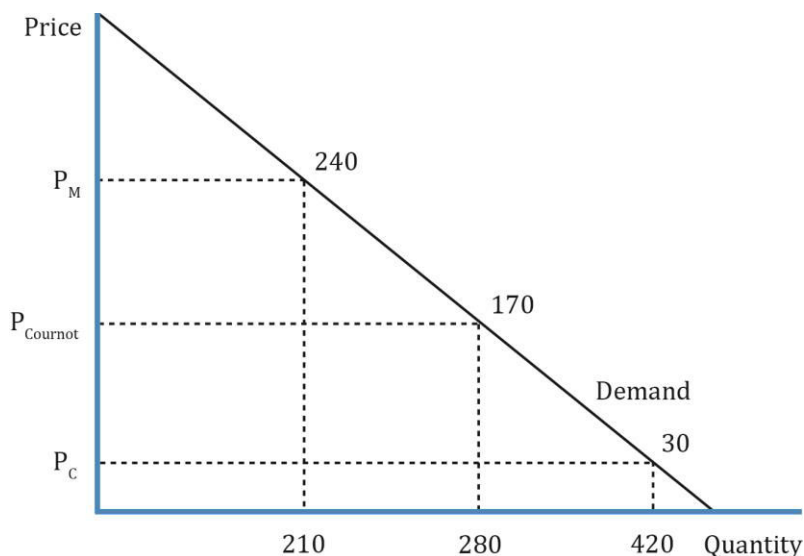
Some important points:

- There are two different demand curves in the model; combining them gives us the overall demand, which is a kinked (bent) curve. A kink in the demand curve leads to a discontinuous (with a gap) marginal revenue curve. One part of the MR curve corresponds to the price increase part of the demand curve and the other to the price decrease part of the demand curve.
- Profit-maximizing rule: $MR = MC$.
- Equilibrium price and quantity do not change so long as the marginal-cost curve of the firm falls between the gaps in the MR curve.
- The MC must change considerably for the firms to change their price.
- Advantage: The model helps explain stable prices.
- Disadvantage: It does not tell us what the prices should be.

The Cournot Assumption

Firms compete simultaneously to determine a profit-maximizing output, based on the assumption that the other firms' output will not change. In the long run, change in price or quantity will NOT increase profits. As the number of firms in an oligopoly increase, the equilibrium point moves closer to perfect competition.

Assume there are two firms with the output levels q_1 and q_2 respectively. Firm 1 chooses its output as q_1 to maximize profit based on the assumption that firm 2's output level q_2 is constant in the future. Similarly, firm 2 chooses its output as q_2 to maximize profits by assuming that firm 1's output level is constant. Firms choose q_1 and q_2 simultaneously. Let us now look at the price and quantity numbers associated with the Cournot assumption.



- With a monopoly, the price is highest and quantity is lowest.
- In a perfect competition market structure, the price is lowest and quantity is highest.
- In a duopoly market characterized by the Cournot assumption, both the price and quantity will lie somewhere in between. As the number of firms increase, the equilibrium point moves towards perfect competition.

The Nash Equilibrium

Unlike perfect competition, in oligopoly there is a lot of strategic interdependence between firms. Since the number of firms are few, the actions one takes affects the others.

Nash Equilibrium: A set of choices/strategies among two or more participants is called a Nash equilibrium if, holding the strategies of all other participants constant, no participant has an incentive to choose a different strategy. In an oligopoly, firms arrive at an equilibrium strategy after considering the actions of other firms (interdependence). Once they arrive at equilibrium, no firm wants to change its strategy.

Assumptions made in Nash equilibrium:

- The firms do the best they can, given the actions of their rivals.
- The actions are interdependent.
- The firms do not cooperate (collude); each firm wants to maximize its own profits.

Example: WesCo and RifCo sell a similar product. Each company can employ a high-price strategy or a low-price strategy. The profit for each strategy is shown. What is the Nash equilibrium?

The four possible strategies are shown in the four boxes. For example, box 1 on the top-left corner has WesCo adopting a low price strategy and RifCo adopting a low price strategy as well. The profit for WesCo is 50 and that for RifCo it is 70. At any point in time, the companies can be in only one box. It is not possible for WesCo to adopt a low price strategy

with profit of 50 (box 1) and RifCo to adopt a high price strategy with profit of 0 (box 2).

WesCo - Low Price 50 RifCo - Low Price 70	WesCo - Low Price 80 RifCo - High Price 0
WesCo - High Price 300 RifCo - Low Price 350	WesCo - High Price 500 RifCo - High Price 300

No matter where the companies start, they will end up in box 4 (lower left box).

Let's start with box 1. The total profit of WesCo and RifCo is 120. They are both selling the products at a lower price. It is in WesCo's best interest to increase prices, and their profits jump from 50 to 300 in box 4. It is in RifCo's best interest as well if WesCo increases the price, as RifCo can also increase the price. RifCo's profit jumps from 70 to 350. The combined profit of box 4 now is 650.

The combined profits are the highest in box 3, which is 800. Both the companies are charging high prices. Box 3 is in WesCo's best interest as it earns its maximum profit of 500, but it's possible only if RifCo also charges the high price. But RifCo is not happy here and would lower the prices to increase its profit from 300 (box 3) to 350 (box 4).

When RifCo lowers its price to make a profit of 350 in box 4, WesCo's profit falls from 500 to 300. The Nash equilibrium position in box 4 is what they arrive at finally.

Can both companies be better if they collude? Yes, if both the companies agree to collude and charge high prices. If WesCo and RifCo agree to split the maximum profit of 800 equally, then each company makes a profit of 400, which is better than the Nash equilibrium profit of 300 and 350 profit respectively. Companies are said to form a **cartel** when they engage in collusive agreements openly.

Factors that affect the chances of successful collusion:

1. Number and size of sellers: The number of firms should be small.
2. Similarity of products: Products must be homogeneous.
3. Cost structure: Firms must have a similar cost structure.
4. Order size and frequency: Orders must be small and frequent.
5. Retaliation: Less likely to break collusive agreement if the threat of retaliation by other firms is severe.
6. Degree of external competition: Collusion increases overall profitability of the market which attracts external competition.

Stackelberg Model

There is one dominant large firm and many small firms. The large firm sets the price and has the first mover advantage.

In the Stackelberg model, the decision-making happens sequentially (recall it happens simultaneously in the Cournot assumption). The leader firm chooses the output first and then the follower firm chooses its output.

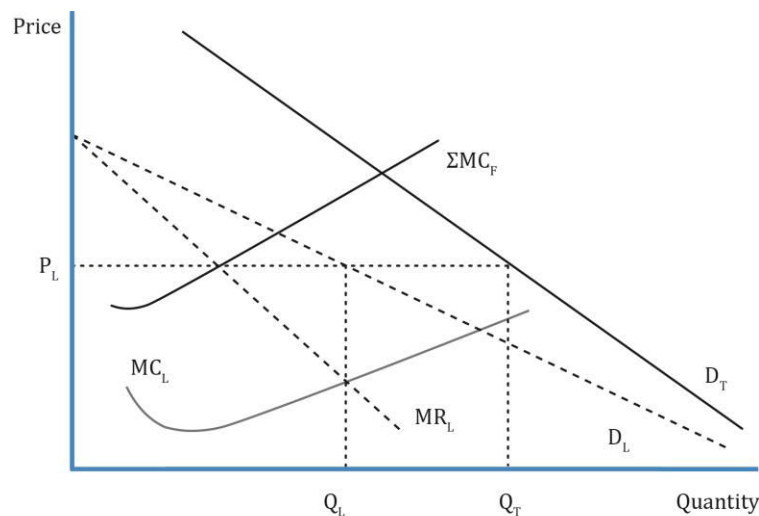
Oligopoly Markets: Optimal Price, Output, and Long-Run Equilibrium

The curriculum discusses the supply analysis for only one type of oligopoly – the dominant firm oligopoly.

- As in monopolistic competition, the supply function is not well defined.
- We cannot determine equilibrium output and price without considering the demand function and competitive strategies.
- Profit-maximizing condition: $MR = MC$.
- The equilibrium price is based on the demand curve.

Example: Say we have an oligopoly market where one firm has a significantly lower cost of production than its competitors and has a 40% market share. A **dominant** or **leader** firm is a firm with at least 40 % market share, greater capacity, lower cost structure, and is price maker. A follower firm is a small firm that is a price taker – i.e. it accepts the price set by the leader firm. Let us say there are five such firms in this market.

The graph below shows the quantity that will be supplied and the price charged by the market leader, as well as by the other firms.



Interpretation of the graph:

- Price is plotted on the y-axis and quantity on the x-axis.
- The solid line represents an aggregate market demand. The following are the curves

for the dominant firm:

- Dashed line – the demand curve.
- MR_L – the marginal revenue curve; it lies below the demand curve and is steeper
- MC_L – the marginal cost curve.
- P_L – optimal price.
- Assuming the other five firms will take the price established by the leader, the overall market demand is given as Q_T . The small/follower firms have no incentive to slash prices as it will lead to price wars with the leader, who is a low-cost producer.
- Quantity supplied by the leader firm = Q_L ; quantity supplied by the other firms = $Q_T - Q_L$.
- Notice that the demand curves of the industry and of the dominant firm are not parallel to each other. As the price decreases, the difference between the curves diminishes. The reasons are:
 - The dominant firm is a low cost producer. When prices start falling, the other smaller firms exit the industry because they do not want to sell below cost.
 - The dominant firm gets a greater market share as other firms exit, and Q_L (quantity supplied by the leader) increases.

Optimal Price and Output

There is no single optimum price and output model that works for all oligopoly market situations because of different strategies and pricing methods. The process for determining the optimal price for a few methods is listed below:

- Kinked demand curve: Price at the kink in demand function.
- Dominant firm: Price at the quantity where $MR = MC$. Followers take the leader's price.
- Cournot assumption: No changes in price and output by other firms once the dominant firm chooses its output level where $MR=MC$.
- Nash equilibrium: Each firm acts in its best interest under the given circumstances. No certainty of price and output level.

Factors Affecting Long-Run Equilibrium in Oligopoly Markets

Long-run economic profits are possible, but empirical evidence suggests that over time the market share of the dominant firm declines.

6. Determining Market Structure

Analysts are interested in investing in markets with high pricing-power as it drives profitability. If there are very few large firms in an industry, then the price tends to be high and the quantity supplied low. When there is a possible merger, analysts should consider the impact of competition law (anti-trust law) as regulators might prevent the merger to keep the industry competitive. In many countries, competition law has been introduced to regulate the degree of market competition in different industries of different countries.

Econometric Approaches

Econometric approaches can be used for measuring market concentration or market power. Some key points in this context are as follows:

- Use regression analysis to estimate elasticity of demand and supply.
- If demand is inelastic, then it indicates companies may have market power.
- The disadvantage is that though it is theoretically appealing, but data is not easily available.

Simpler Measures

Simpler approaches to estimate elasticity that avoid the drawbacks in regression analysis include the N-firm concentration ratio and Herfindahl-Hirshman Index (HHI).

N-Firm Concentration Ratio and HHI

N-Firm concentration ratio: It is the sum of the market shares of the largest N firms. It is almost zero for perfect competition and 100 for monopoly.

For example, in an industry, assume the five largest firms in the industry have a market share of 25%, 15%, 10%, 10% and 10%. The 5-firm concentration ratio would be 70%.

Advantages:

- Data is easily available.
- Simple to use and understand.

Disadvantages:

- Unaffected by mergers among top firms. Assume the top two firms by market share merge and the market shares of five largest firms are 40%, 10%, 10%, 10% and 2% now. The 5-firm concentration ratio would be 72% instead of 70%, which is not very different from what it was earlier. But the largest firm has a high market share of 40%, which is not evident in the concentration ratio number.
- Does not quantify market power.
- Does not consider barriers to entry.
- Does not consider elasticity of demand.

Herfindahl-Hirschman Index (HHI)

- Sum of squared market shares of N largest firms in a market (ranges from 0 to 1). A number close to 1 indicates it is concentrated or monopolistic.
- For example, assume the market shares of four firms are 50%, 20%, 10% and 20%. The HHI is $0.5^2 + 0.2^2 + 0.1^2 + 0.2^2 = 0.34$.

Advantage:

Simple and commonly used by regulators.

Disadvantage:

- Does not consider barriers to entry.
- Does not consider elasticity of demand.

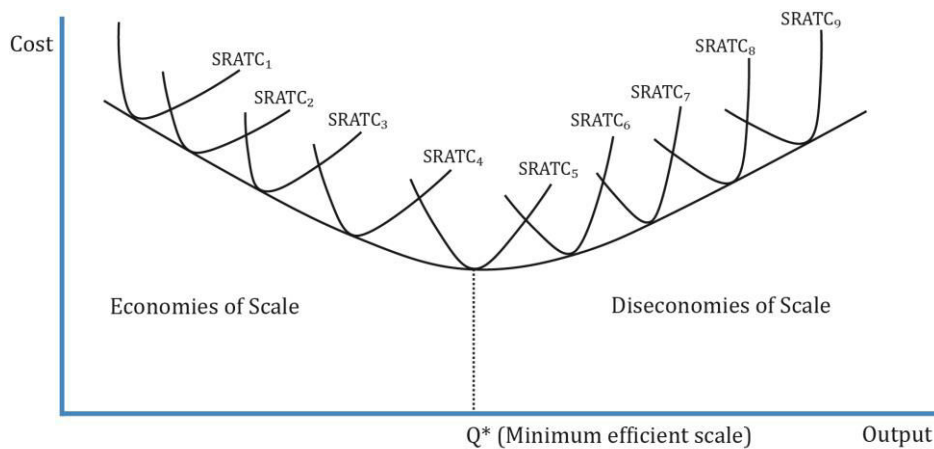
Summary

LO: Determine and interpret breakeven and shutdown points of production, as well as how economies and diseconomies of scale affect costs under perfect and imperfect competition.

Situation	Short Run	Long Run
Price > ATC	Economic Profit - Operate	Economic Profit - Operate
Price = ATC	Breakeven - Operate	Breakeven - Operate
AVC < Price < ATC	Operate	Shutdown
Price < AVC	Shutdown	Shutdown

Economies of scale: As output increases the long-run cost per unit decreases.

Diseconomies of scale: As output increases the long-run cost per unit increases.



LO: Describe characteristics of perfect competition, monopolistic competition, oligopoly, and pure monopoly.

	Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly
Number of Sellers	Many firms	Many firms	Few firms	Single firm
Barriers to Entry	Very low	Low	High	Very high
Nature of Substitute Products	Very close substitutes	Substitutes but differentiated	Very close substitutes or differentiated	No good substitutes
Nature of Competition	Price only	Price, marketing, & features	Price, marketing, & features	Advertising
Price Power	None	Some	Some to significant	Significant

LO: Explain supply and demand relationships under monopolistic competition, including the optimal price and output for firms as well as pricing strategy.

- Since the products are unique, a monopolistic firm has a downward sloping demand curve. MR is steeper and lies below the demand curve.
- Profit maximization output is based on $MR = MC$.
- Price is determined based on the demand curve.
- The supply function is not well-defined in monopolistic competition.

LO: Explain supply and demand relationships under oligopoly, including the optimal price and output for firms as well as pricing strategy.

If firms do not collude, each firm faces an individual demand curve and a market demand curve. There are several models that try to explain pricing in oligopoly markets:

- Pricing interdependence
- Cournot assumption
- Nash equilibrium
- Stackelberg model

The curriculum discusses the supply analysis for only one type of oligopoly – the dominant firm oligopoly.

- As in monopolistic competition, the supply function is not well defined.
- We cannot determine equilibrium output and price without considering the demand function and competitive strategies.
- Profit-maximizing condition: $MR = MC$.
- The equilibrium price is based on the demand curve

There is no single optimum price and output model that works for all oligopoly market situations because of different strategies and pricing methods. The process for determining the optimal price for a few methods is listed below:

- Kinked demand curve: Price at the kink in demand function.
- Dominant firm: Price at the quantity where $MR = MC$. Followers take the leader's price.
- Cournot assumption: No changes in price and output by other firms once the dominant firm chooses its output level where $MR=MC$.
- Nash equilibrium: Each firm acts in its best interest under the given circumstances. No certainty of price and output level.

LO: Identify the type of market structure within which a firm operates and describe the use and limitations of concentration measures.

N-Firm Concentration Ratio:

- Sum of the percentage market shares of the N largest firms in an industry.
- Market share = Firm sales / Total market sales.

- Advantage: Simple to use and understand.
- Disadvantages: Ignores barriers to entry and does not directly measure market power or elasticity of demand.

Herfindahl-Hirschman Index (HHI):

- HHI = sum of squared market shares of N largest firms in a market
- Ranges from 0 to 1 – where 0 indicates perfect competition and 1 indicates a perfect monopoly.
- Advantage: Simple and commonly used by regulators.
- Disadvantage: Does not consider barriers to entry and elasticity of demand.