

Topics in Demand and Supply Analysis

Abstract

Keywords

Keyword1 — Keyword2 — Keyword3

12a	Calculate and interpret price, income and cross-price elasticities of demand and describe factors that affect each measure
12b	Compare substitution and income effects
12c	Distinguish between normal goods and inferior goods
12d	Describe the phenomenon of diminishing marginal returns
12e	Determine and interpret breakeven and shutdown points of production
12f	Describe how economies of scale and diseconomies of scale affect costs

1. Monopolies

A **monopoly** is characterized by a single seller of a product with no close substitutes. It has power to choose the price at which sells the product. High barriers to entry protect monopoly producers from competition. This protection can be achieved through legally enforceable exclusive rights such as patents, copyrights, exploration of natural resources. **Natural monopolies** refer to the specific situation where the average cost of production is lower when there is only one producer. Natural monopolies are frequently backed by the government and therefore, the price is subject to regulation.

Contents

1	Monopolies	1	• There is a single seller of a highly differentiated product
2	Oligopoly	4	
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4	Perfect Competition	7	• Product is differentiated in the sense there are no close substitutes
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			• Entry into the market is very difficult, with significant barriers to entry
			• Firm has considerable pricing power

Demand Analysis

The monopoly demand function is the aggregate demand for the product in the relevant market. We assume income effect and substitution effect to be negatively related with price, i.e. the law of demand stands (+ price - demand). So, the structure of the demand function in such market is dictated by the Elasticity of Demand. The supply analysis depends on the firm's cost structure.

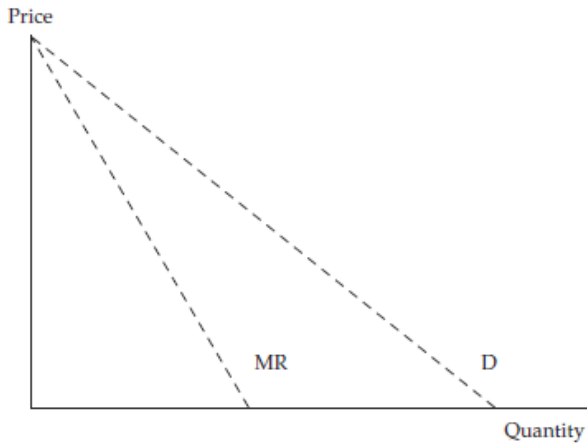


Figure 1. Monopolist Demand and Marginal Revenue

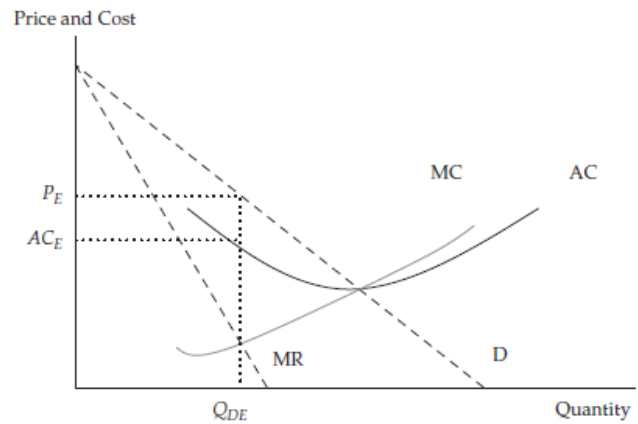


Figure 3. Monopolist Demand and Supply

Profit maximizing output

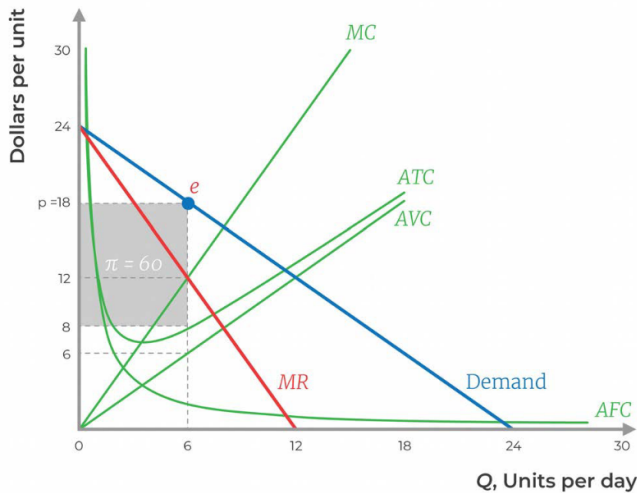


Figure 2. Profit maximization under unregulated monopolies

In order to maximize profit, monopolies will expand output until marginal cost of production equals the marginal revenue ($MR = MC$). Because there are significant entry barriers, no firm is going to compete for profits and thus long-run positive economic profits can exist.

$$MR = MC \quad MR = P\left(1 - \frac{1}{E_p}\right) \quad P = \frac{MC}{\left(1 - \frac{1}{E_p}\right)} \quad (1)$$

The condition of profit also insures the demand curve must lie above the firm's average total cost (ATC) at the optimal quantity so that $P \geq ATC$ and Economic Profit = $(P - ATC)q$

Natural Monopolies and regulated environment

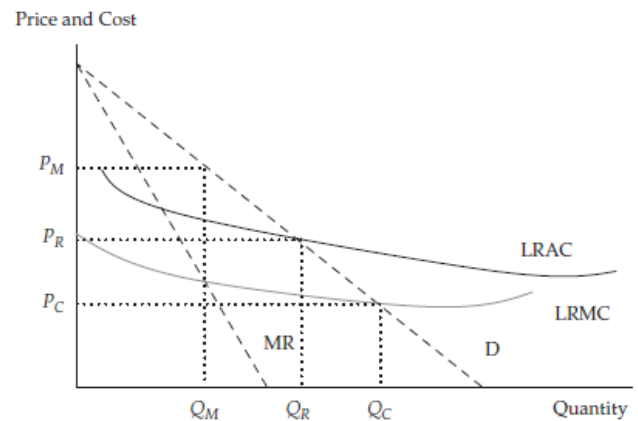


Figure 4. Monopolist Demand and Supply

Given the 3 possible solutions of pricing (1) Q_M , (2) Q_R and (3) Q_C . In (1), the monopolist would maximize profit without regulation by achieving a long-run marginal cost equal to marginal revenue ($LRMC = MR$).

In (2) the price would be set at $LRAC = Demand$, achieving zero economic profits and increasing welfare. Price would be set at P_R (Q_R, P_R). Another solution (3) would be (Q_C, P_C) where price equals marginal cost of production ($LRMC = D$). This solution would be considered unfair as the revenues would be lower than long-run average cost ($P < LRAC$), which means firm will exit the market in the long term unless government subsidizes the difference between price and LRAC in order to breakeven (subsidy = $P - LRAC$).

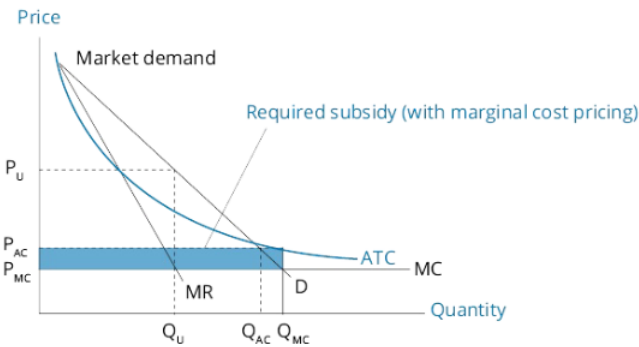


Figure 5. Unregulated monopoly (Q_M, P_M), Average Cost Pricing (Q_R, P_R), Marginal Cost Pricing (Q_C, P_C)

Average Cost Pricing is the most common form of regulation and it's used to increase output by decreasing demand, increase allocative efficiency and increase of social welfare (consumer + producer surplus) and minimize **Deadweight Loss** (DWL). DWL is the difference between welfare in perfect markets and inefficient markets such as monopolies.

$$DWL = Welfare_{PC} - Welfare_M \quad (2)$$

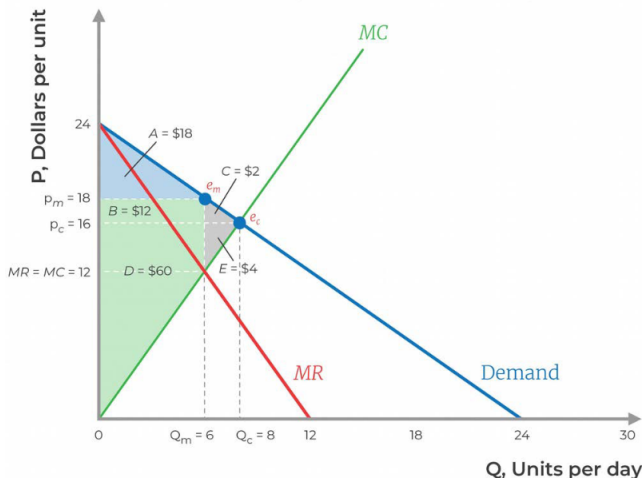


Figure 6. Allocative inefficiency and Deadweight Loss (DWL)

Monopolies aren't always inefficient. Economies of scale and regulation may make monopolies more efficient than perfect competition (case for natural monopolies), although in most cases monopolies are inefficient.

Price strategy and price discrimination

Price discrimination is the practice of charging different consumers different prices for the same product or service. Examples of such practice is airline ticketing where different prices are practiced among business and leisure travelers. This method allows monopolies to capture more consumer surplus as economic profit than it's possible by charging a single price.

Market segmentation creates different demand curves, each with different sensitivities to price changes (elasticities). For example, business travelers demand might be less elastic than leisure travelers because they travel in order to meet agendas and can't easily switch between flights risking to miss their schedule. Leisure travelers, however, can easily swap between flights and carriers because they are less time constrained and thus more price sensible.

- **First-degree price discrimination** (personalized pricing) it's a pricing method where the monopoly tries to capture the entire consumer surplus by measuring how often the product is used and how valuable the product is for each customer and charges the highest price each consumer is willing to pay for the product.
- **Second-degree price discrimination** is when price varies with quantity and quality demanded. Sellers aren't able to differentiate between different types of customers but they are able to differentiate among different customer preferences. This is done by non-linear pricing (bulk buying) or quality based pricing (economic vs executive class).
- **Third-degree price discrimination** consists of splitting consumers into consumer groups such as age groups (adults, children, elderly), students/seniors and the rest. The businesses model their pricing decisions onto customers characteristics (thus identifying customer types, and not pricing preferences per se).

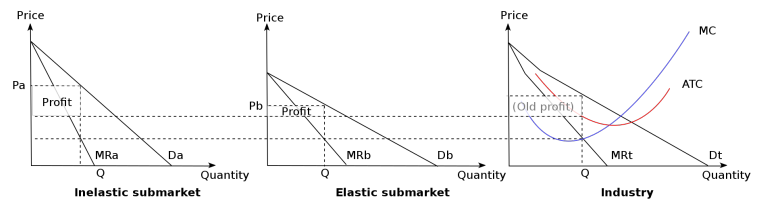


Figure 7. Price discrimination into 2 submarkets and aggregate demand

2. Oligopoly

Oligopoly is characterized by only a few firms doing business in a relevant market. The products are all similar and good substitutes of one another. The goods can be differentiated by marketing and brand recognition or some potentially small differentiating features like flavoring, packaging, etc.

The most distinguished characteristic of oligopoly markets is the small number of firms that dominate the market. The firms are so few that their pricing decisions affect each other directly and pricing decisions are interdependent. That is, if a firm changes pricings, others will retaliate and adjust accordingly in order to keep their market share.

- There are few sellers
- The products sold are close substitutes
- Entry into the market is difficult, with significant barriers to entry and fairly high costs
- Firms have substantial pricing power
- Products are often somewhat differentiated by marketing strategies, features and other non-price strategies

Kinked Demand Curve Model

The kinked demand curve model assumes an increase in firm's product price will not be followed by its competitors. Raising price above P_K , its competitors remain at P_K resulting in a loss of market share by the firm because it has the highest price. The *kink point* (Q_K, P_K) marks two different demand elasticities: above the kink point, elasticity is higher as demand is more sensible to price increase (if a firm increases price, other firms will stay at P_K and thus customers can easily substitute the good); below the kink point, elasticity is lower because if a firm reduces its product price, other firms will match the price cut.

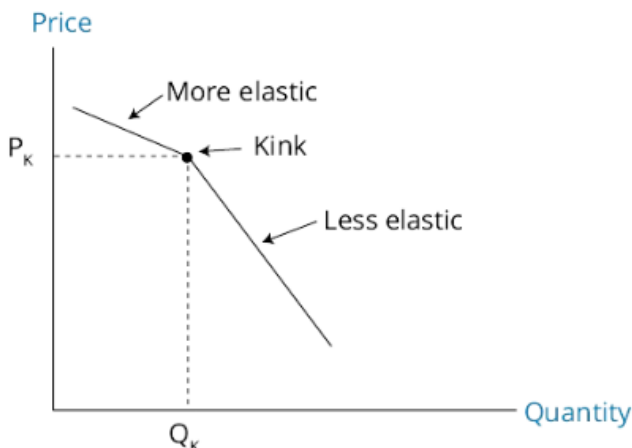


Figure 8. Kinked Demand Curve

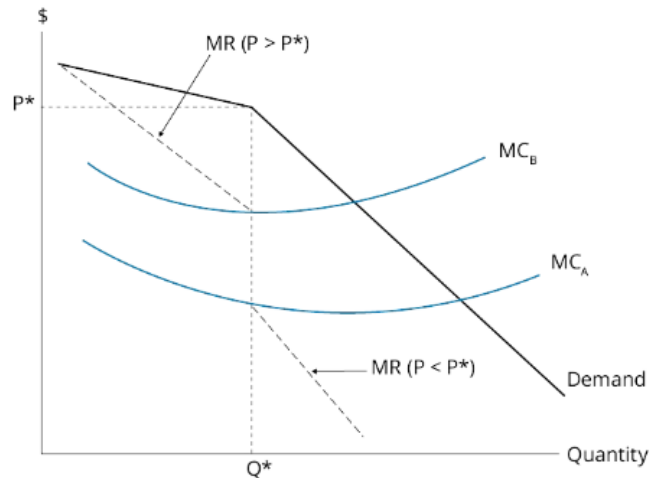


Figure 9. Gap in marginal revenues at the kink point

Cournot model or Duopoly

The model considers an oligopoly with two competing firms. Each firm knows the quantity provided by the other firm and assumes the supply is at the optimal point and will keep constant in the short-run. By subtracting this quantity to the demand curve, the firms can construct a demand curve and marginal revenue curve for its own production and determine the profit maximizing quantity.

The stable equilibrium is achieved when quantities supplied by each firm are the same and therefore there aren't additional profits to be gained by changing quantities and prices.

Cournot model is considered to be an earlier development of strategic games. The solution for such problem is the **Nash Equilibrium** which states the equilibrium is reached when the choices of all firms are such that there is no other choice that makes any firm better off.

	Firm B Honors	Firm B Cheats
Firm A Honors	A earns economic profit B earns economic profit	A has an economic loss B earns increased economic profit
Firm A Cheats	A earns increased economic profit B has an economic loss	A earns zero economic profit B earns zero economic profit

Figure 10. Duopoly dilemma

In the **game theory**, the Nash Equilibrium is present when two or more participants in non-cooperative games have no incentive to deviate from their respective equilibrium strategies after they consider and anticipate their opponents rational choice. *As the actions are non-cooperative, each firm will make the decisions that maximize its own profit and not maximize joint profits.*

Collusive agreements and Cartels

People of the same trade seldom meet together, even for meriment and diversion, but the conversation ends in a conspiracy against the public, or some contrivance to raise prices. —Adam Smith, 1776

Oligopolistic firms have an incentive to form cartels in which they collude in setting prices or quantities in order to increase

their profits. **Collusion agreements** or **price fixing agreements** is an agreement between market suppliers in order to control the level of supply, fix or stabilize the price and increase sellers profits. Price fixing is inefficient because firms generate deadweight in social welfare when trying to capture consumer welfare.

An example of a Cartel is the Organization of Petroleum Exporting Countries (OPEC) which is an agreement to set the output quantity of oil barrels between market suppliers that that each member agrees to produce less than the output it would produce if it acted independently. As a result, it increases scarcity and market prices, increasing profits.

In order to protect consumers interest there are **Antitrust Laws** which are federal and state government legislation that regulates the conduct of market suppliers and are generally intended to increase market competition, prevent monopolies, increase the overall market efficiency and consumer welfare. Cartels aren't always successful as members can still "cheat" on their agreements. If the forces of competition overwhelm the collusive alliance, the cartel is inefficient. For Cartels and price collusion to be efficient:

- The number and size distribution of sellers is rather small. If the number of suppliers is higher, there is an increase competition for market share and economic prices. If the firms have all similar market shares, the competitive forces tend to overpower the collusion.
- The more products are homogeneous, the more likely cartels are successful. Homogeneous products decreases competition in the sense firms can't hardly leverage technology, marketing to increase their market share.
- The more similar the costs structures, the more likely it is to work. If a firm has increasingly more benefits from economies of scale in comparison to its competitors, it will push prices down over the long-run till $LRAC = MR$.
- Oligopolies are less likely to break the collusive agreements if their cost of breaking it is severe, i.e. the threat of retaliation by other companies is costly.

Stackelberg model or Dominant Firm Model

In this scenario, a single firm has a significantly large market share because of its greater scale and lower cost structure. In this model, the price is determined essentially by the dominant firm (DF) and other competitive firms (CF) follow.

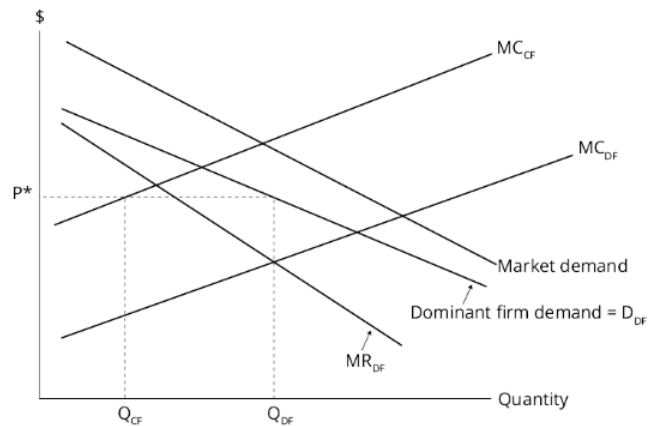


Figure 11. Dominant Firm Model

A decrease in price from the DF results in a decrease in price from CF in the short run. In the long run, because $P^* < MR_{CF}$, smaller firms will decrease output and/or exit the market because they are operating under the breakeven point. This results in a decrease of the overall market share of CF in favor of the Dominant Firm in the long-run.

3. Monopolistic Competition

The most distinguished factor between monopolistic competition and perfect competition is the product differentiation. There are still a lot of sellers and buyers and entry barriers are fairly accessible. However, because firms tend to marginally differentiate their products, it gives them some pricing power (perfect competition assumes no pricing power).

- Large number of suppliers
- The products offered are close substitutes of one another
- Although products are substitutes, they aren't perfect substitutes and thus are differentiated through marketing, quality, features or other non price strategies
- Firms have some pricing power
- Firms compete on price, quality, advertising and marketing
- Low barriers to entry so that when firms are earning economic profits, new firms are expected to enter the industry

In the long-run the profit-maximizing is the level of output where $LRMC=MR$.

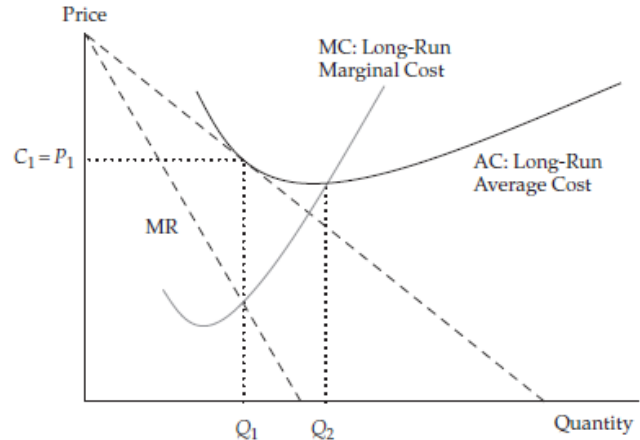


Figure 14. Long-run maximum profit

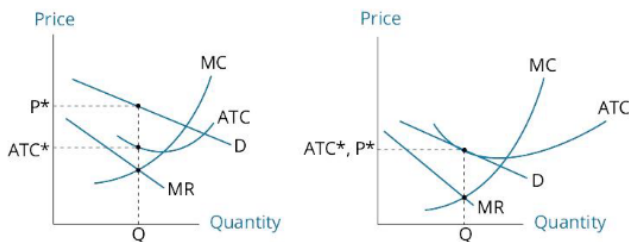


Figure 12. (a) Short-Run Output (b) Long-Run Output

Profit maximization

In the short-run the profit-maximizing is the level of output where $MR=MC$

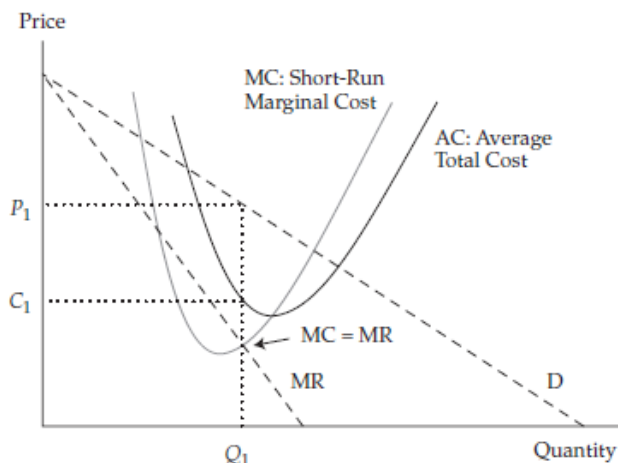


Figure 13. Short-run maximum profit

4. Perfect Competition

Perfect competition is characterized by homogeneous products and many firms where competition forces them all to sell at the market price. Firms are **price takers** (have no bargaining power when setting the price). If they increase the price, their demand is nearly zero because customers can easily buy perfectly substitute goods from competitors at zero loss of utility - demand is perfectly elastic (horizontal demand). Overall market supply and demand determine the price.

- There are large number of buyers and sellers
- The products offered by the sellers are identical (no differentiation)
- There are few barriers to entry and exit
- Sellers have no market-pricing power
- There is non-price competition

Profit maximization

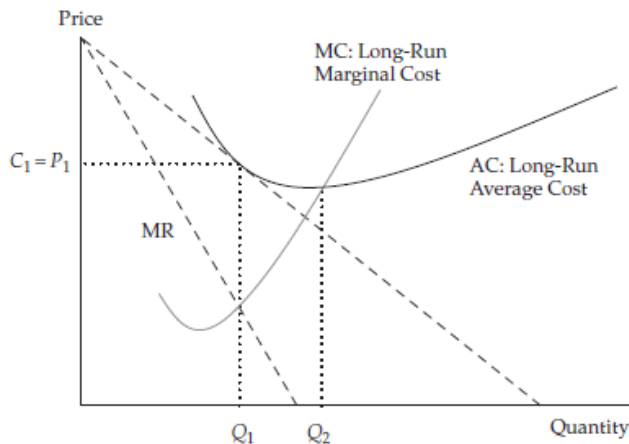


Figure 15. (a) Marginal Approach (b) Total Approach

The most important assumption under perfect competition is that (a) $MC=MR=Demand$ and (b) *economic profit is nonexistent in the long-run* (although it can exist in the short-run as well as losses) because firms can compete for those profits in the long-run, assuring normal profits (zero economic profits). Economic loss occurs when marginal revenue is less than marginal cost ($MR < MC$). Economic profit occurs when marginal revenue is higher than marginal cost ($MR > MC$).

Equilibrium

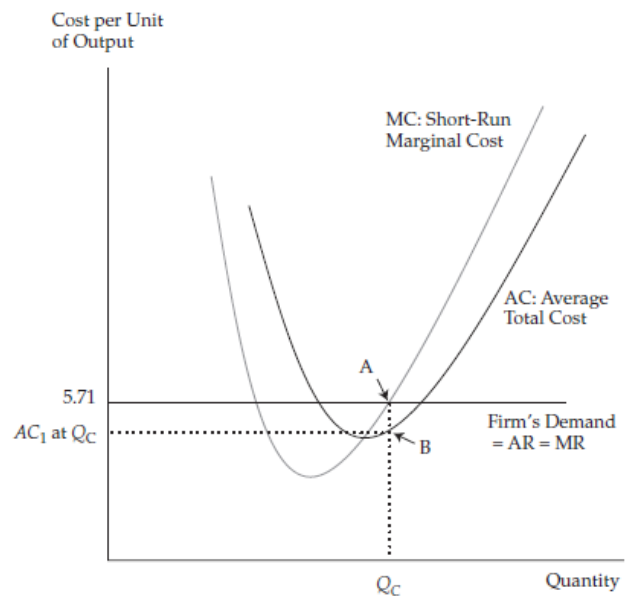


Figure 16. Short-run equilibria

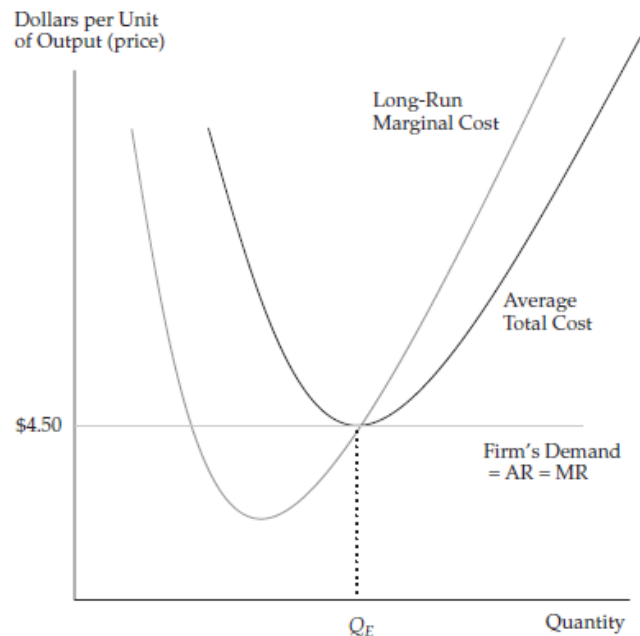


Figure 17. Long-run equilibria

References

- [cfa, 2019] 2019. *CFA program curriculum*. CFA Institute.