Economics: Microeconomics and Macroeconomics

Supplemental

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1. Supply and Demand: Introduction (Prerequisite)

Candidate Note: Candidates are expected to be familiar with the material covered in this prerequisite economics reading.

Learning Objectives

This summary includes a review and an analysis of the principles set forth by CFA Institute. Upon review of this summary, you should be able to:

Overview

This summary introduces the principles of supply and demand analysis. What causes consumers to demand more or less of a good or service, and what causes suppliers to supply more or less of these goods and services? How can this information be used to understand changes in demand and supply?

Types of Markets

Learning Objective: Describe the different types of markets.

Markets can be either factor or goods markets. In **factor markets** the *factors of production are bought and sold*. Factors include land, labor, equipment materials, etc. and are privately owned in capitalist markets. In **goods markets** *production outputs are sold*. Firms sell products when they believe revenues will exceed their costs, while consumers buy goods and services when they believe expected value is greater than the purchase cost. In economic terms, firms buy factors and services of factors and then turn those factors into final or intermediate goods and services that are sold. **Intermediate goods and services** are *used as inputs to make other goods or services*, while consumers purchase final goods and services. Sales take place when value exceeds cost.

In the **labor market** *households sell and firms buy labor*. In the factor market for labor, households are sellers and firms are buyers. Households sell labor when the payment received is greater than the value of leisure time foregone, while firms employ workers whose productivity is greater than their cost.

When households consume less than their earnings, savings result. Households earn returns on their financial capital, which adds to household income in the form of dividends and capital gains from stock investments and interest income from bonds and other fixed income investments. By saving, households are determining that future returns are worth more than current consumption.

Financial institutions facilitate the exchange of savings for capital investments. Households can purchase long-term investments such as stocks and bonds in the capital markets. For firms, capital markets are critical vehicles for raising needed investment capital.

Supply and Demand Curves and Equilibrium

Learning Objective: Describe supply and demand principles.

Learning Objective: Understand aggregate supply and demand curves, including equilibrium (partial and general), and how markets reach equilibrium.

Learning Objective: Understand and calculate individual and aggregate inverse supply and demand functions and supply and demand curves.

The fact that *consumers are willing to buy more of a good when the price goes down, and less when the price goes up* is called the **law of demand**. The law simply states that a rise in the price of a good will cause consumers to buy less of the good because they now have a greater incentive to seek and use substitutes. The converse is also true.

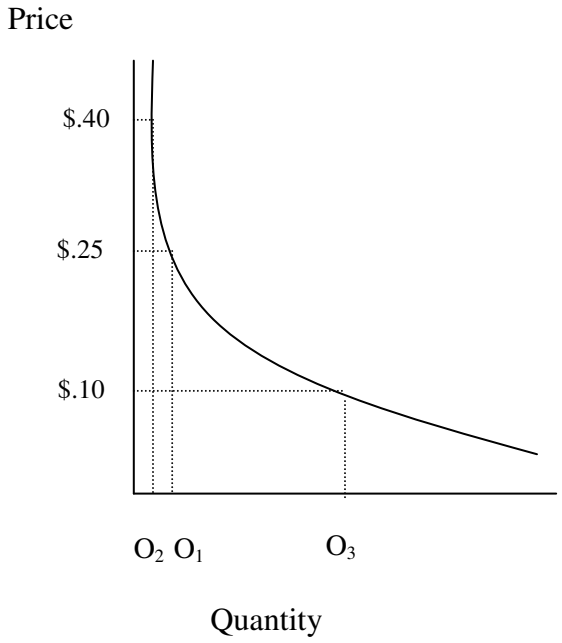
For example, Sally considers tangerines and oranges to be approximate substitutes. At current prices, Sally demands 4 oranges and 6 tangerines. However, a severe cold spell in Florida causes the price of oranges to increase substantially. Facing higher prices for oranges, Sally chooses 2 oranges and 7 tangerines. In accordance with the law of demand, Sally reduces her demand for oranges in response to a rising price. Sally substitutes tangerines for oranges since tangerines are now relatively less expensive.

The **market demand schedule** *plots combinations of price and quantity which consumers will tolerate*. The demand curve slopes downward to the right indicating that the consumer demand for a good increases as the price of the good decreases. The slope of the demand curve reveals the responsiveness of demand to price changes: the steeper the slope, the less responsive demand is to price changes. An increase in price would mean only a small decrease in quantity demanded.

Note: The height of the demand curve denotes the maximum price that consumers are willing to pay for an additional unit of the good.

Example

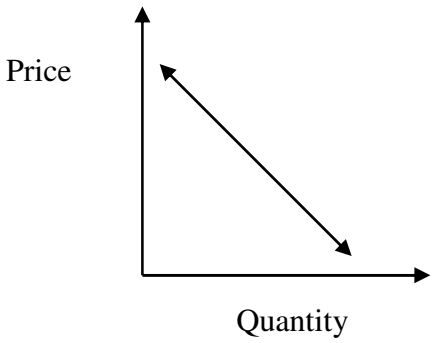
Consider the market demand schedule for oranges.



When the price of oranges is 25 cents, consumers demand O_1 quantity of oranges. If the price rises to 40 cents, consumers demand fewer oranges, O_2 ($O_2 < O_1$). If the price declines to 10 cents, consumers increase their demand to O_3 ($O_3 > O_2 < O_1$). The market demand schedule reflects the law of demand explained earlier.

Note: The responsiveness of demand to price changes is reflected in the distances O_2O_1 and O_1O_3 where $O_2O_1 < O_1O_3$. This implies that consumers are more responsive to the price change of 25 cents to 10 cents than they are to the price change of 40 cents to 25 cents. They increase their consumption more when the price drops relatively more.

The **first law of demand** states that *the quantity of a purchased good is inversely related to its price (i.e., the demand curve slopes downward)*.



Substitution effect: As the price of a good declines, its opportunity cost declines and induces consumers to buy more of it and less of a similar, but higher priced good. The substitution effect is *how much of an increase (or decrease) in the amount of a good consumed can be attributed to the fact that the good is cheaper (or more expensive), relative to other goods due to a reduction (or increase) in price*.

Income effect: As the price of a good declines, consumers who purchase that good experience an increase in income (that is, they can now buy more units of all goods). The income effect can be defined as *how much of the increase (or decrease) in the amount of the good consumed can be attributed to the increase (or decrease) in the consumer's real income, the consumption possibilities available to the consumer*.

Demand can be written as a linear equation. As income increases, more oranges are demanded. In this case, assume:

$$Q = 0.001I - 2P_O$$

This says as the price of oranges increases, quantity demanded decreases, and as income increases, the quantity of oranges demanded increases. Suppose income is \$40,000 and oranges cost \$1 per orange. The quantity demanded is $0.001 \times 40{,}000 - 2 \times 1 = 38$ oranges. If the price increases by \$0.50, then consumers demand will decrease to $0.001 \times 40{,}000 - 2 \times 1.5 = 37$ oranges.

An **inverse demand curve** states price in terms of quantity. In this example, solving for price:

$$\frac{Q}{2} - 0.005 = P_O$$

Time as a Cost

The monetary price of a good is not always a complete measure of its cost to the consumer. Time, a scarce commodity, must also be expended in the consumption of most goods. Reading a book has a low monetary cost but a high time cost. Eating in an expensive restaurant has a high monetary cost but a much lower time cost. Individuals differ in the cost of their time according to their wage rate (i.e., an individual earning \$15/hour has a lower time cost than an individual earning \$50/hour).

Price elasticity of demand indicates *the degree of consumer response to variations in price*. It is defined as:

$$\frac{\text{Percent change in quantity demanded}}{\text{Percent change in price}}$$

This ratio is called the **elasticity coefficient**. Elastic demand implies that consumers are highly responsive to a change in the price of a good. *The more elastic the demand, the more horizontal the demand curve*.

To calculate the price elasticity, the percent change in quantity demanded is determined. That is, if Q_0 were originally demanded and Q_1 was demanded after a price change from P_0 to P_1, the percent change in quantity demanded is found through the following equation:

$$(1) \qquad \frac{Q_0 - Q_1}{(Q_0 + Q_1)/2} \times 100$$

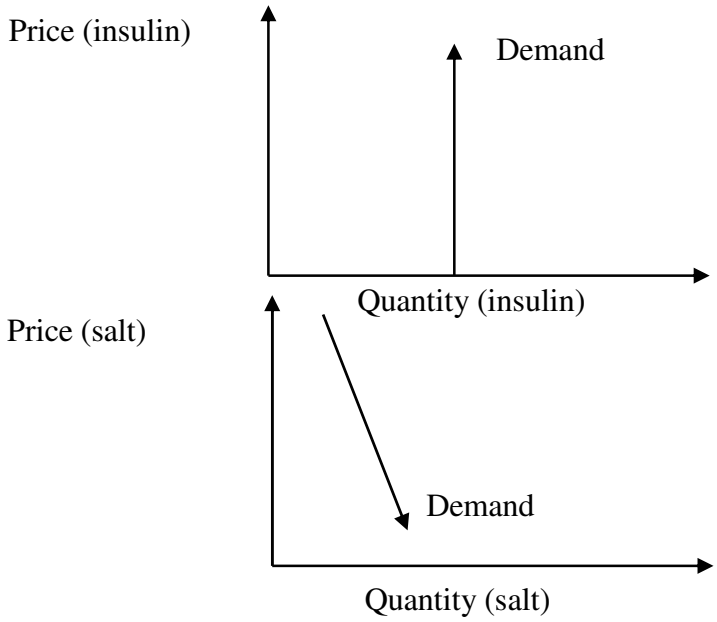
The percent change in price is found in a similar manner: if P_0 is the initial price and P_1 is the new price:

$$(2) \qquad \frac{P_0 - P_1}{(P_0 + P_1)/2} \times 100$$

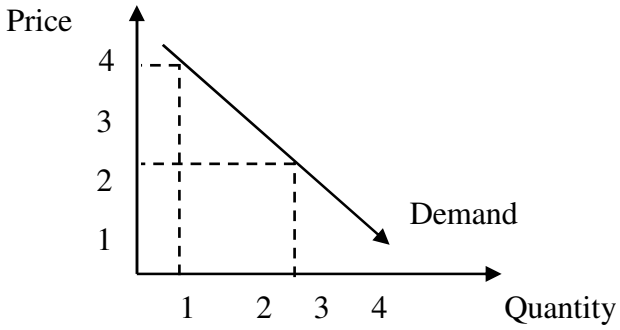
Dividing the equation (1), the percent change in quantity demanded, by the equation (2), the percent change in price, yields the price elasticity.

Perfectly inelastic: *Demand is perfectly inelastic if a consumer consumes the same amount of a good regardless of the price*. For example, a diabetic's demand for insulin is perfectly inelastic.

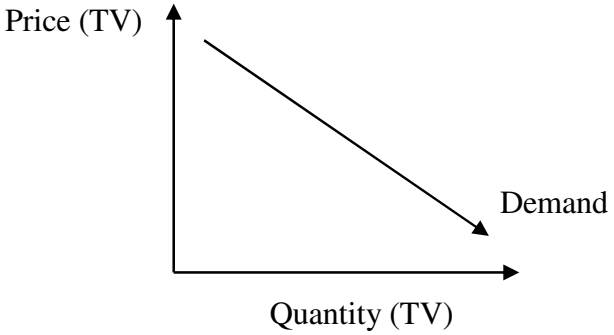
Relatively inelastic: Demand is relatively inelastic *if a percent increase in price results in a smaller percent reduction in sales*. For example, a 1% increase in the price of salt leads to a half percent decline in demand for salt.



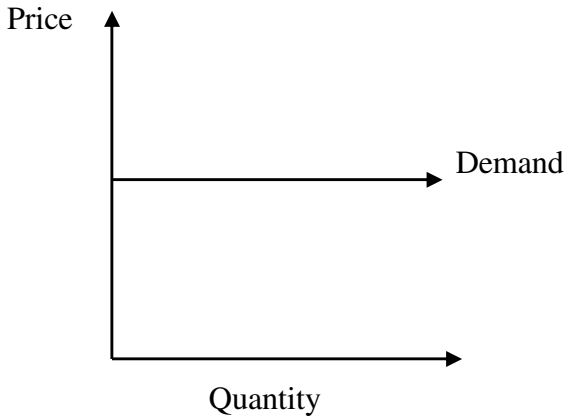
Unitary elasticity: Demand is said to have unitary elasticity *when a percent change in quantity demanded equals the percent change in price*. In this case, sales revenue (price times quantity sold) is constant.



Relatively elastic: Demand is relatively elastic *when a percent increase in price leads to a larger percent reduction in purchases*. For example, a 1% increase in the price of televisions leads to a 3% decrease in demand for televisions.



Perfectly elastic: Demand is perfectly elastic *when an increase beyond market price causes consumers to completely refrain from purchasing a given good and seek substitutes*. For example, consumers will buy all of a grower's rice at the market price. However, no rice will be purchased at a price higher than the market price.

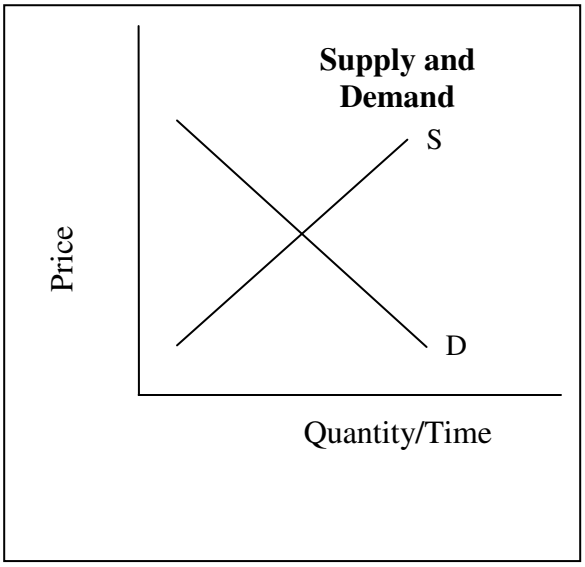


A higher price induces producers to supply a greater amount of the product. The *positive relationship between the price of a product and the amount of it that will be supplied* is termed the **law of supply**.

The *market supply curve* reflects combinations of price and quantity that producers will be willing to supply. *Note*: The height of the supply curve indicates both the minimum price necessary to induce producers to supply a specific quantity and the opportunity cost of producing the marginal unit of the good.

Supply and Demand

The market is an abstract concept referring to trade taking place between buyers and sellers.



Market equilibrium is *a state in which the conflicting forces of supply and demand are in perfect balance*. At equilibrium, consumer demand for a good is just equal to producer supply. Equilibrium occurs only at the intersection of the demand and supply curves as illustrated in the graph at the right. **General equilibrium** refers to *equilibrium in the overall market*. **Partial equilibrium** refers to *equilibrium for a subset of the market*, for example, equilibrium for a single product, while prices for other products in the market are assumed to be fixed.

Consider the following table of the price for oranges:

Price	Market Supply	Market Demand
10 cents	1	7
15 cents	2	6
20 cents	3	5
25 cents	4	4
30 cents	5	3
35 cents	6	2
40 cents	7	1

Equilibrium will occur when the price is equal to 25 cents, because at this price the quantity supplied is equal to the quantity demanded. At all other prices, the quantity demanded does not equal the quantity supplied.

Short-Run Market Equilibrium

The **short run** is defined as *a time period of insufficient length to permit decision makers to adjust fully to a change in market conditions* (i.e., suppliers cannot build a new plant if demand increases). In the short run, only changing the amount of labor employed alters supply.

Consider the conflicting nature of the laws of demand and supply. Consumers buy less as the price of a good increases, while producers supply more. This conflict is resolved through price changes: under excess supply the price falls, and under excess demand the price rises. Price is at its equilibrium level only when there is neither excess supply nor excess demand in the market. The market price moves toward the single price that will bring the quantity demanded by consumers into balance with the quantity supplied by producers.

Consider again the example of the oranges discussed above. If the price of oranges is 10 cents each, consumers demand 7 oranges while producers supply only 1. Thus, the market is in a state of excess demand. The market price must rise to establish equilibrium.

On the other hand, if the price of oranges is 40 cents, the supply is 7 and the demand is 1. Excess supply exists and the market price will fall. *Excess supply and demand is eliminated only at the equilibrium price*.

The **price equalization principle** states that *markets, in the absence of trade restrictions, tend to establish a uniform price for each good throughout the world (except for price differences due to transport costs and differential tax treatment of the good).*

Consider the market for jeans. A pair of jeans produced in Iowa costs $30 in New York City and $39 in Los Angeles. Price equalization does not hold. Accordingly, individuals will buy jeans in New York and sell them in Los Angeles, making a profit of $9 per pair. If this occurs, the supply of jeans in Los Angeles rises and the price falls. Individuals will stop buying jeans in New York and selling them in Los Angeles once the price has equalized (considering the cost of transportation). Clearly then, prices in the two cities must be equal: if they are not, the excess supply or demand is eroded away by individuals seeking profits.

Long-Run Market Equilibrium

The **long run** is defined as *a time period of sufficient length to enable decision makers to adjust fully to a market change*. In the long run, producers have time to alter their utilization of *all* productive factors, not only labor.

Two conditions are met in long-run equilibrium:

1. supply equals demand
2. the producer's opportunity cost equals the market price

If the opportunity cost of supplying the good is less than the market price, profits accrue. Positive profits attract additional suppliers, which expands supply and reduces price until profit is eroded.

Alternatively, if the opportunity cost of producing a good exceeds the market price, suppliers experience losses.

Losses induce producers to leave the market, causing prices to rise until long-run equilibrium is restored. The convergence in price to producer opportunity cost reflects the rate of return equalization principle. Capital investment in each market moves toward a uniform, normal rate of return. Neither profits nor losses accrue. In the absence of such equalization, investment funds will flow into or out of production until the normal rate of return is established.

A **movement along a supply or demand curve** refers to *a change in the supply provided or a change in quantity demanded*. For example, if prices increase and less of a good is demanded, this causes movement along a demand curve from one point to another. This is illustrated in the diagram of the market demand schedule for oranges shown previously. When the price of oranges rose from 25 cents to 40 cents, the quantity demanded changed from O_1 to O_2. This is movement along the demand curve. A similar movement occurs along the supply curve if producers change the amount supplied in response to a change in price. A shift in the supply or demand curve occurs when various factors cause the entire curve to move outward or inward. These factors are discussed in the next section.

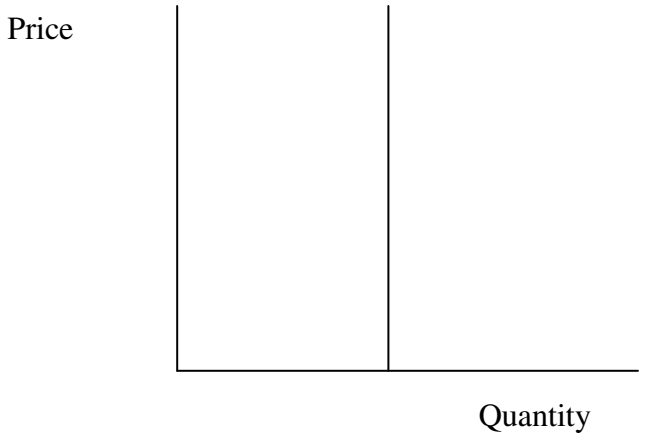
The **elasticity of supply** refers to *the percent change in quantity supplied divided by the percent change in price* (which was the cause of the change in supply). This is a measure of how responsive sellers are to a change in price. There is a direct relationship between price and supply: as the price increases (decreases), supply will also increase (decrease).

Supply elasticity is calculated as:

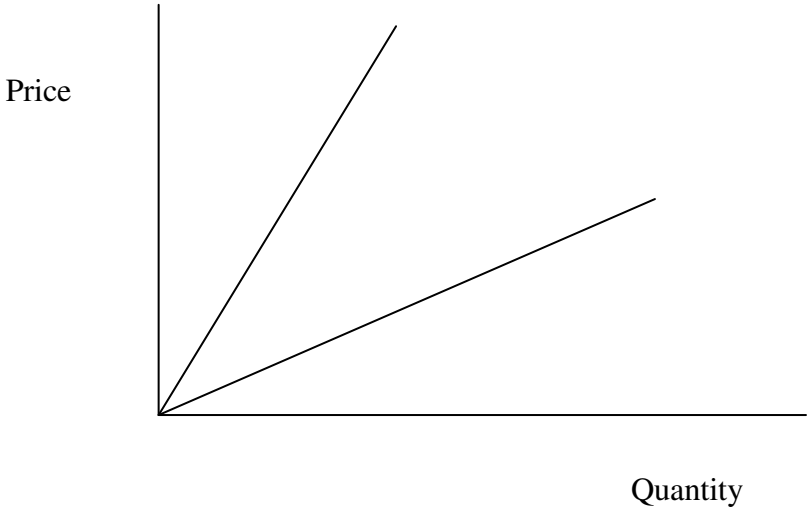
$$\text{Elasticity of supply} = \frac{\text{Percent change in quantity supplied}}{\text{Percent change in price}}$$

For example, suppose the price of a good rises by 10% and as a result, suppliers produce 20% more of this good. In this case, the elasticity of supply is 20%/10% = 2. Like elasticity of demand, supply elasticity curves can include perfectly inelastic, unitary elastic, or perfectly elastic curves.

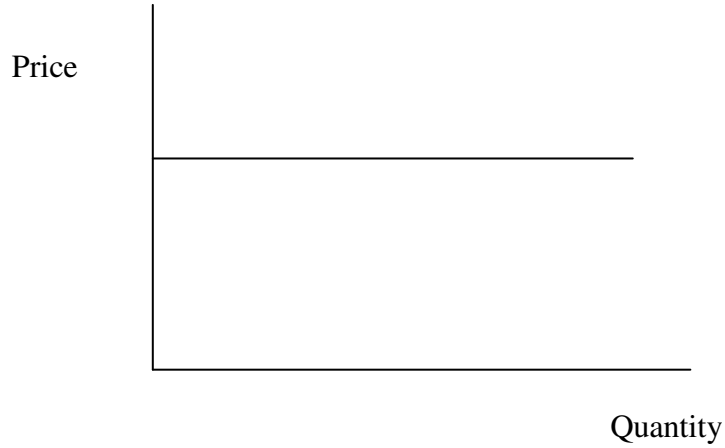
In a perfectly inelastic supply, a change in price does not lead to a change in quantity supplied.



If there is unitary elastic supply, for every percent change in price, there is a percent change in quantity supplied.



In a perfectly elastic supply, an infinite quantity is supplied.



Supply elasticity is influenced by:

- **substitutes** - If goods can only be made using scarce resources, then they will have a low or zero elasticity of supply (i.e., a new architectural design by Frank Lloyd Wright will have zero elasticity - no more designs can ever be produced). If goods can be produced with readily available resources, they will have a high elasticity of supply. This includes most agricultural resources, which can be produced on many different plots of land in many countries.
- **time** - When price changes, there will be an immediate change in the *momentary supply curve*. Goods that take time to produce will have a small momentary supply curve change. The *long-run supply curve* records the change in supply after all ways of adjusting supply have been examined, for example, by building a new plant, planting more fields, etc. The *short-run supply curve* records the change in supply after some (the easiest) possible adjustments to supply have been examined. This could include hiring more workers, or paying them overtime in order to produce more.

It is less costly to expand output slowly in response to a demand increase. For example, the immediate response to an increase in demand is to extract more production from existing facilities. Eventually, a new plant can be built to meet increased demand. Therefore, the market supply curve is more elastic in the long run than in the short run.

The supply function can also be stated as an equation. As price for a good increases, producers want to supply more, but as labor costs (L) increase, they will want to sell less. Suppose shirts sell for $20. Workers are paid $10/hour. The supply function is:

$$Q = 200P_S - 50L$$

At a price of $20/shirt and wages of $10/hour, the supplier will supply 200 × 20 – 50 × 10 = 4,000 – 500 = 3,500 shirts. If the price of shirts increases to $22, and labor increases $0.50/hour, then the producer will supply 200 × 22 – 50 × 10.5 = 4,400 – 525 = 3,875 shirts.

The inverse supply function is the supply curve, stating price in terms of quantity, in this case:

$$P = \frac{Q}{200} - 0.25L$$

The firm's short-run response is limited by the fixed nature of some of its factors of production. Within this framework, however, some firms can expand some factors more quickly than others. For example, hiring additional workers for a third shift can be implemented more quickly than building a new plant. Generally, it is more cost effective to increase output slowly when demand rises. Expanding output will increase over time as long as price is greater than costs. The market supply curve has greater elasticity when an industry has more time to change output levels.

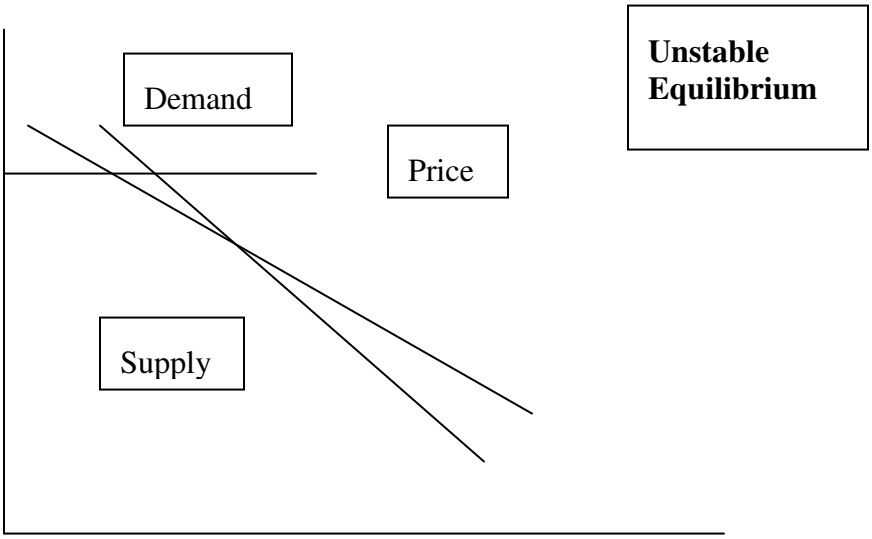
When Markets Are Not in Equilibrium

Learning Objective: Understand the differences between stable and unstable equilibria (including price bubbles), citing examples of each.

Learning Objective: Understand and calculate excess demand or supply when prices are not in equilibrium.

Stable and Unstable Equilibria

In a **stable equilibrium**, *when the price is not the equilibrium, it tends to move back into equilibrium*. For example, if you have a supply curve with a positive slope and a demand curve with a negative slope, if the price was higher than the equilibrium price, then demand would decrease, and supply would increase, resulting in equilibrium again. In an **unstable equilibrium** this process does not occur. For example, suppose the demand and supply curves both are negatively sloped, and the price is higher than the equilibrium price. There is excess demand, which would lead to a price increase. But the price is already higher than equilibrium, resulting in an unstable equilibrium.



If supply or demand is non-linear, then their can be multiple equilibria, either stable or unstable. There is a stable equilibrium in most markets. However, there can be bubble markets, for example technology stocks in the late 1990s and housing in the mid-2000s. At the time of this writing, gold prices are at an all time high because of domestic and world economic instability, and analysts are calling the spike in gold prices a bubble. A bubble can occur, for example, when prices are rising quickly and buyers assume the price rise will continue. This shifts the demand curve to the right, with buyers wanting more because they expect the future price to be higher. If sellers also anticipate higher prices in the future, they will be reluctant to sell and will demand higher prices, shifting the supply curve left. Here, both buyers' and sellers' expectations are met, and the price continues to rise. At some point, the high prices cannot be sustained and the bubble "bursts," resulting in a lower-priced equilibrium.

If supply and demand are not in equilibrium, you can calculate price for good A as follows:

Suppose the demand function is $Q_D = 20 – 0.5P$. The supply function is $Q_S = 15 + P$. Assume the price is \$4/unit. The demand is $20 – 0.5 \times 4 = 18$. Supply is $15 + 4 = 19$. Supply is greater than demand, and there is excess supply of one unit.

Auctions

Learning Objective: List types of auctions and calculate auction-winning prices.

Types of auctions:

- **Common value auction** - *value of each item is the same for all bidders*. Value is revealed after the auction. Before the auction, buyers must estimate intrinsic value. An example would be an auction for a commodity where everyone agrees on the value of

each item auctioned but must estimate the quantity auctioned. The true value is revealed to the winning bidder after the auction.

- **Private value auction** - *bidders have different, subjective values for the item*, for example, in an art auction, bidders may want an item not only for its intrinsic value but also for the enjoyment they would get from owning that item.

Mechanisms for arriving at price:

- **Ascending price (English) auction** - Typically, this is a face-to-face auction where buyers bid openly, starting at a low price and rising as the bidding progresses. The process reveals information about intrinsic value, as fewer bidders remain in the auction as the price rises. The item is won by the highest bidder.

- **First and second price sealed bid auction (Vickery)** - In a first price sealed bid auction, the bidders submit bids that are not seen by other bidders. The bids are opened, and the highest bidder wins. If the winning bid is greater than intrinsic value, the winning bidder has experienced the "winner's curse" and loses money because he has been overly optimistic about the asset's worth. If all the bidders are uncertain about intrinsic value, they may all underbid, resulting in the seller not realizing the full value of the asset. There is no winner's curse in a private value auction, since a bidder will not pay more than his/her private valuation of the item. Because of the possibility of underpaying for the asset - if every bidder is conservative and just trying to bid slightly higher than the second highest bidder, a second price sealed bid, or Vickery auction could be held. As in a first price sealed auction, all bids are submitted and opened together. The price paid is not the highest bid, but instead is the second highest price. This type of auction gives bidders the incentive to bid their actual reservation prices, and is more likely to result in a final price near the intrinsic value of the item.

- **Descending price (Dutch)** - The first price is a high price, which the auctioneer lowers incrementally until there is a buyer. Modified Dutch auctions are sometimes used in the securities markets, for example, when a company repurchases shares or issues shares in an initial public offering (IPO). Google's IPO, for example, was conducted as a Dutch auction. Potential buyers offered prices and number of shares they would be willing to purchase. The prices were sorted in descending order until the desired number of shares that Google wanted to sell was reached. All of the successful bidders paid that price per share, even if they had been willing to pay a higher price. In a single price auction, for example, as in the auction for Treasury bills, non-competitive bidders submit an amount they are willing to pay. Competitive bidders submit an amount and price. The prices are ranked, and stops at the highest yield, with all the Treasury bills sold at the price corresponding to that yield. If there is excess demand, then every buyer's share is a percent of their desired purchase.

For example, suppose a firm wishes to repurchase $10 million shares. The firm receives the following bids in a Dutch auction:

Price	Number of Shares Offered
$50/share	1 million
$40/share	2 million
$35/share	4 million
$30/share	5 million
$25/share	7 million

The 10 million shares desired is reached (and exceeded) at $30/share (1 + 2 + 4 + 5 = 12). The final price is $30/share. The 12 million bidders receive 10/12 of the number of shares they desired, paying $30/share. The 7 million bidders at $25/share receive no shares.

Supply and Demand Imbalances and their Causes

Learning Objective: Understand how government regulation and intervention impacts supply and demand.

Learning Objective: Predict how introducing or removing market interferences, such as price floors or ceilings, impacts price and quality.

Marginal benefit or marginal utility is *the benefit one derives from the consumption of one additional unit of a good*.

The **law of diminishing marginal utility** states that *as the consumption of a commodity increases, the marginal utility derived from consuming more of the commodity will eventually decline*. Total utility increases with consumption, but at a decreasing rate.

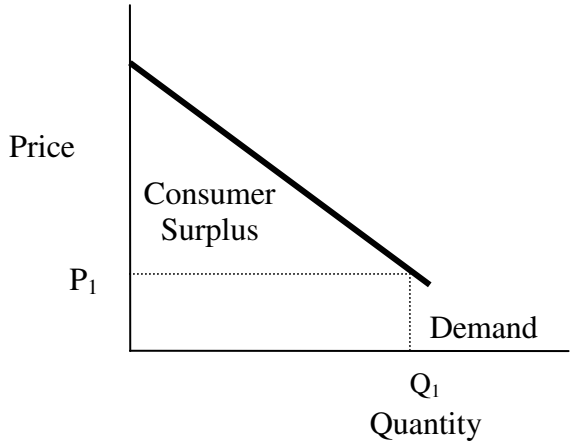
Consumers maximize their welfare by purchasing goods until the benefit, or marginal utility, derived from the consumption of additional units of the good exactly equals the cost (selling price) of the good. The intuition is clear: if the consumer stops consuming the good when the benefit derived is greater than the cost, then he or she is missing out on the opportunity to gain even more utility from additional units of the good. Buying more units of the good under these circumstances provides more utility to the consumer than the cost of the additional units. On the other hand, if someone consumes beyond the point where marginal benefit equals marginal cost, then the additional units cost more than the benefit they provide.

Allocative efficiency means *the goods most desired are produced at the lowest possible cost*. There has been continuing debate about allocative efficiency in low entry barrier markets. One view is that there is allocative inefficiency because price-searchers do not produce output levels that minimize long-run average costs. Because of the low entry barriers, there are a large number of firms with sales falling short of their least-cost capacity. Or, perhaps inefficiency results from costly duplication, or because producers expend resources to differentiate their similar products. A more recent view is that consumers are happy with the potential overproduction because they value convenience, product diversity, etc., as well as lower prices. For example, designer jeans are still purchased, even though they cost more than generic jeans.

To find the efficient quantity of a good, you must look at marginal cost and marginal benefit. If marginal benefit is greater than marginal cost, then more of the good will be produced - value is increased. At some point, however, marginal cost will exceed marginal benefit. At that point, the producer no longer makes more of that good or service. Efficiency is achieved when marginal benefit equals marginal cost - exactly the right amount of a good or service is being produced and consumed.

Consumer surplus is *the difference between the maximum amount a consumer would be willing to pay for a good and the payment that is actually required to purchase the good*.

Consumer surplus is represented by the area defined below the demand curve but above market price.



There is a difference between price and value. Value is the benefit received from a good or service, and price is the cost of that good or service. The value of one more unit of a good or service, or the highest price consumers are willing to pay for this good or service, is its marginal benefit. The demand curve is a picture of marginal benefit. The demand curve shows relative prices, not monetary prices. It illustrates the amount of dollar goods foregone in order to purchase one more unit of a particular good.

Marginal cost (MC) is *the change in total cost that results from the production of one additional unit*. MC usually declines at smaller output levels and then eventually rises as output is increased. Costs are incurred when choices are made. Decisions to purchase raw materials, hire new employees, etc., mean costs for the firm. **Opportunity costs** represent *the highest*

valued option that the decision maker expects to give up as a result of a choice. For a producer, cost is what they must pay to produce a good, and price is what they receive. The supply curve represents what the firm gives up in order to produce an additional unit of the good or service. The supply curve represents the marginal cost curve.

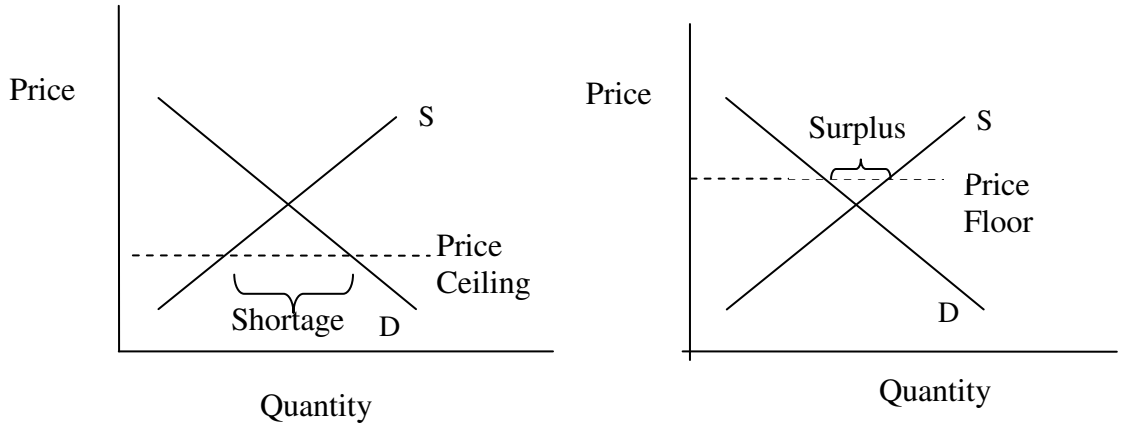
Economic theory assumes that buyers and sellers have no costs, which is not the case. For example, a willing seller might have trouble finding a willing buyer in an illiquid market. The case of a willing buyer and seller being unable to find each other is called a **search cost**, resulting in a **deadweight loss**. When this cost is high, a third party may have the opportunity to provide a matching service, for example, brokers receive a fee for providing this service to buyers and sellers of stocks.

Legal factors can often distort the natural supply/demand equilibrium. Price controls are a common example. A **price control** is *any type of government-mandated pricing scheme*. These could be a fixed price, a price ceiling (a maximum price), or a price floor (a minimum price). All three price control types can be accomplished with a variety of methods.

Price Ceilings

A **ceiling price** is *a government-imposed maximum price for a good that is below its equilibrium price*. Some cities have rent controls, limiting the rent increases that can be charged to existing tenants. Governments sometimes impose price freezes or ceilings after a natural disaster to prevent price gouging. Price ceilings create a deadweight loss. Buyers want more, but sellers want to produce and sell less. Quantity produced and sold decreases, even though demand is higher than this quantity. Buyers who are able to buy at the new, lower price are advantaged, and sellers and buyers who are unable to purchase the product because there is insufficient quantity are disadvantaged.

Impact of Price Ceilings and Price Floors



Of course, it may be possible for the intersection of supply and demand to occur at some price higher than the legal limit. The graph above shows the impact of a price ceiling on supply and demand.

Note that the price intersects the supply and demand curve at different points, implying that producers will not supply as much quantity as is demanded. *The difference between the quantity supplied and demanded* is called a **shortage**.

Remember that the role of prices is to ration scarce goods. When a price ceiling is imposed, nominal prices cannot rise to absorb the shortage.

In practice, however, some method of rationing must arise. Most often, this comes in the form of a clandestine price increase. The most obvious would be black market dealing. For example, a landlord in a rent-controlled city might demand that renters pay a large damage deposit up front, which is understood to be never returned. Less obvious are indirect price increases such as decreases in the quality or size of the good under price control.

Over the long term, price ceilings result in dwindling supply. The control presents no incentive for entrepreneurs to expand supply. Even current suppliers may become wary of remaining in a business where profit margins could be wiped out by legislative decree.

Are rent ceilings fair? From a "fair rules" point of view, they are not fair because they prevent the owner of the housing from selling at market price. From a "fair results" point of view, they are fair because they benefit those who otherwise would not be able to afford housing. In reality, scarce housing is likely to be allocated by queuing (a long waiting list to get housing) and through discrimination (friends and relatives of the owners are more likely to obtain housing than someone without contacts).

Rent controls also discourage landlords from making improvements. In New York City, for example, landlords might have let their rent-controlled properties deteriorate because they were not making enough from the properties to justify the expense of the improvements. They also may have hoped that their tenants would leave for better housing, allowing them to charge a higher price to the next tenant.

How are scarce resources allocated when there is a shortage? They are typically assigned through search activity and black markets.

Search Activity

The *time you spend shopping for something or doing business* is called a **search activity**. You may spend a small amount of time searching (you know that the price of bananas is about the same at all the grocery stores, so you go to the closest one) or a long time (trying to find scarce Cabbage Patch Kids for your daughters at Christmas in the mid 1980s). When prices are regulated and there are shortages, search activity is higher. The marginal or opportunity cost for a good includes both the price and the time spent searching for it. Searching is costly in terms of time and use of resources, such as your car, telephone, etc., that could have been used in more productive ways other than searching.

The Black Market

The **black market** refers to *any market which operates outside the law*. Most obvious are the markets for illegal drugs or stolen goods. However, black markets also include any other transaction with illegal aspects, such as goods smuggled across borders to avoid tariffs, or laborers paid in cash to avoid taxes.

The laws of supply and demand still apply in an illegal market, but may be distorted. This distortion comes from several sources:

- *Marginal costs of production are higher due to the cost of avoiding law enforcement.* This tends to result in higher prices than would persist if the same good were traded legally. The greater the penalties imposed on buyers and sellers, the greater the decrease in demand and supply. It is theoretically possible to reduce supply and demand to zero if there are high enough penalties and sufficient law enforcement.
- *Contracts are not enforceable by the court system*. This has two results.
    1. The incidence of defective products is higher, as producers cannot be sued over ineffective or dangerous products.
    2. Disagreements in the black market are generally resolved through violence or the threat thereof. This suggests that individuals or organizations with a comparative advantage in violence are more likely to succeed in the black market.

Could currently illegal markets, like the market for drugs, be eliminated if drugs were legalized but highly taxed? A high enough tax would decrease supply and increase prices. It is likely this would result in buyers and sellers evading tax laws.

The Labor Market

An employee (laborer) essentially *sells* his/her time, knowledge, skills, etc. to an employer. Therefore, in the labor market, laborers are *suppliers* and employers are *consumers*.

The convergence of supply and demand will set the wage for all skill sets that exist in an economy. This pricing system will then ration laborers across employers in the exact manner that prices ration goods across consumers. There is a strong relationship between the demand for a good and the demand for the resources to produce that good, including labor. Therefore, employees with the skills to produce goods in high demand are likely to command higher wages. Conversely, goods which require specialized (i.e., high-priced) labor to produce will be more costly.

Price Floor

A **price floor** *makes it illegal to buy or sell a good below a specified price, which is above the equilibrium price*. Now there is less demand from buyers but more willingness to sell among producers. Producers who are able to sell benefit at the expense of the buyers. Price floors also create deadweight losses. Price floors include minimum wage laws, which potentially reduce

employment - those employed benefit from higher wages, while those unable to find employment are disadvantaged.

The government may enact a price floor to protect a group of suppliers with political clout. Well-known price floors include food subsidies and the minimum wage. A floor creates the opposite effect from a ceiling; therefore, producers will supply more quantity than is demanded.

Much like the shortage created by price ceilings, the normal rationing ability of prices has been distorted and some alternative rationing device will develop. However, in this case, it will be the buyers who will have discriminatory ability.

The minimum wage is a price floor in the labor market. In theory, the minimum wage should result in an abundance of supply relative to demand, i.e., the unemployment rate among low-skilled workers should be higher than it would otherwise be. There is ample evidence that this is the case. In addition, other rationing devices should exist. In this case, employers have little incentive to attract workers with non-pecuniary benefits, such as flexible hours, health insurance, etc.

The minimum wage is considered to lead to unemployment and greater resources spent on job searches. The results of empirical studies on this question are mixed. One result of the minimum wage is a greater quantity of labor supplied. This could be seen as an increase in the number of people who quit school to get a job.

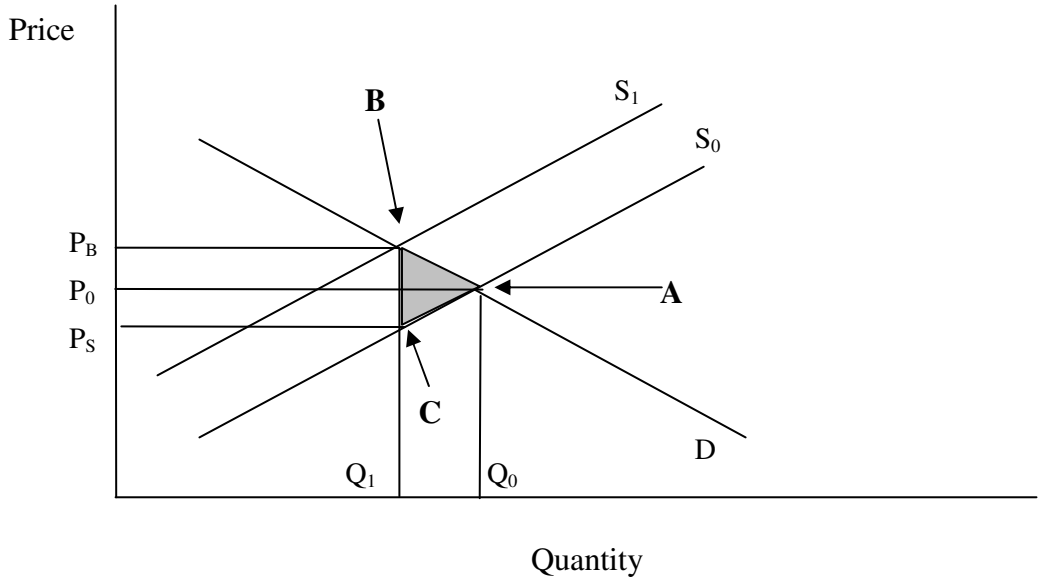
Taxes

When a tax is imposed on a good or service, the **tax incidence** *indicates the impact on both buyers and sellers of the taxed item*. While such a tax may legally be borne by one party or another, the actual economic impact is usually shared (to some degree) by both buyers and sellers.

Note that *whether the tax is legally imposed on the buyer or seller* (called the **statutory incidence**) is irrelevant in terms of the economic impact. The above situation shows the supply curve shifting because of a tax on sellers. However, a demand shift of the same degree (if the tax were imposed on buyers) would cause a deadweight loss of the same magnitude. The actual tax burden is the same, whether it is imposed on buyers or sellers.

The graph below shows the impact of a tax on both supply and demand. Independent of a tax, supply and demand intersect at point A, resulting in price P_0. A tax is imposed causing the after-tax supply curve to shift from S_0 to S_1. The new intersection of supply and demand is at point B, resulting in a price buyers must pay of P_B. However, since the seller must now pay a tax on the sale, the seller only receives P_S for the good.

The shaded area is called the **deadweight loss**. It indicates *the amount of combined producer and consumer surplus that is not captured because of the distortive impact of the tax*. The area above the P_0 line is lost consumer surplus, and below is lost producer surplus. Deadweight loss can also occur if there is overproduction.



As is evident by viewing this graph, the share of deadweight loss divided between consumer and producer surplus is primarily a function of the slope of the demand and supply curves. The price elasticity of demand and supply will determine the actual tax incidence.

As an example, imagine a tax is imposed which requires producers to pay a tax for each unit sold. Ideally, producers would like to pass this tax onto consumers in the form of price increases. Price elasticity of demand will determine whether this will be successful. If price elasticity is low, this means consumers will demand only slightly less of a good if the price increases. If producers raised prices to compensate for the tax, they would continue to sell a similar quantity, and therefore consumers are likely to bear the tax incidence.

Elasticity of supply is also an important factor. If supply is highly elastic, this means that producers will significantly curtail their production level if marginal revenue (nominal price minus tax) falls. In this case, consumers would also bear the majority of the tax incidence, as producers would simply cut production and consumers would suffer due to decreased quantity available.

Subsidies

Many U.S. farmers receive agricultural **subsidies**, *a payment by the government to a producer*. Farmers face a unique supply and demand situation. Demand for agricultural commodities is reasonably inelastic, so if output is poor, then prices rise and if output is high, then prices fall. Subsidies decrease the farmers' costs, and increase supply. When supply increases, prices fall,

but farmers' income (price for crop plus subsidy) is higher than it would be without the subsidy. The subsidy results in a marginal cost, that is greater than the marginal benefit, and leads to a deadweight loss from overproduction. Because U.S. farmers are producing more than the optimal amount, they may sell their excess production in global markets, leading to a decrease in production and revenues in other countries. Farm subsidies prevent efficient use of resources worldwide.

Quotas

Agricultural production may also be regulated using **production quotas**, which *limit the amount of a good which can be produced in a certain period*. Quotas raise price because supply is limited. Suppose a quota is set below the equilibrium supply for that good. This will cause prices to rise and costs to fall (which explains why government quotas may be popular with producers). Voluntary quotas are not likely to be effective - each producer has a strong incentive to cheat by producing a little more to benefit from the higher prices for the good. Quotas, like subsidies, lead to inefficient production, in this case, underproduction.

One prominent government action that impacts supply and demand is taxes. An **excise tax** is one *levied on buyers and sellers, per unit of product*, resulting in deadweight loss. For example, taxing buyers moves the demand curve down, resulting in a lower price and equilibrium at a lower quantity. Sellers receive a lower price, and while buyers pay a lower price, they must pay a tax to the government, increasing their total purchase price. Both buyers and sellers are impacted, with sellers receiving a lower price and buyers paying a higher price than the pre-tax price. The result is the same if the tax is imposed on the sellers. In this case, because of the producers' higher costs due to the tax, the supply curve shifts upwards. In the new equilibrium, the price is higher, but sellers must give part to the government, ultimately receiving a lower after-tax price. The deadweight loss is shared by buyers and sellers. The largest share of the deadweight loss goes to the party with the steepest curve.

Other forms of government interference with supply and demand include:

- Tariffs and quotas on imports
- Banning trade in a good
- Regulations concerning production or consumption of goods. Note that not all regulations are undesirable. Government regulations concerning pollution or child labor add costs but are socially desirable.

In addition to price ceilings and floors, taxes, and quotas, allocative efficiency may not be achieved because of:

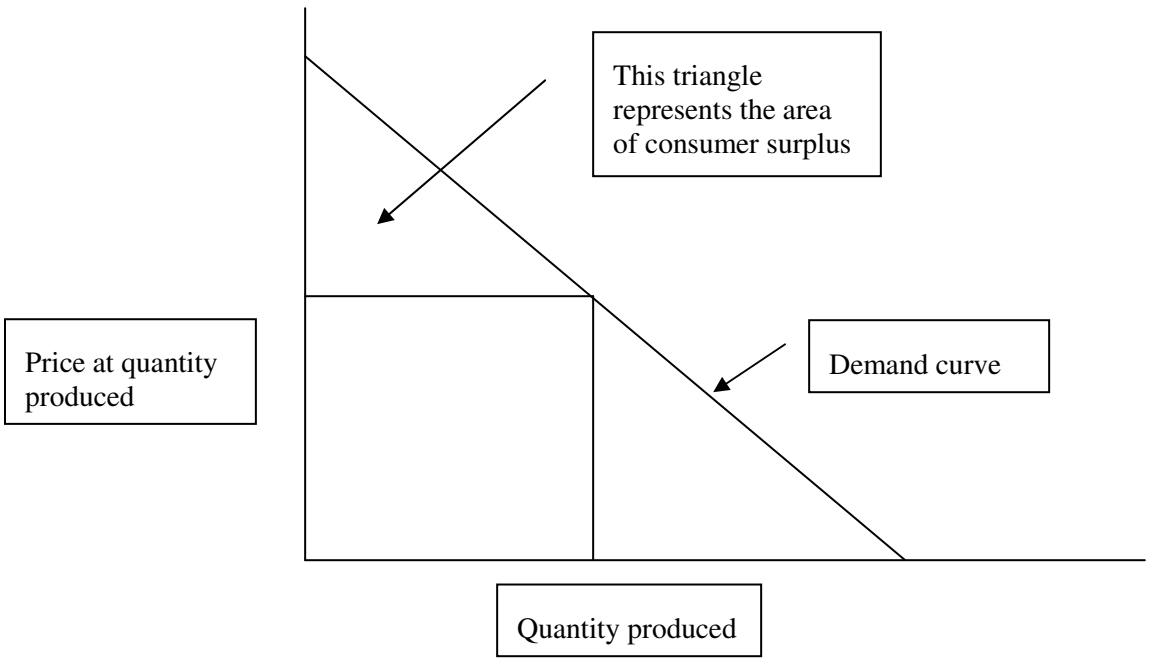
- *subsidies* - Government payments to producers, mean lower prices to consumers and higher prices for sellers, increasing the quantity produced, even if it not the efficient quantity.
- *monopolies* - In a monopoly, a single firm controls the market, and can set quantity and price. Monopolies generally result in higher prices and production levels at less than the efficient quantity.

- *public goods* - The government pays for goods and services that are used by all citizens, such as highways and national defense. A competitive market will not produce the efficient quantity of public goods because it is not in the best interest of each citizen to pay their share. They would receive more benefit as "free riders," allowing others to pay.
- *common resources* - These are resources available to everyone, like clean air. Competitive markets tend to overuse common resources.
- *external costs and benefits* - External costs are paid by people other than the producer and external benefits are received by people other than the consumer. Pollution is an example of an external cost and a beautification project is an example of an external benefit.

Consumer, Producer, and Total Surpluses

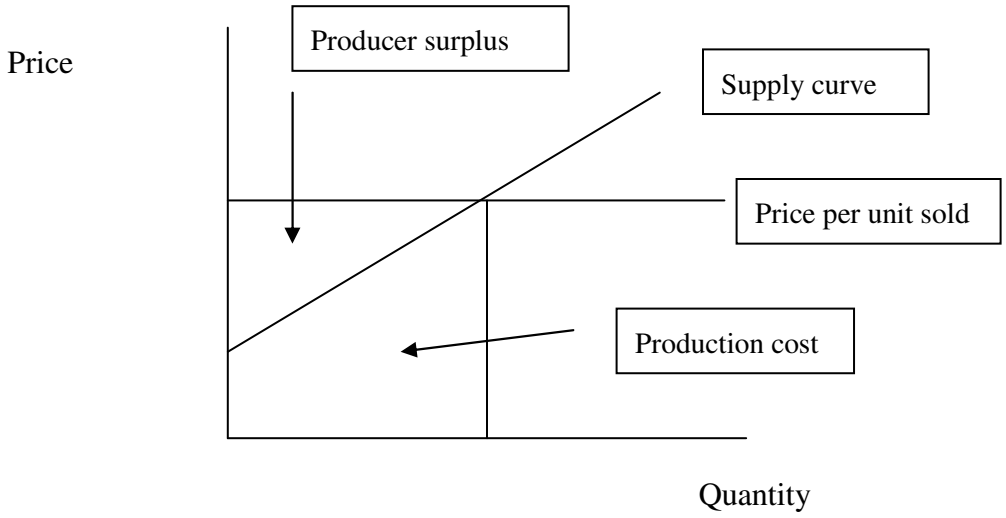
Learning Objective: Understand and calculate consumer surplus, producer surplus, and total surplus.

Consumer surplus *measures buyers' benefit from participating in a market for a particular good*. It is the difference between how a buyer values a good and how much was actually paid for that good. Consumer benefit is the amount they would be willing to pay minus the amount actually paid for an item. Demand increases as price decreases and the price buyers will pay for one more unit of a good shows how much they value that unit, relative to the goods they are giving up to make the purchase. Demand curves typically have a negative slope, meaning the value of an additional unit decreases as more is consumed and that value is a marginal value. The area underneath the demand curve represents the total of all the marginal values of each unit purchased.

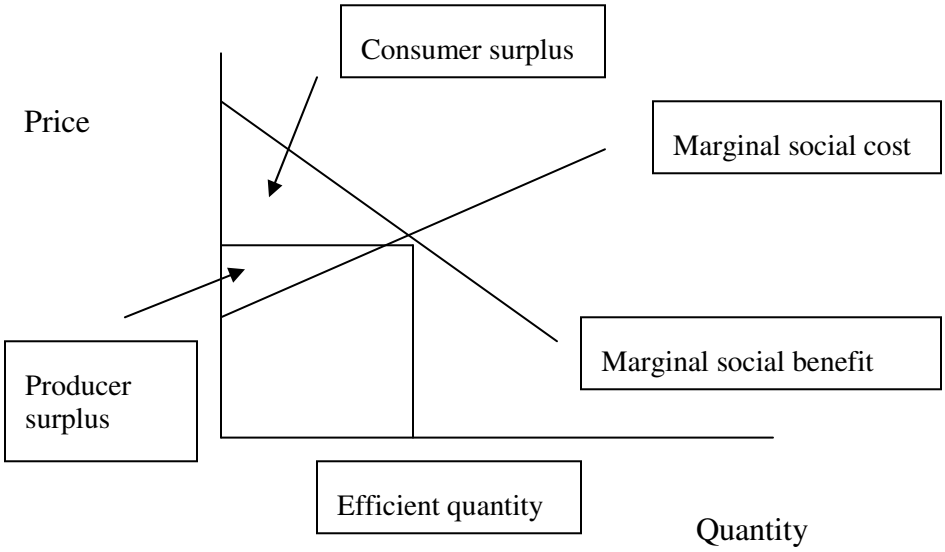


Producer surplus refers to *the gain that producers achieve when price is greater than marginal cost*. **Variable production costs** *are those that increase as production quantity increase* and **total revenue** is *price per unit x number of units sold*.

The total of the price (for total units sold) minus the cost for producing those units is producer surplus. Graphically, producer surplus is:



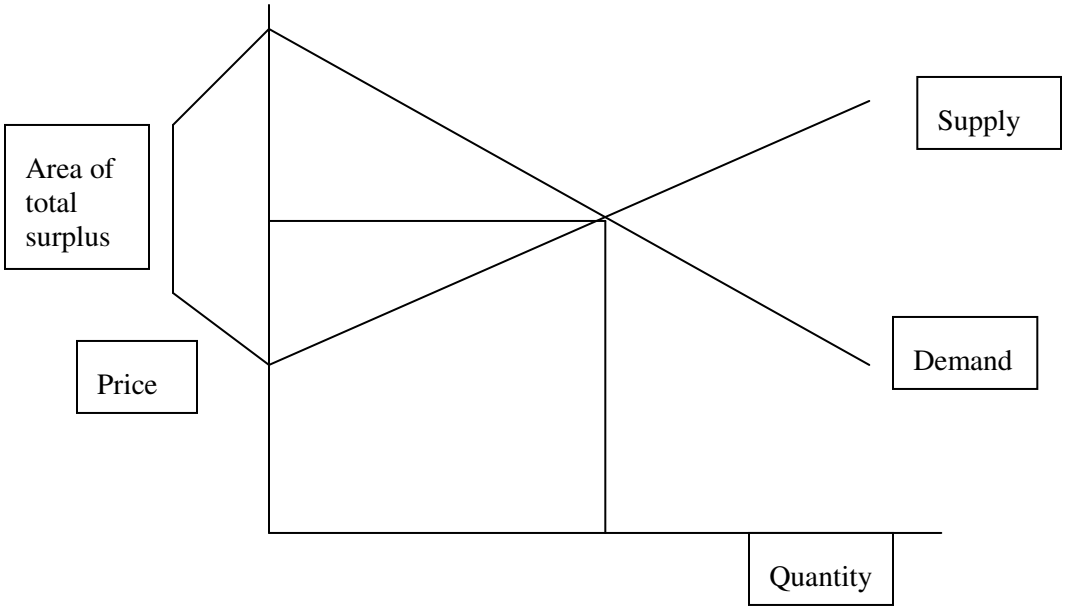
The marginal benefit and cost curves can be expanded to include all of society, instead of just a single good or service. The marginal benefit (demand) curve for society is called the **marginal social benefit**. The marginal cost (supply) curve for society is called the marginal social cost curve. The point at which the two curves intersect, the point at which marginal benefit equals marginal cost, represents the most efficient allocation of resources for the entire society. **Competition** will move producers to their efficient level. When society produces the efficient quantity, then consumer and producer surpluses are maximized.



The points on a supply curve represent the lowest price producers will accept for each additional unit of a good, a marginal cost. Sellers would lose money if the good were sold for less than its marginal cost.

Supply curves usually have positive slopes - as price increases sellers desire to produce more. The area of producer surplus represents the difference between price received per unit and the price at which they would have been willing to sell.

It is possible for both parties to be happy - to believe they have received a bargain. **Total surplus** is *the difference between what buyers were willing to pay and producers willing to accept*. It is also the sum of consumer and producer surpluses. If the demand curve is steeper than the supply curve, then consumers receive more of the surplus; if the supply curve is steeper, then producers receive more. A greater surplus represents a greater gain to society as a whole. Total surplus is the greatest when the market is at equilibrium.



Suppose the markets are not in equilibrium and more than the optimal quantity (the point where supply and demand intersect) is produced. This will mean that the cost of producing the units is greater than the value of consuming the units. In this case, total surplus is reduced.

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