

# DEMAND AND SUPPLY

# Introduction

- Supply and demand are the forces that make market economies work.
- They determine the quantity of each good produced and the price at which it is sold. If you want to know how any event or policy will affect the economy, you must think first about how it will affect supply and demand.
- The terms *supply* and *demand* refer to the behavior of people as they interact with one another in competitive markets.

# What is a market?

- A **market** is a group of buyers and sellers of a particular good or service. The buyers as a group determine the demand for the product, and the sellers as a group determine the supply of the product.
- Sometimes markets are highly organized, such as the markets for many agricultural commodities. In these markets, buyers and sellers meet at a specific time and place, where an auctioneer helps set prices and arrange sales.
- More often, markets are less organized. For example, consider the market for ice cream in a particular town. Buyers of ice cream do not meet together at any one time. The sellers of ice cream are in different locations and offer somewhat different products. There is no auctioneer calling out the price of ice cream. Each seller posts a price for an ice-cream cone, and each buyer decides how much ice cream to buy at each store.

# What is competition?

- Economists use the term **competitive market** to describe a market in which there are so many buyers and so many sellers that each has a negligible impact on the market price. Each seller of ice cream has limited control over the price because other sellers are offering similar products.
- A perfectly competitive market must have two characteristics: (1) the goods offered for sale are all exactly the same, and (2) the buyers and sellers are so numerous that no single buyer or seller has any influence over the market price.
- Because buyers and sellers in perfectly competitive markets must accept the price the market determines, they are said to be *price takers*. At the market price, buyers can buy all they want, and sellers can sell all they want.

- Not all goods and services, however, are sold in perfectly competitive markets. Some markets have only one seller, and this seller sets the price. Such a seller is called a **monopoly**.
- Despite the diversity of market types we find in the world, assuming perfect competition is a useful simplification and, therefore, a natural place to start. Perfectly competitive markets are the easiest to analyze because everyone participating in the market takes the price as given by market conditions. Moreover, because some degree of competition is present in most markets, many of the lessons that we learn by studying supply and demand under perfect competition apply in more complicated markets as well.

# Demand

- The **quantity demanded** of any good is the amount of the good that buyers are willing and able to purchase. Many things influence demand but price plays a central role.
- Other things equal, the quantity demanded of a good falls when the price of the good rises. The inverse relationship between price and quantity demanded is true for most goods in the economy that economists call it the **law of demand**.

# Market demand curves

- We sum the individual demand curves **horizontally** to obtain the **market demand curve**. That is, to find the total quantity demanded at any price, we add the individual quantities, which are found on the horizontal axis of the individual demand curves.
- Because we are interested in analyzing how markets function, we work most often with the market demand curve.
- The **market demand curve shows how the total quantity demanded of a good varies as the price of the good varies**, while all the other factors that affect how much consumers want to buy are held constant.

# Demand Curve





# Factors shifting the demand curve

- Because the market demand curve holds other things constant, it need not be stable over time. If something happens to alter the quantity demanded at any given price, the demand curve shifts resulting in either increase (shift to the right) or decrease in demand (shift to the left).

❑ Income

❑ Prices of related goods-When a fall in the price of one good reduces the demand for another good, the two goods are called **substitutes**. When a fall in the price of one good raises the demand for another good, the two goods are called **complements**.

❑ **Expectations** Your expectations about the future may affect your demand for a good or service today. For example, if you expect to earn a higher income next month, you may choose to save less now and spend more of your current income buying ice cream. As another example, if you expect the price of ice cream to fall tomorrow, you may be less willing to buy an ice-cream cone at today's price.

❑ **Number of Buyers** In addition to the preceding factors, which influence the behavior of individual buyers, market demand depends on the number of these buyers.

❖ Shifts vs movement along the demand curve

# Supply

- The **quantity supplied** of any good or service is the amount that sellers are willing and able to sell.
- When the price of ice cream is high, selling ice cream is profitable, and so the quantity supplied is large. By contrast, when the price of ice cream is low, the business is less profitable, and so sellers produce less ice cream.
- This relationship between price and quantity supplied is called the **law of supply**: Other things equal, when the price of a good rises, the quantity supplied of the good also rises, and when the price falls, the quantity supplied falls as well.

# Market supply curves

- Just as market demand is the sum of the demands of all buyers, **market supply** is the sum of the supplies of all sellers.
- As with demand curves, we sum the individual supply curves **horizontally** to obtain the market supply curve. That is, to find the total quantity supplied at any price, we add the individual quantities, which are found on the horizontal axis of the individual supply curves.
- The supply curve slopes upward because, other things equal, a higher price means a greater quantity supplied.

# Supply curve



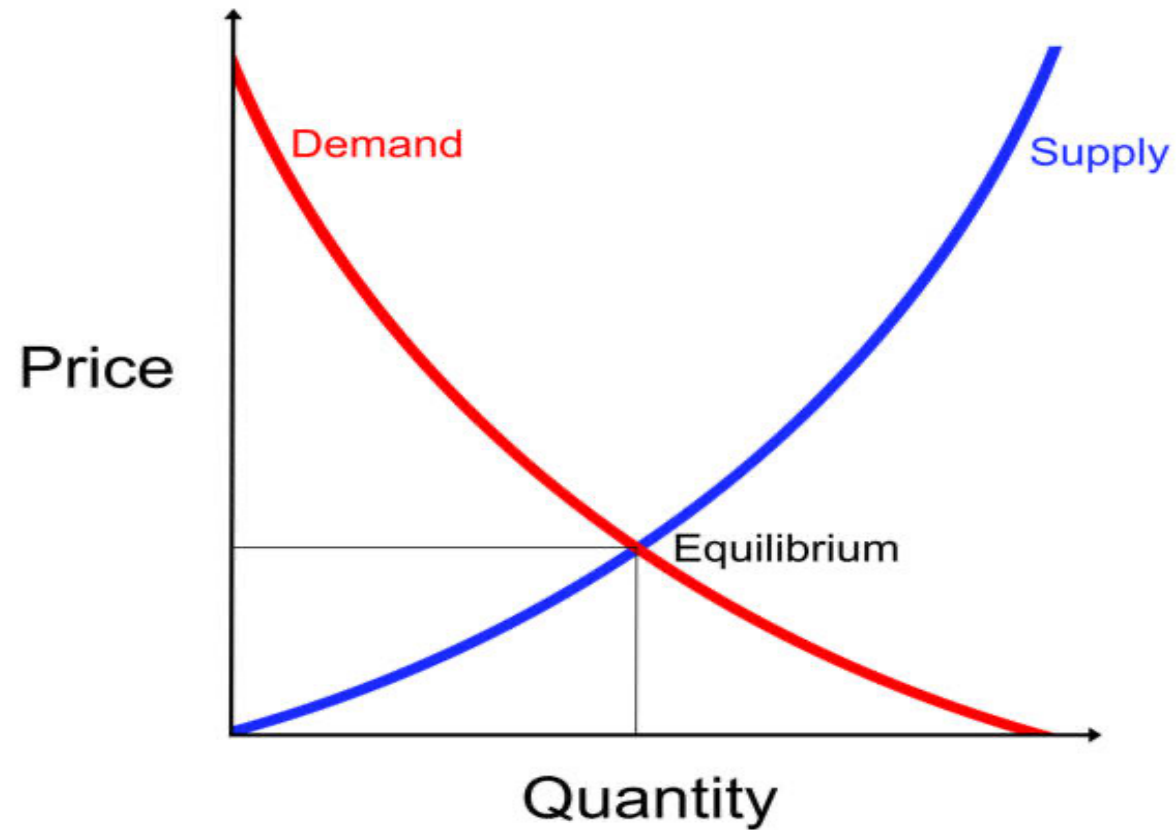
# Shifts in the supply curve

- Because the market supply curve holds other things constant, the curve shifts **when one of the factors changes** resulting in either increase (shift to the right) or decrease in supply (shift to the left).
  - Input prices
  - Technology
  - Expectations
  - Number of sellers

# Demand and Supply

- We now combine market demand and supply curves to see how they determine the price and quantity of a good sold in a market.
- There is one point at which the supply and demand curves intersect. This point is called the market's **equilibrium**. The price at this intersection is called the **equilibrium price**, and the quantity is called the **equilibrium quantity**.
- The equilibrium price is sometimes called the market-clearing price because, at this price, everyone in the market has been satisfied: Buyers have bought all they want to buy, and sellers have sold all they want to sell.
- The actions of buyers and sellers naturally move markets toward the equilibrium of supply and demand. (i.e there is no excess supply or demand)

# Equilibrium in the market





# Understanding changes to the equilibrium

- Shift of the demand curve (case of increase in demand)
- Shift of the supply curve (case of decrease in supply)
- Simultaneous shifts

# Normal and inferior goods

- Normal goods are those goods for which the demand rises as consumer income rises.
- An **inferior good** is a good whose demand decreases when consumer income rises (or demand increases when consumer income decreases)

THANK YOU

# ELASTICITY



# Price elasticity of demand

- Elasticity is a measure of **how much** buyers and sellers respond to changes in market conditions. When studying how some event or policy affects a market, we can discuss not only the direction of the effects but their magnitude as well.
- The **price elasticity of demand** measures how much the quantity demanded responds to a change in price. Demand for a good is said to be *elastic* if the quantity demanded responds substantially to changes in the price.
- Demand is said to be *inelastic* if the quantity demanded responds only slightly to changes in the price.

# Determinants of elasticity of demand

- Elasticity reflects the many economic, social, and psychological forces that shape consumer preferences.
- **Availability of close substitutes-** Goods with close substitutes tend to have more elastic demand because it is easier for consumers to switch from that good to others.
- **Necessities vs luxuries-** Necessities tend to have inelastic demands, whereas luxuries have elastic demands. Of course, whether a good is a necessity or a luxury depends not on the intrinsic properties of the good but on the preferences of the buyer.

❑ **Definition of the market-** The elasticity of demand in any market depends on how we draw the boundaries of the market. Narrowly defined markets tend to have more elastic demand than broadly defined markets because it is easier to find close substitutes for narrowly defined goods.

❑ **Time horizon-** Goods tend to have more elastic demand over longer time horizons.

- The price elasticity of demand as the percentage change in the quantity demanded divided by the percentage change in the price.

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

- Reporting in absolute values. A larger price elasticity implies a greater responsiveness of quantity demanded to price.



# Midpoint method of computing elasticity

- The standard procedure for computing a percentage change is to divide the change by the initial level. By contrast, the midpoint method computes a percentage change by dividing the change by the midpoint (or average) of the initial and final levels.
- Price elasticity of demand = 
$$\frac{(Q_2 - Q_1) / [(Q_2 + Q_1) / 2]}{(P_2 - P_1) / [(P_2 + P_1) / 2]}$$
- Because the midpoint method gives the same answer regardless of the direction of change, it is often used when calculating the price elasticity of demand between two points.

# Variety of demand curves

- Economists classify demand curves according to their elasticity. Demand is considered **elastic** when the elasticity is greater than 1, which means the quantity moves proportionately more than the price.
- Perfectly elastic (infinite elasticity)- demand curve horizontal
- Demand is considered **inelastic** when the elasticity is less than 1, which means the quantity moves proportionately less than the price.
- Perfectly inelastic (zero elasticity)- demand curve vertical
- If the elasticity is exactly 1, the quantity moves the same amount proportionately as the price, and demand is said to have *unit elasticity*.

- Because the price elasticity of demand measures how much quantity demanded responds to changes in the price, it is closely related to the slope of the demand curve.
- The flatter the demand curve that passes through a given point, the greater the price elasticity of demand. The steeper the demand curve that passes through a given point, the smaller the price elasticity of demand.

# Total revenue and the elasticity of demand

- In any market, total revenue is  $P \times Q$ , the price of the good times the quantity of the good sold.
- **If demand is inelastic**, then an **increase in the price causes an increase in total revenue**. An increase in price from \$1 to \$3 causes the quantity demanded to fall from 100 to 80, so total revenue rises from \$100 to \$240. An increase in price raises  $P \times Q$  because the fall in  $Q$  is proportionately smaller than the rise in  $P$ .
- **If demand is elastic**, the reduction in the quantity demanded is so great that it more than offsets the increase in the price. This leads to a **decrease in total revenue**.

# Income elasticity of demand

- The **income elasticity of demand** measures how the quantity demanded changes as consumer income changes. It is calculated as the percentage change in quantity demanded divided by the percentage change in income.
- Income elasticity of demand =  
$$\frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

- Most goods are **normal goods**. Higher income raises the quantity demanded. Because quantity demanded and income move in the same direction, normal goods have positive income elasticities.
- Because quantity demanded and income move in opposite directions, inferior goods have negative income elasticities.
- Even among normal goods, income elasticities vary substantially in size. Necessities, such as food and clothing, tend to have small income elasticities because consumers choose to buy some of these goods even when their incomes are low. Luxuries, such as caviar and diamonds, tend to have large income elasticities because consumers feel that they can do without these goods altogether if their incomes are too low.

# Cross price elasticity of demand

- The **cross-price elasticity of demand** measures how the quantity demanded of one good responds to a change in the price of another good. It is calculated as the percentage change in quantity demanded of good 1 divided by the percentage change in the price of good 2.
- Cross-price elasticity of demand =  
$$\frac{\text{Percentage change in quantity demanded of good 1}}{\text{Percentage change in the price of good 2}}$$
- Whether the cross-price elasticity is a positive or negative number depends on whether the two goods are substitutes or complements.

# Determinants of elasticity of supply

- The **price elasticity of supply** measures how much the quantity supplied responds to changes in the price.
- Supply of a good is said to be *elastic* if the quantity supplied responds substantially to changes in the price. Supply is said to be *inelastic* if the quantity supplied responds only slightly to changes in the price.
- In most markets, a **key determinant of the price elasticity of supply is the time period being considered**. Supply is usually more elastic in the long run than in the short run.
- Over short periods of time, firms cannot easily change the size of their factories to make more or less of a good. Thus, in the short run, the quantity supplied is not very responsive to the price. By contrast, over longer periods, firms can build new factories or close old ones. In addition, new firms can enter a market, and old firms can shut down.



- Economists compute the price elasticity of supply as the percentage change in the quantity supplied divided by the percentage change in the price.
- Price elasticity of supply =  $\frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$

# Variety of Supply Curves

- In the extreme case of a zero elasticity, supply is *perfectly inelastic*, and the supply curve is vertical. In this case, the quantity supplied is the same regardless of the price.
- As the elasticity rises, the supply curve gets flatter, which shows that the quantity supplied responds more to changes in the price.
- *Perfectly elastic supply* occurs as the price elasticity of supply approaches infinity and the supply curve becomes horizontal, meaning that very small changes in the price lead to very large changes in the quantity supplied.

- **For low levels of quantity supplied, the elasticity of supply is high,** indicating that firms respond substantially to changes in the price. In this region, firms have capacity for production that is not being used, such as plants and equipment idle for all or part of the day. Small increases in price make it profitable for firms to begin using this idle capacity.
- As the quantity supplied rises, firms begin to reach capacity. Once capacity is fully used, increasing production further requires the construction of new plants. To induce firms to incur this extra expense, the price must rise substantially, so supply becomes less elastic.

# Applications of elasticity

- Innovations in farming- inelastic demand for wheat and supply curve shift
- Drug use- what is the best policy?
  - drug interdiction (shifts the supply curve to the left) or
  - drug education (shifts demand curve to the left)

BUDGET CONSTRAINT

# Introduction

- Economists assume that consumers choose the best bundle of goods they can afford. Now, we have to describe more precisely what we mean by “best” and what we mean by “can afford.
- In real life there are many goods to consume, but for our purposes it is convenient to consider only the case of two goods, since we can then depict the consumer’s choice behaviour graphically.
- We will indicate the consumer’s consumption bundle by  $(x, y)$ . This is simply a list of two numbers that tells us how much the consumer is choosing to consume of good 1,  $x$ , and how much the consumer is choosing to consume of good 2,  $y$ .

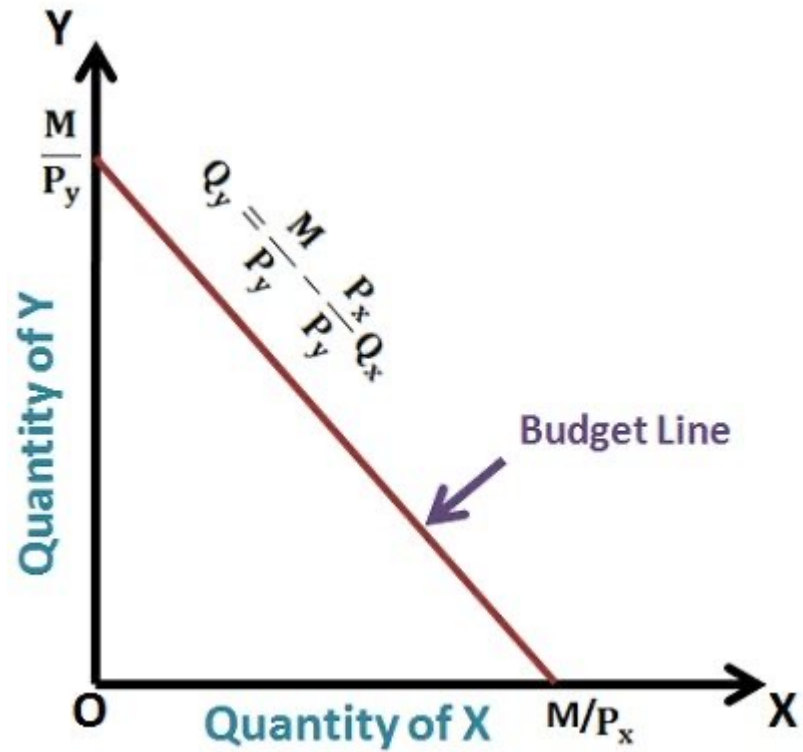
- We suppose that we can observe the prices of the two goods,  $(p_1, p_2)$  and the amount of money the consumer has to spend,  $m$ . Then the budget constraint of the consumer can be written as

$$p_1x + p_2y \leq m.$$

- The consumer's affordable consumption bundles are those that don't cost any more than  $m$ . We call this set of affordable consumption bundles at prices  $(p_1, p_2)$  and income  $m$  the budget set of the consumer.
- Two goods are often enough

# Budget line

- The budget line is the set of bundles that cost exactly  $m$





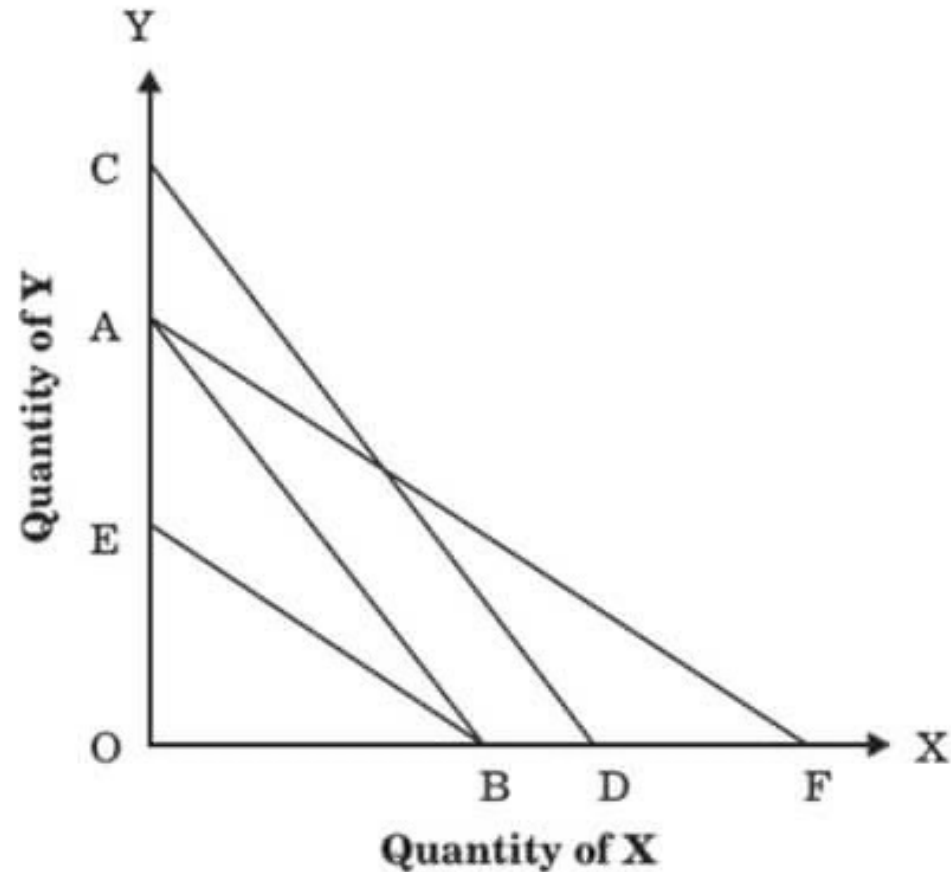
# Slope of the budget line

- The slope of the budget line has a nice economic interpretation. It measures the rate at which the market is willing to “substitute” good x for good y.
- The slope of the budget line measures the opportunity cost of consuming good 1. In order to consume more of good x you have to give up some consumption of good y. Giving up the opportunity to consume good y is the true economic cost of more good x consumption; and that cost is measured by the slope of the budget line.

# How the budget line changes?

- First consider changes in income. An increase in income will increase the vertical intercept and not affect the slope of the line. Thus an increase in income will result in a parallel shift outward of the budget line.
- Now consider changes in prices. Increasing  $p_1$  will not change the vertical intercept, but it will make the budget line steeper since  $p_1/p_2$  will become larger.

# Shifts due to income and price changes



- What happens to the budget line when we change the prices of good 1 and good 2 at the same time? Suppose for example that we double the prices of both goods 1 and 2. In this case both the horizontal and vertical intercepts shift inward by a factor of one-half, and therefore the budget line shifts inward by one-half as well. Multiplying both prices by two is just like dividing income by 2.

# What if income decreases and prices increase?

- If  $m$  decreases and  $p_1$  and  $p_2$  both increase, then the intercepts  $m/p_1$  and  $m/p_2$  must both decrease. This means that the budget line will shift inward.
- What about the slope? If price 2 increases more than price 1, so that  $-p_1/p_2$  decreases (in absolute value), then the budget line will be flatter; if price 2 increases less than price 1, the budget line will be steeper.

# CONSUMER PREFERENCES

# Introduction

- In the last session, we devoted to clarifying the meaning of “can afford,” and this session will be devoted to clarifying the economic concept of “best things.”
- We call the objects of consumer choice consumption bundles.
- We will use the symbol  $\succ$  to mean that one bundle is strictly preferred to another, so that  $(x_1, x_2) \succ (y_1, y_2)$  should be interpreted as saying that the consumer strictly prefers  $(x_1, x_2)$  to  $(y_1, y_2)$ , in the sense that she definitely wants the x-bundle rather than the y-bundle.

- If the consumer is indifferent between two bundles of goods, we use the symbol  $\sim$  and write  $(x_1, x_2) \sim (y_1, y_2)$ . Indifference means that the consumer would be just as satisfied, according to her own preferences consuming the bundle  $(x_1, x_2)$  as she would be consuming the other bundle,  $(y_1, y_2)$ .
- If the consumer prefers or is indifferent between the two bundles we say that she weakly prefers  $(x_1, x_2)$  to  $(y_1, y_2)$ . This can be written as  $(x_1, x_2) \succeq (y_1, y_2)$



# Assumptions about Preferences

- We usually make some assumptions about how the preference relations work. Some of the assumptions about preferences are so fundamental that we can refer to them as “axioms” of consumer theory.

## □ Three axioms of consumer preference

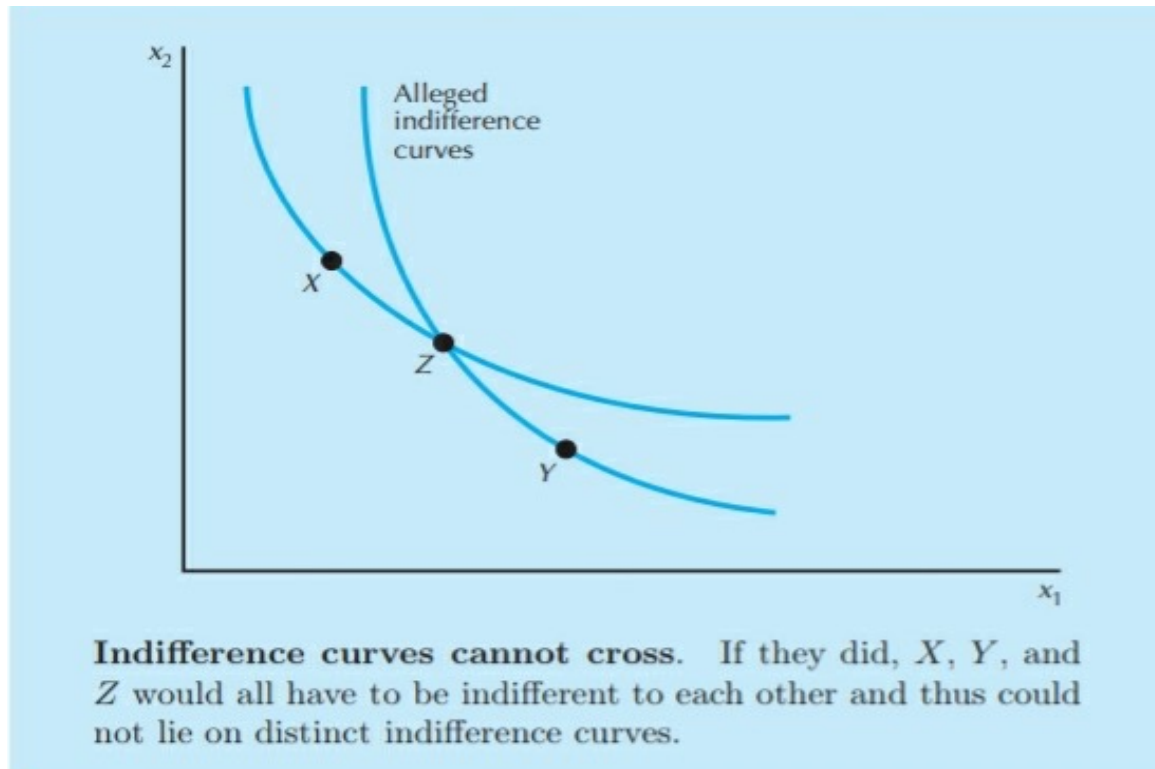
- **Complete.** We assume that any two different bundles can be compared. That is, given any  $x$ -bundle and any  $y$ -bundle, we assume that  $(x_1, x_2) \succeq (y_1, y_2)$ , or  $(y_1, y_2) \succeq (x_1, x_2)$ , or both, in which case the consumer is indifferent between the two bundles.

- **Reflexive**- We assume that any bundle is at least as good as itself i.e  $(x_1, x_2) \succeq (x_1, x_2)$ .
- **Transitive**- If  $(x_1, x_2) \succeq (y_1, y_2)$  and  $(y_1, y_2) \succeq (z_1, z_2)$ , then we assume that  $(x_1, x_2) \succeq (z_1, z_2)$ . In other words, if the consumer thinks that X is at least as good as Y and that Y is at least as good as Z, then the consumer thinks that X is at least as good as Z.

# Indifference curves

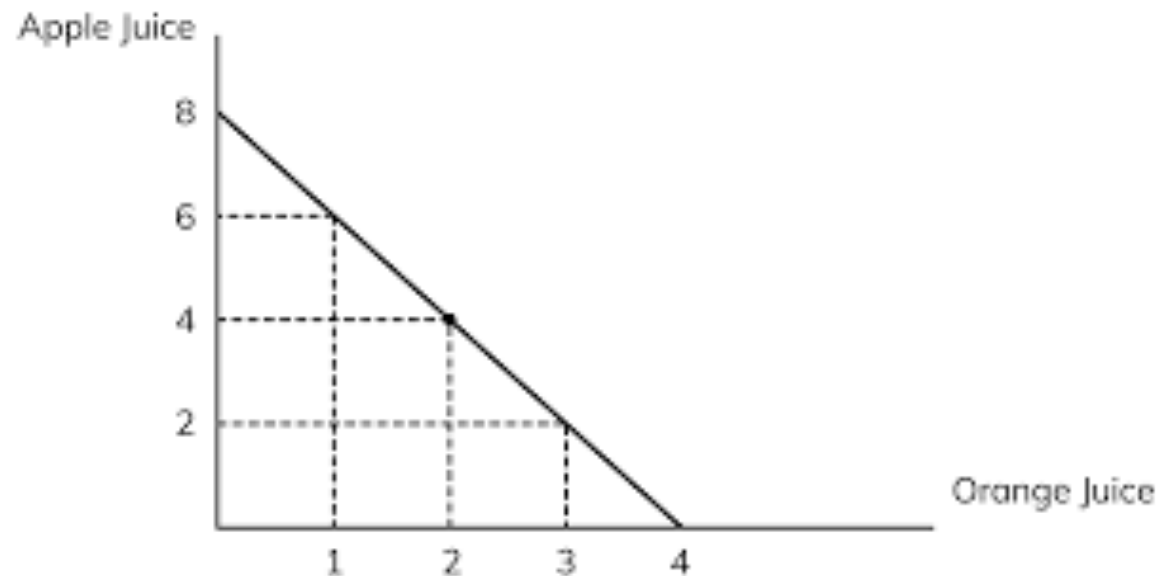
- Preferences can be graphically described using a construction known as indifference curves.
- We can pick a certain consumption bundle  $(x_1, x_2)$  and shade in all of the consumption bundles that are weakly preferred to  $(x_1, x_2)$ . This is called the weakly preferred set. The bundles on the boundary of this set—the bundles for which the consumer is just indifferent to  $(x_1, x_2)$ —form the indifference curve.
- We can draw an indifference curve through any consumption bundle we want. The indifference curve through a consumption bundle consists of all bundles of goods that leave the consumer indifferent to the given bundle.

- We can now state an important principle of indifference curves- **indifference curves representing distinct levels of preference cannot cross.**

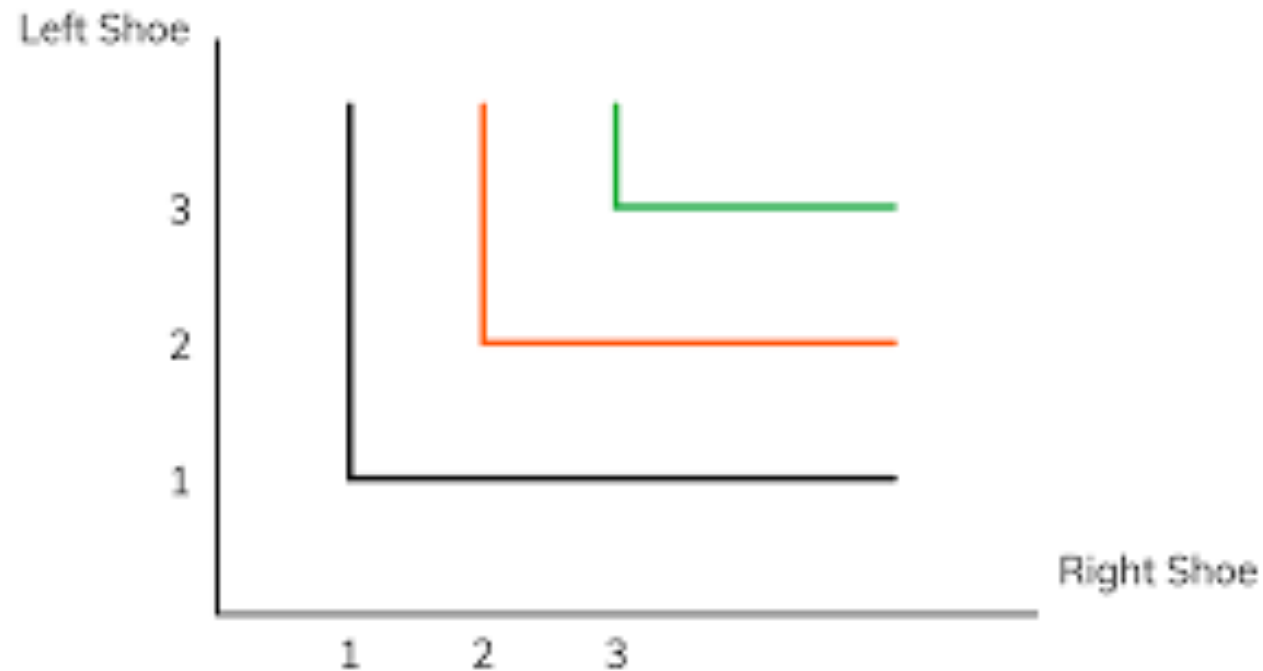


# Examples of preferences

- **Perfect substitutes-** Two goods are perfect substitutes if the consumer is willing to substitute one good for the other at a constant rate. The important fact about perfect substitutes is that the indifference curves have a **constant slope**.

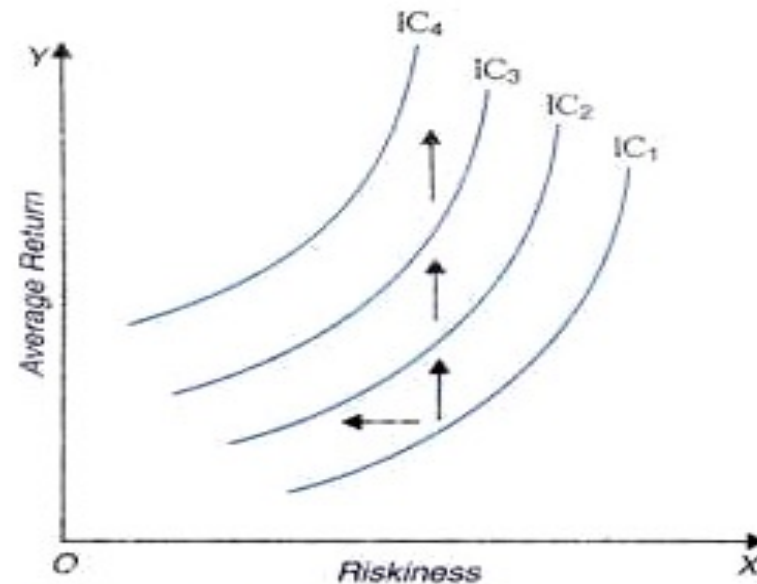


- **Perfect complements**-Perfect complements are goods that are always consumed together in **fixed proportions**. In some sense the goods “complement” each other. A nice example is that of right shoes and left shoes. The consumer likes shoes, but always wears right and left shoes together. **IC’s are L- shaped.**



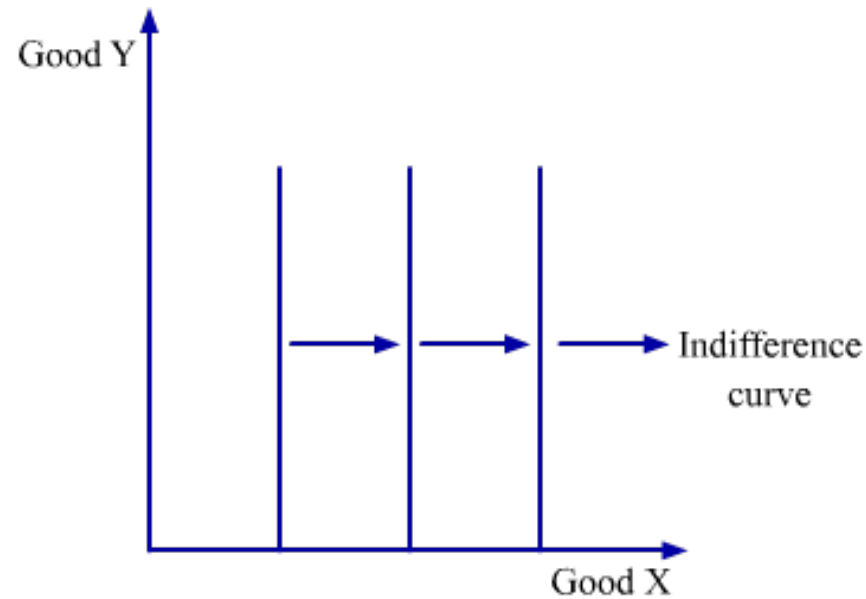
# IC in case of 'Bads'

- A bad is a commodity that the consumer doesn't like. Indifference curves in this case slope up and to the right. Consumption preference is towards lesser risk and more average return.



# IC in the case of neutral good

- A good is a neutral good if the consumer doesn't care about it one way or the other. In this case, his indifference curves will be vertical lines.





# Well behaved preferences

- These are general assumptions that we will typically make about preferences. These assumptions are not the only possible ones; in some situations you might want to use different assumptions. But we will take them as the defining features for **well-behaved indifference curves**.
- First we will typically assume that **more is better**, that is, that we are talking about *goods*, not bads. More precisely, if  $(x_1, x_2)$  is a bundle of goods and  $(y_1, y_2)$  is a bundle of goods with at least as much of both goods and more of one, then  $(y_1, y_2) \succ (x_1, x_2)$ . This assumption is called **monotonicity** of preferences.

- What does monotonicity imply about the shape of indifference curves? It implies that they have a *negative* slope.
- Second, we are going to assume that averages are preferred to extremes. That is, if we take two bundles of goods  $(x_1, x_2)$  and  $(y_1, y_2)$  on the same indifference curve and then take an **average bundle**, it **will be at least as good as or strictly preferred to each of the two extreme bundles**.
- This weighted-average bundle has the average amount of good 1 and the average amount of good 2 that is present in the two bundles. It therefore lies halfway along the straight line connecting the  $x$ -bundle and the  $y$ -bundle.

- What does this assumption about preferences mean geometrically? It means that **the set of bundles weakly preferred to  $(x_1, x_2)$  is a convex set**. For suppose that  $(y_1, y_2)$  and  $(x_1, x_2)$  are indifferent bundles. Then, if averages are preferred to extremes, all of the weighted averages of  $(x_1, x_2)$  and  $(y_1, y_2)$  are weakly preferred to  $(x_1, x_2)$  and  $(y_1, y_2)$ . A convex set has the property that if you take *any* two points in the set and draw the line segment connecting those two points, that line segment lies entirely in the set.

# Marginal Rate of Substitution

- MRS measures the rate at which the consumer is just willing to substitute one good for the other.
- We've already seen that monotonic preferences imply that indifference curves must have a negative slope. Since the MRS is the numerical measure of the slope of an indifference curve, it will naturally be a negative number.

- Any time the exchange line *crosses* the indifference curve, there will be some points on that line that are preferred to  $(x_1, x_2)$ —that lie above the indifference curve. Thus, if there is to be no movement from  $x_1, x_2$ , the exchange line must be tangent to the indifference curve. That is, the slope of the exchange line,  $-E$ , must be the slope of the indifference curve at  $(x_1, x_2)$ .
- At any other rate of exchange, the exchange line would cut the indifference curve and thus allow the consumer to move to a more preferred point.
- Thus the slope of the indifference curve, the marginal rate of substitution, measures the rate at which the consumer is just on the margin of trading or not trading. At any rate of exchange other than the MRS, the consumer would want to trade one good for the other. But **if the rate of exchange equals the MRS, the consumer wants to stay put.**

# Other interpretations of the MRS

- If good 2 represents the consumption of “all other goods,” and it is measured in dollars that you can spend on other goods, then **MRS can be interpreted as the marginal willingness- to-pay**. The marginal rate of substitution of good 2 for good 1 is how many dollars you would just be willing to give up spending on other goods in order to consume a little bit more of good 1.
- Thus the MRS measures the marginal willingness to give up dollars in order to consume a small amount more of good 1. But **giving up those dollars is just like paying dollars** in order to consume a little more of good 1.

# Marginal Utility and MRS

- Consider a change in the consumption of each good,  $(\Delta x_1, \Delta x_2)$ , that keeps utility constant—that is, a change in consumption that moves us along the indifference curve. Then we must have

$$MU_1 \Delta x_1 + MU_2 \Delta x_2 = \Delta U = 0.$$

- Solving for the slope of the indifference curve we have

$$MRS = \frac{\Delta x_2}{\Delta x_1} = -\frac{MU_1}{MU_2}$$

OPTIMAL CHOICE

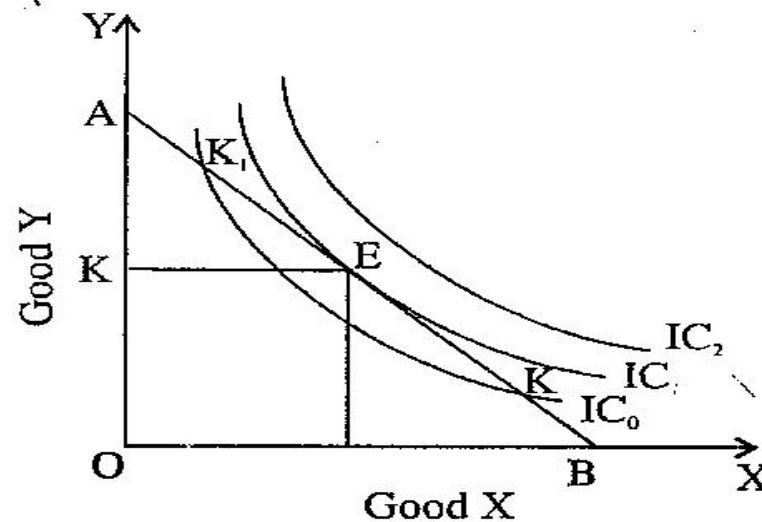


# Introduction

- We will put together the budget set and the theory of preferences in order to examine the optimal choice of consumers. We said earlier that the economic model of consumer choice is that people choose the best bundle they can afford.
- We can now say that consumers choose the most preferred bundle from their budget sets.

# Optimal choice

- Simply start at the right-hand corner of the budget line and move to the left. As we move along the budget line we note that we are moving to higher and higher indifference curves. We stop when we get to the highest indifference curve that just touches the budget line.



- At this choice, **the indifference curve is *tangent* to the budget line**. If you think about it a moment you'll see that this has to be the case: if the indifference curve weren't tangent, it would cross the budget line, and if it crossed the budget line, there would be some nearby point on the budget line that lies above the indifference curve—which means that we couldn't have started at an optimal bundle.
- Thus, the consumer chooses consumption of the two goods so that the marginal rate of substitution equals the relative price.
- The relative price is the rate at which the *market* is willing to trade one good for the other, whereas the marginal rate of substitution is the rate at which the *consumer* is willing to trade one good for the other. At the consumer's optimum, the consumer's valuation of the two goods (as measured by the marginal rate of substitution) equals the market's valuation (as measured by the relative price).

# How changes in income affect consumer choice?

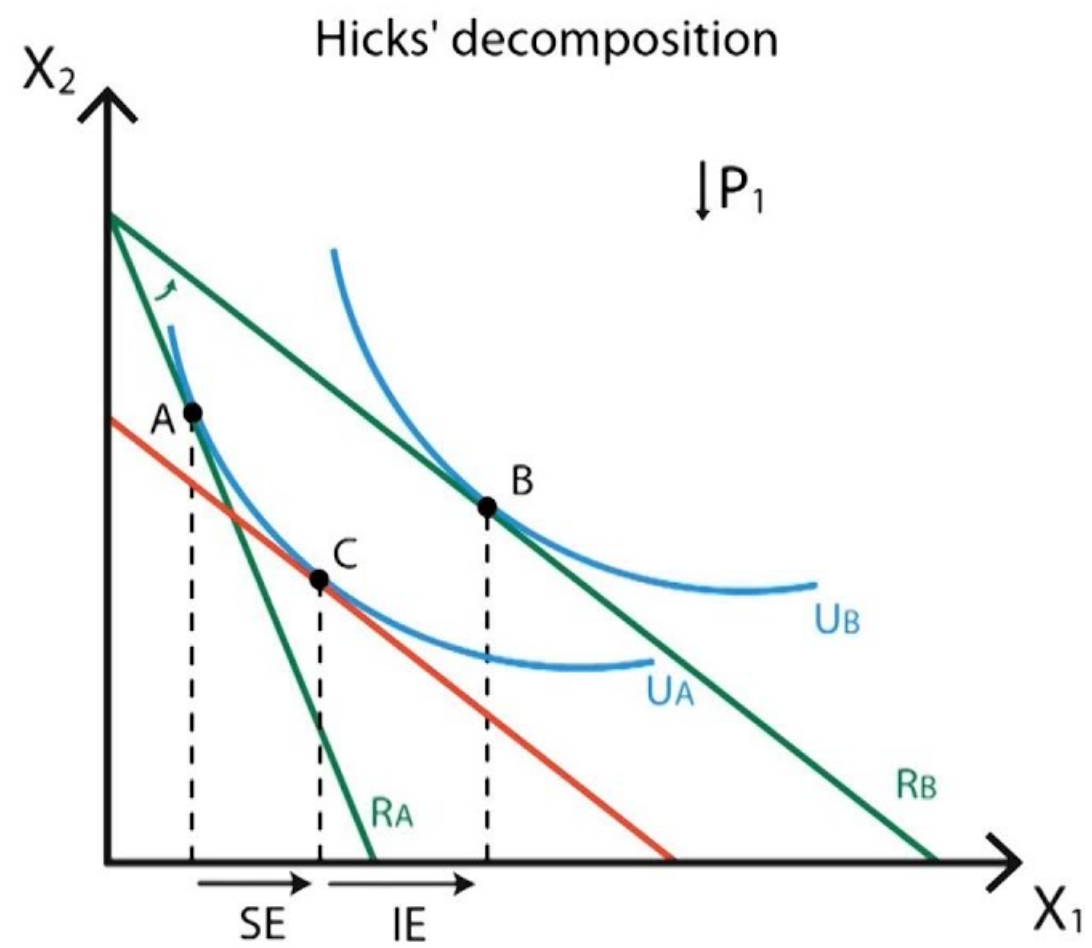
- Suppose that income increases. With higher income, the consumer can afford more of both goods. The increase in income leads to a parallel shift of the budget constraint outward.
- The expanded budget constraint allows the consumer to choose a better combination of both goods (if both goods are normal goods), one that is on a higher indifference curve.
- If a consumer buys less of a good when his income rises, economists call it an **inferior good**.

# How changes in prices affect consumer choices?

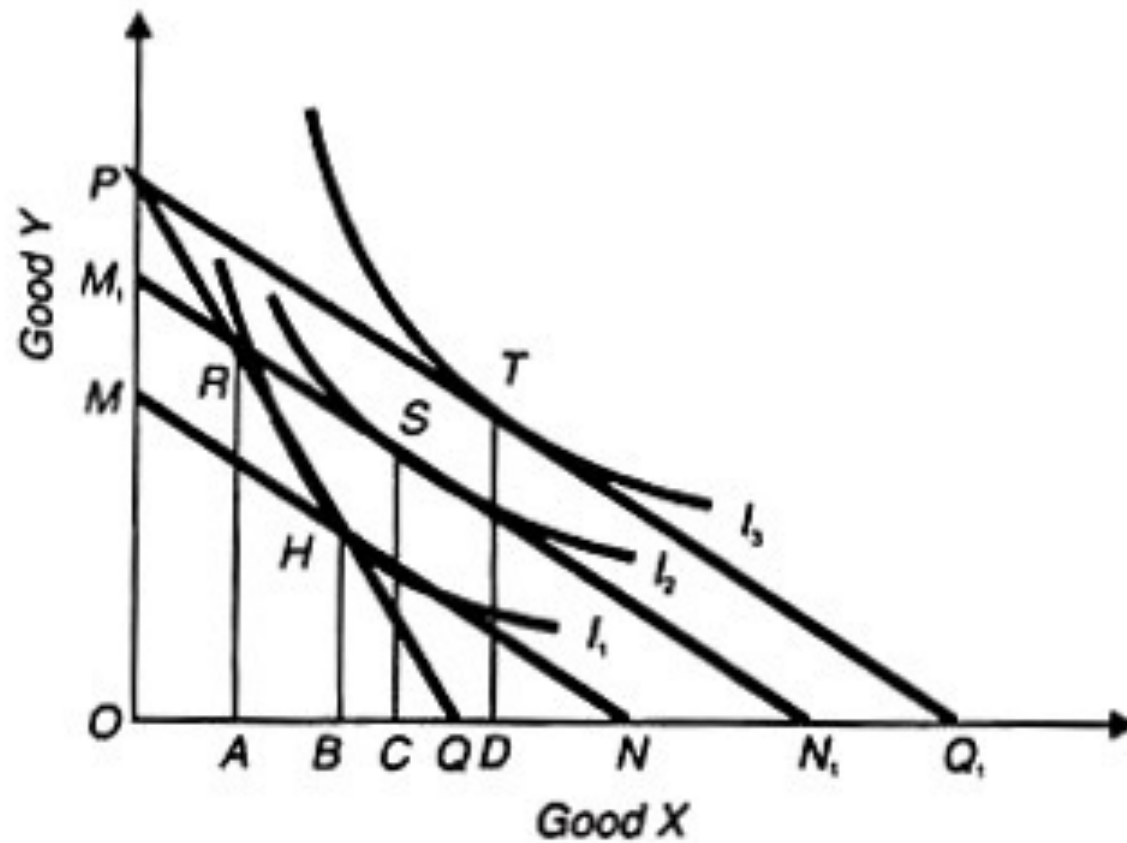
- The lower price expands the consumer's set of buying opportunities. In other words, a fall in the price of any good shifts the budget constraint outward.
- The decrease in the price of a good makes the consumer better off. If both goods are normal goods, the consumer will want to spread this improvement in his purchasing power over both goods. This **income effect tends to make the consumer buy more of both goods.**
- Yet at the same time, consumption of the particular good has become less expensive relative to consumption of the other good. This **substitution effect tends to make the consumer choose less of the other good** and more of the good whose price has fallen.

# Income and Substitution Effects

- Thus, the impact of a change in the price of a good on consumption can be decomposed into two effects: an **income effect** and a **substitution effect**.
- We can interpret the income and substitution effects using indifference curves. The income effect (IE) is the change in consumption that results from the movement to a higher indifference curve. The substitution effect (SE) is the change in consumption that results from being at a point on the same indifference curve with a different marginal rate of substitution.



# Slutsky Decomposition





- PQ is the original budget line where R is the point of equilibrium on indifference curve  $I_1$ , at which OA of X and RA of Y are bought by the consumer. Now with the fall in the price of X, the budget line extends to  $PQ_1$  and the consumer moves to point T on the higher indifference curve  $I_3$ . The movement from R to T is the price effect which shows that the consumer buys AD more of X, as a result of the fall in its price.
- In terms of the Slutsky method, a new budget line  $M_1 N_1$  is drawn parallel to  $PQ_1$  in such a way that the apparent real income of the consumer remains the same even after the fall in the price of X. If  **$M_1 N_1$  passes through point R, the consumer has the same money income** to buy combination R as he was buying at the old budget line PQ.
- But in reality the consumer prefers the combination S to combination R on the budget line  $M_1 N_1$ , because point S lies on the budget line which is tangent to a higher indifference curve  $I_2$  than point R which lies on a lower indifference curve  $I_1$ . The movement from R to S is the Slutsky substitution effect.
- As a result, the consumer buys AC more of X and the movement from S to T or CD of X is the income effect.

- The **Hicksian substitution effect is smaller than the Slutsky substitution effect** by BC quantity of X. On the other hand, the Hicksian income effect BD is greater than the Slutsky income effect CD.
- The Slutsky theorem is a good approximation to keep real income constant and is superior to Hicks' method. In the Slutsky method, **income can be calculated equal to cost-difference directly by studying market phenomena and behaviour**, whereas the Hicksian compensating variation in income is difficult to estimate.
- The **Slutsky substitution effect provides the consumer greater satisfaction by bringing him on a higher indifference curve**, while the Hicksian substitution effect puts him on the initial level of satisfaction on the original indifference curve.

# Deriving the demand curve from ICs

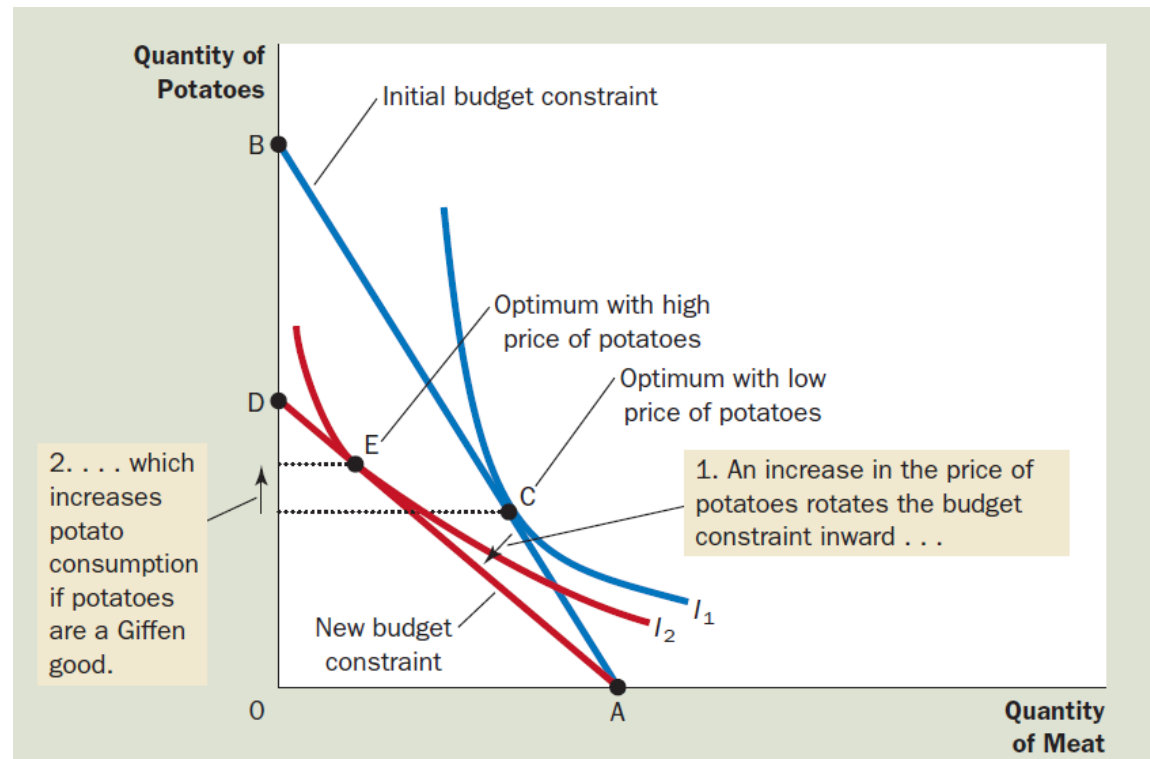
- Changes in the price of a good alter the consumer's budget constraint and, therefore, the quantities of the two goods that he chooses to buy. The demand curve for any good reflects these consumption decisions.
- A demand curve shows the quantity demanded of a good for any given price. We can view a consumer's demand curve as a summary of the optimal decisions that arise from his budget constraint and indifference curves.

# Price effect in case of inferior goods

- If X is an inferior good, the income effect of a fall in the price of X will be positive because as the real income of the consumer increases, less quantity of X will be demanded. This is so because price and quantity demanded move in the same direction.
- On the other hand, the negative substitution effect will increase the quantity demanded of X. The negative substitution effect is stronger than the positive income effect in the case of inferior goods so that the total price effect is negative.

# Price effect in case of Giffen good

- Economists use the term Giffen good to describe a good that violates the law of demand. **Giffen goods are inferior goods for which income effect dominates the substitution effect.** Therefore they have demand curves that slope upward.



- When the price of potatoes rises, the consumer is poorer. The income effect makes the consumer want to buy less meat and more potatoes. At the same time, because the potatoes have become more expensive relative to meat, the substitution effect makes the consumer want to buy more meat and less potatoes. However, the income effect is so strong that it exceeds the substitution effect. In the end, the consumer responds to the higher price of potatoes by buying less meat and more potatoes.
- Some historians suggest that potatoes were a Giffen good during the Irish potato famine of the 19th century. Potatoes were such a large part of people's diet that when the price of potatoes rose, it had a large income effect. People responded to their reduced living standard by cutting back on the luxury of meat and buying more of the staple food of potatoes.

# Costs of Production

# Introduction

- We used the supply curve to summarize firms' production decisions. According to the law of supply, firms are willing to produce and sell a greater quantity of a good when the price of the good is higher, and this response leads to a supply curve that slopes upward. Now we examine firm behavior in more detail which will give you a better understanding of the decisions behind the supply curve.
- It will also introduce you to a part of economics called *industrial organization*—the study of how firms' decisions about prices and quantities depend on the market conditions they face.



# Total revenue and profit

- Economists normally assume that the goal of a firm is to maximize profit.
- The amount that the firm receives for the sale of its output is called its **total revenue**. The amount that the firm pays to buy inputs is called its **total cost**. Profit is a firm's total revenue minus its total cost:

$$\text{Profit} = \text{Total revenue} - \text{Total cost}$$

# Costs as opportunity costs

- When economists speak of a firm's cost of production, **they include all the opportunity costs** of making its output of goods and services. The opportunity cost of an item refers to all those things that must be forgone to acquire that item.
- The costs of inputs, wages etc require the firm to pay out some money. Hence they are called as explicit costs. By contrast, some of a firm's opportunity costs, called **implicit costs**, do not require a cash outlay. Imagine if a proprietor of a firm could have made certain income by working elsewhere. This foregone income would be part of his implicit costs. Both are part of the firms total costs.

- The distinction between explicit and implicit costs highlights an important difference between how economists and accountants analyze a business. Economists are interested in studying how firms make production and pricing decisions. Because these decisions are based on both explicit and implicit costs, **economists include both when measuring a firm's costs.**
- By contrast, accountants have the job of keeping track of the money that flows into and out of firms. As a result, they measure the explicit costs but usually ignore the implicit costs.

# Economic profit vs accounting profit

- Because economists and accountants measure costs differently, they also measure profit differently. An economist measures a firm's **economic profit** as the firm's total revenue minus all the opportunity costs (explicit and implicit) of producing the goods and services sold.
- An accountant measures the firm's **accounting profit** as the firm's total revenue minus only the firm's explicit costs.
- Because the accountant ignores the implicit costs, **accounting profit is usually larger than economic profit**. For a business to be profitable from an economist's standpoint, total revenue must cover all the opportunity costs, both explicit and implicit.

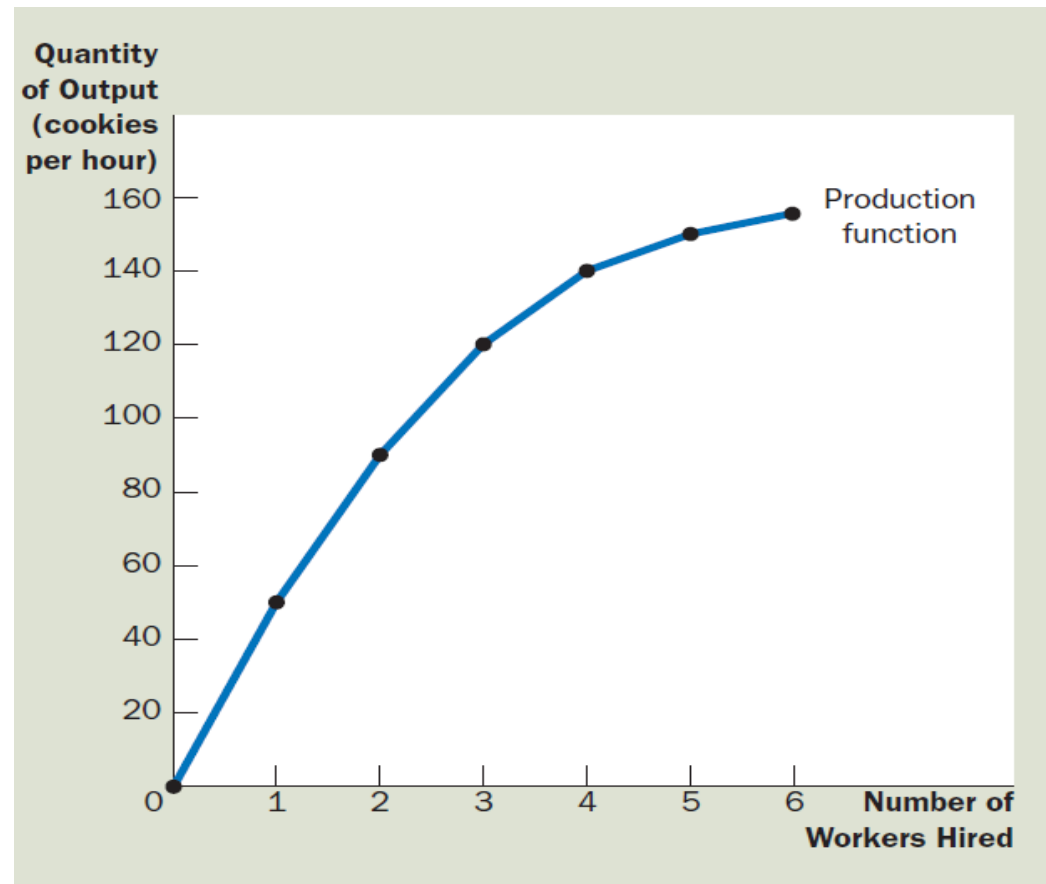
- A firm making positive economic profit will stay in business. It is covering all its opportunity costs and has some revenue left to reward the firm owners. When a firm is making economic losses (that is, when economic profits are negative), the business owners are failing to earn enough revenue to cover all the costs of production. Unless conditions change, the firm owners will eventually close down the business and exit the industry.

# The Production Function

- The relationship between the quantity of inputs and quantity of output is called the **production function**.

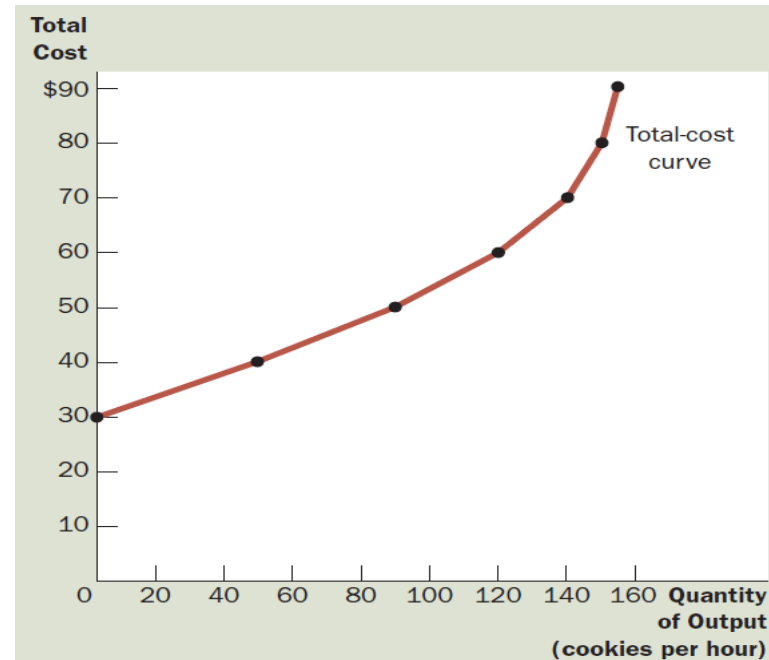
Number of Workers	Output (quantity of cookies produced per hour)	Marginal Product of Labor	Cost of Factory	Cost of Workers	Total Cost of Inputs (cost of factory + cost of workers)
0	0		\$30	\$0	\$30
1	50	50	30	10	40
2	90	40	30	20	50
3	120	30	30	30	60
4	140	20	30	40	70
5	150	10	30	50	80
6	155	5	30	60	90

- The production function shows the relationship between the number of workers hired and the quantity of output produced. The production function gets flatter as the number of workers increases, which reflects diminishing marginal product.



# Total cost curve

- The total cost curve shows the relationship between quantity of output produced and the total cost of production. The total cost curve gets steeper as the quantity of output increases because of diminishing marginal product.





# The Various Measures of Cost

- Some costs, called **fixed costs**, do not vary with the quantity of output produced. They are incurred even if the firm produces nothing at all. For instance, the rent for a factory.
- Some of the firm's costs, called **variable costs**, change as the firm alters the quantity of output produced. A firm's total cost is the sum of fixed and variable costs.
- Total cost divided by the quantity of output is called **average total cost**. Because total cost is the sum of fixed and variable costs, average total cost can be expressed as the sum of average fixed cost and average variable cost. **Average fixed cost** is the fixed cost divided by the quantity of output, and **average variable cost** is the variable cost divided by the quantity of output.

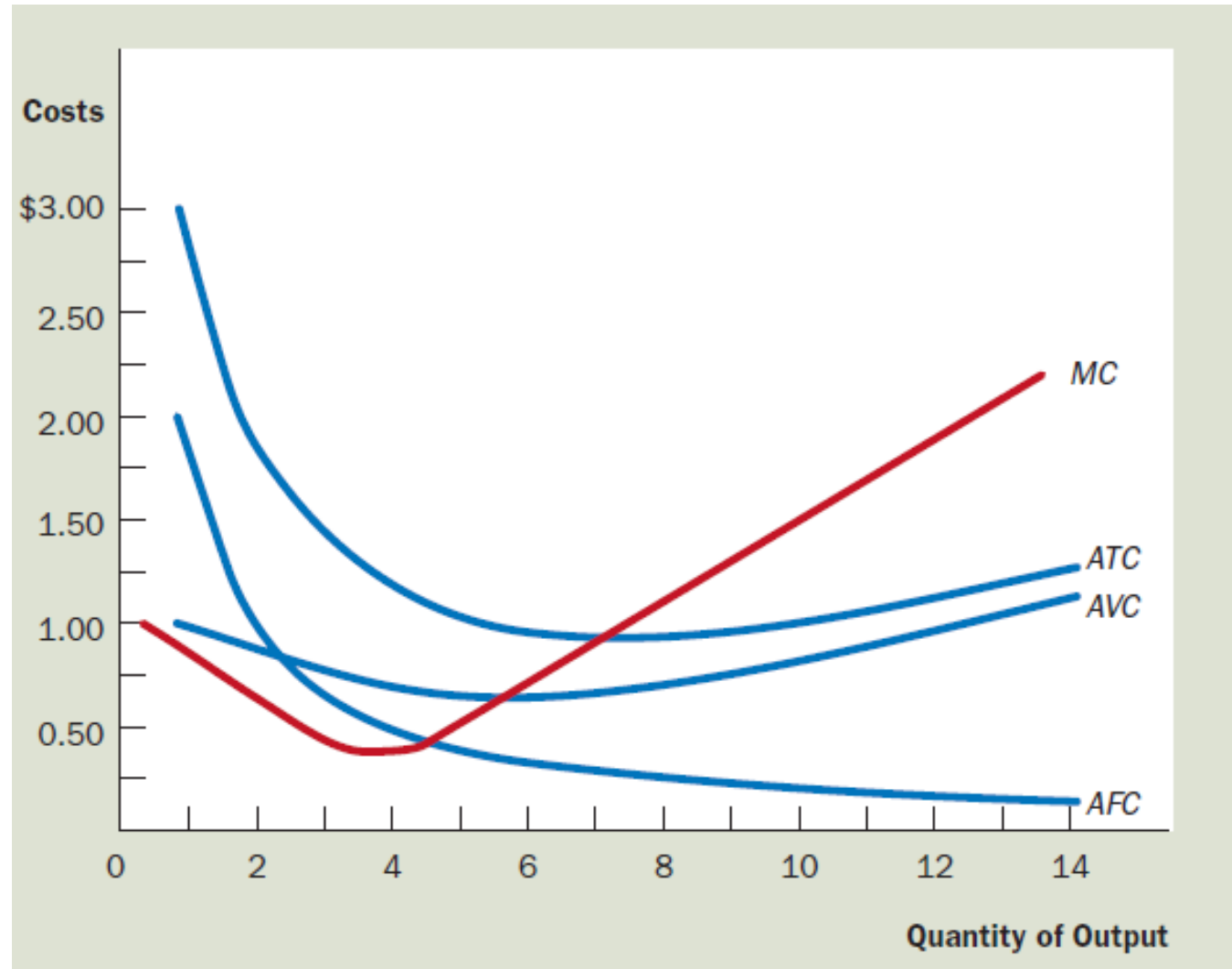
- The amount that total cost rises when the firm increases production by 1 unit of output is called the **marginal cost**.
- Average total cost tells us the cost of a typical unit of output if total cost is divided evenly over all the units produced. Marginal cost tells us the increase in total cost that arises from producing an additional unit of output.

Quantity of Coffee (cups per hour)	Total Cost	Fixed Cost	Variable Cost	Average Fixed Cost	Average Variable Cost	Average Total Cost	Marginal Cost
0	\$ 3.00	\$3.00	\$ 0.00	—	—	—	
1	3.30	3.00	0.30	\$3.00	\$0.30	\$3.30	\$0.30
2	3.80	3.00	0.80	1.50	0.40	1.90	0.50
3	4.50	3.00	1.50	1.00	0.50	1.50	0.70
4	5.40	3.00	2.40	0.75	0.60	1.35	0.90
5	6.50	3.00	3.50	0.60	0.70	1.30	1.10
6	7.80	3.00	4.80	0.50	0.80	1.30	1.30
7	9.30	3.00	6.30	0.43	0.90	1.33	1.50
8	11.00	3.00	8.00	0.38	1.00	1.38	1.70
9	12.90	3.00	9.90	0.33	1.10	1.43	1.90
10	15.00	3.00	12.00	0.30	1.20	1.50	2.10

# Cost curves and their shapes

- Many firms experience increasing marginal product before diminishing marginal product. Therefore **marginal cost and average variable cost fall for a while before beginning to rise**. At low levels of output, idle resources mean that marginal product of extra labour is large and marginal cost low. At higher levels, this is reversed.
- Average total cost is the sum of average fixed cost and average variable cost. Average fixed cost always declines as output rises because the fixed cost is spread over a larger number of units.
- When the firm produces large quantity of output, however, the increase in average variable cost becomes the dominant force, and average total cost starts rising. The tug of war between average fixed cost and average variable cost generates the U-shape in average total cost.

- The bottom of the U-shape occurs at the quantity that minimizes average total cost. This quantity is sometimes called the **efficient scale** of the firm.

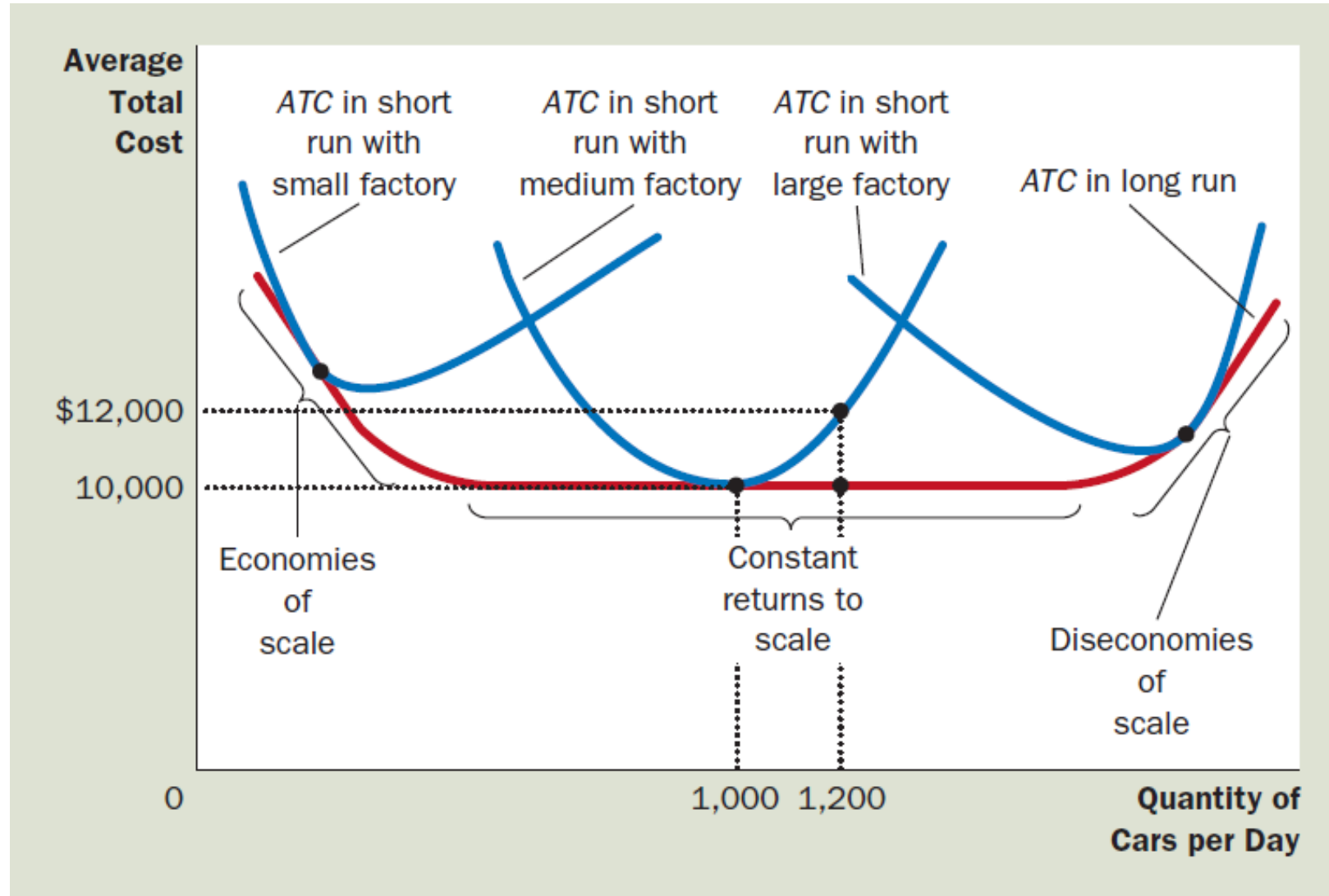


# Relationship between Marginal cost and Average Total Cost

- Whenever marginal cost is less than average total cost, average total cost is falling. Whenever marginal cost is greater than average total cost, average total cost is rising.
- This relationship between average total cost and marginal cost has an important corollary: **The marginal-cost curve crosses the average-total-cost curve at its minimum.**
- At low levels of output, marginal cost is below average total cost, so average total cost is falling. But after the two curves cross, marginal cost rises above average total cost which must start to rise at this level of output. Hence, this point of intersection is the minimum of average total cost.

# Short run and Long run Average Costs

- Because **many decisions are fixed in the short run** but variable in the long run, a firm's long-run cost curves differ from its short-run cost curves.
- As the firm moves along the long-run curve, it is adjusting the size of the factory to the quantity of production.
- The long-run average-total cost curve is a much flatter U-shape than the short-run average total cost curve. In addition, all the short-run curves lie on or above the long-run. These properties arise because firms have greater flexibility in the long run.
- In essence, in the long run, the firm gets to choose which short-run curve it wants to use. But in the short run, it has to use whatever short-run curve it has chosen in the past.



# Economies and Diseconomies of Scale

- The shape of the long-run average-total-cost curve conveys important information about the production processes that a firm has available for manufacturing a good. In particular, it tells us how costs vary with the scale—that is, the size—of a firm's operations.
- When long-run average total cost declines as output increases, there are said to be **economies of scale**. When long-run average total cost rises as output increases, there are said to be **diseconomies of scale**. When long-run average total cost does not vary with the level of output, there are said to be **constant returns to scale**.



- Economies of scale often arise because **higher production levels allow specialization** among workers, which permits each worker to become better at a specific task. For instance, if Ford hires a large number of workers and produces a large number of cars, it can reduce costs with modern assembly-line production.
- Diseconomies of scale can arise because of **coordination problems** that are inherent in any large organization. The more cars Ford produces, the more stretched the management team becomes, and the less effective the managers become at keeping costs down.
- Thus, long-run average total cost is falling at low levels of production because of increasing specialization and rising at high levels of production because of increasing coordination problems.

# Competitive Markets

# Introduction

- Difference in market structure shapes the pricing and production decisions of the firms that operate in these markets.
- A market is competitive if each buyer and seller is small compared to the size of the market and, therefore, has little ability to influence market prices. By contrast, if a firm can influence the market price of the good it sells, it is said to have *market power*.
- A market supply curve is tightly linked to firms' costs of production.

# Meaning of competition

- **A competitive market**, sometimes called a *perfectly competitive market*, has two characteristics:
  - There are many buyers and many sellers in the market.
  - The goods offered by the various sellers are largely the same.
  - Firms can freely enter or exit the market.
- As a result of first two characteristics, the actions of any single buyer or seller in the market have a negligible impact on the market price. Each buyer and seller takes the market price as given (**price takers**)

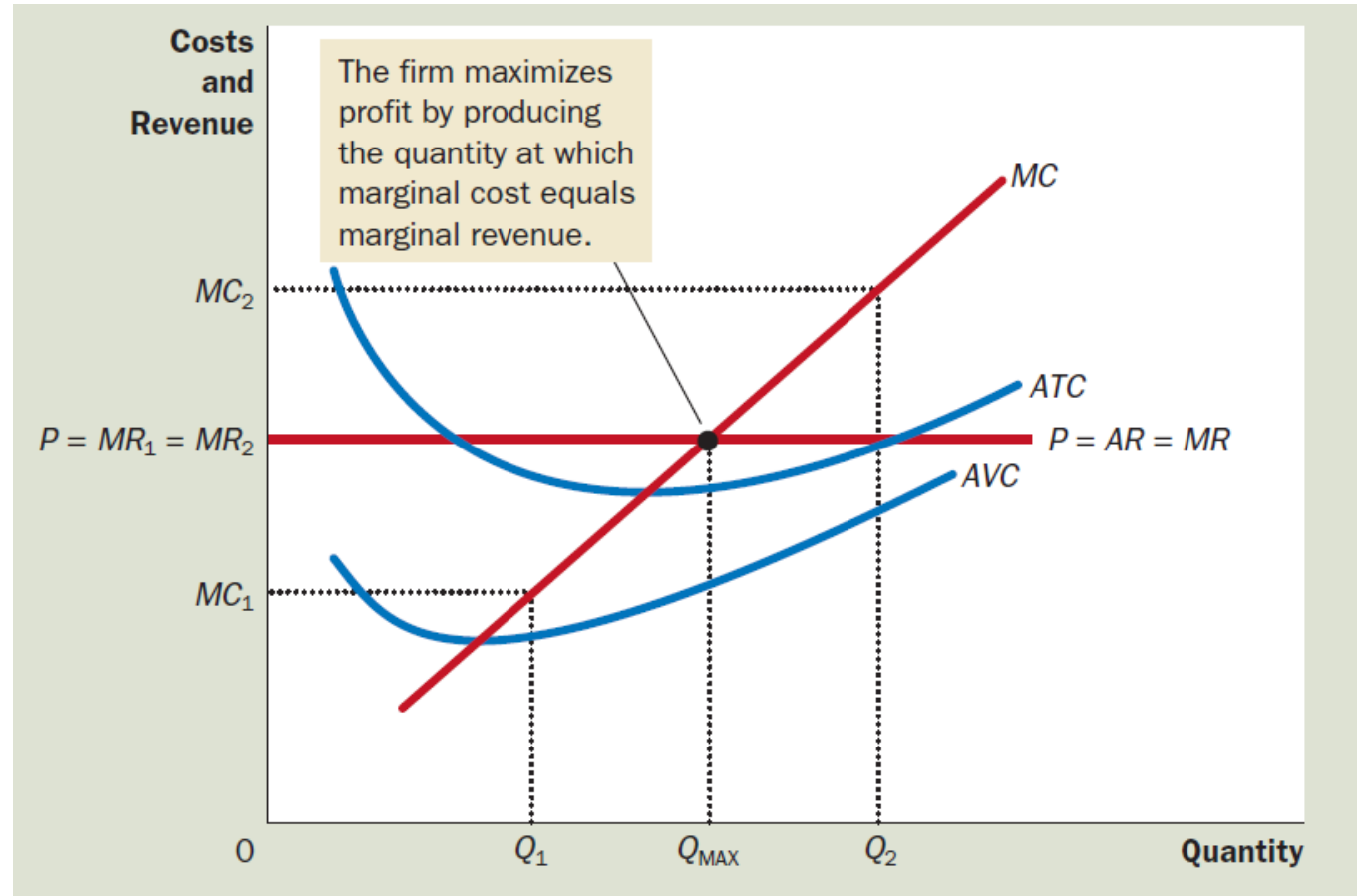
# Revenue of a Competitive Firm

- Total revenue is proportional to the amount of output since prices are given.
- Average revenue is total revenue ( $P \times Q$ ) divided by the quantity ( $Q$ ). Therefore, **for all firms, average revenue equals the price of the good.**
- Total revenue is  $P \times Q$ , and  $P$  is fixed for a competitive firm. Therefore, when  $Q$  rises by 1 unit, total revenue rises by  $P$  rupees. **For competitive firms, marginal revenue equals the price of the good.**

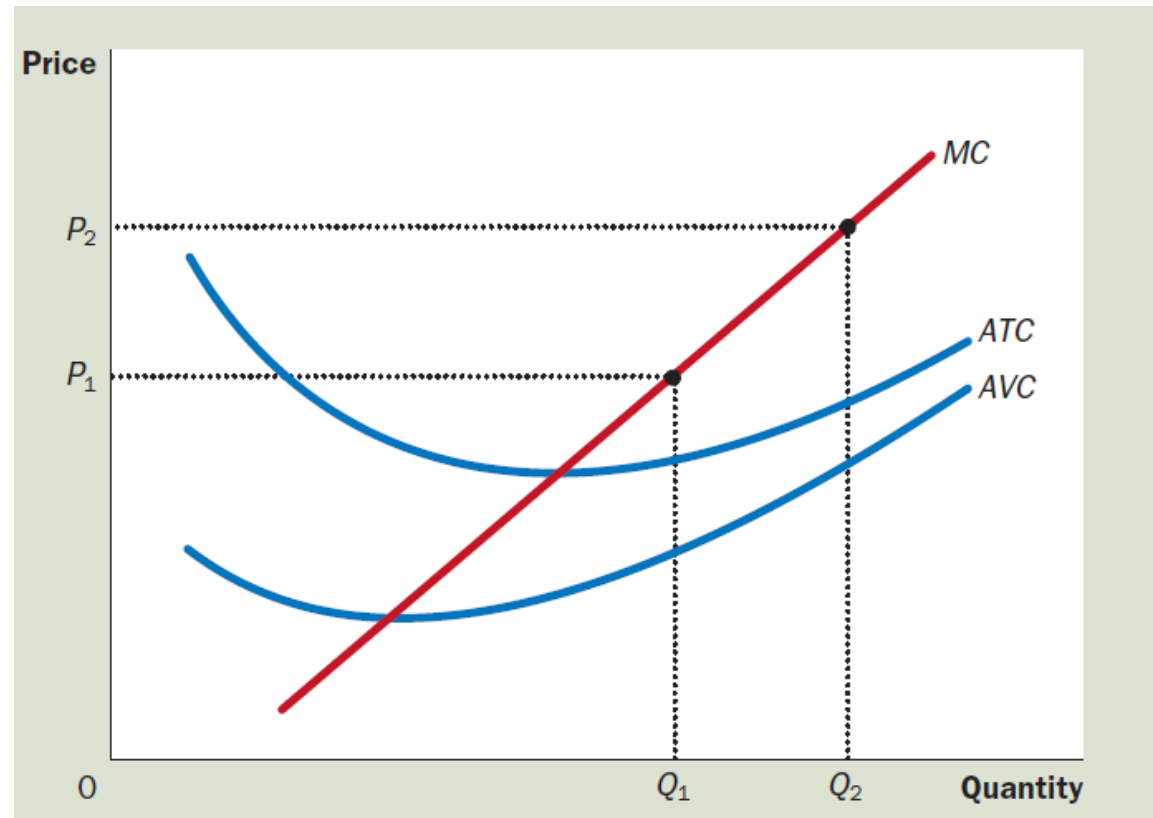
# Profit maximization

- The goal of a competitive firm is to maximize profit.
- If marginal revenue is greater than marginal cost—production should be increased because it will put more money in their pockets than it takes out. If it is lesser, production should be decreased as costs saved would exceed the additional revenue lost .
- The firm is at its profit maximizing quantity when marginal revenue equals marginal cost.
- The price line facing the firm is horizontal since it is a price taker. The price of the firm's output is the same regardless of the quantity it decides to produce.

# Profit maximizing output



- An increase in the price from  $P_1$  to  $P_2$  leads to an increase in the firm's profit maximizing quantity from  $Q_1$  to  $Q_2$ . Because the **marginal cost curve** shows the quantity supplied by the firm at any given price, it is **also the competitive firm's supply curve**.





# Shutdown in the short run

- In certain circumstances, however, the firm will decide to shut down and not produce anything at all. Here we should distinguish between a temporary shutdown of a firm and the permanent exit of a firm from the market.
- A **shutdown refers to a short-run decision** not to produce anything during a specific period of time because of current market conditions. **Exit** refers to a long-run decision to leave the market.
- The short-run and long-run decisions differ because **most firms cannot avoid their fixed costs in the short run but can do so in the long run**. That is, a firm that shuts down temporarily still has to pay its fixed costs, whereas a firm that exits the market does not have to pay any costs at all, fixed or variable.

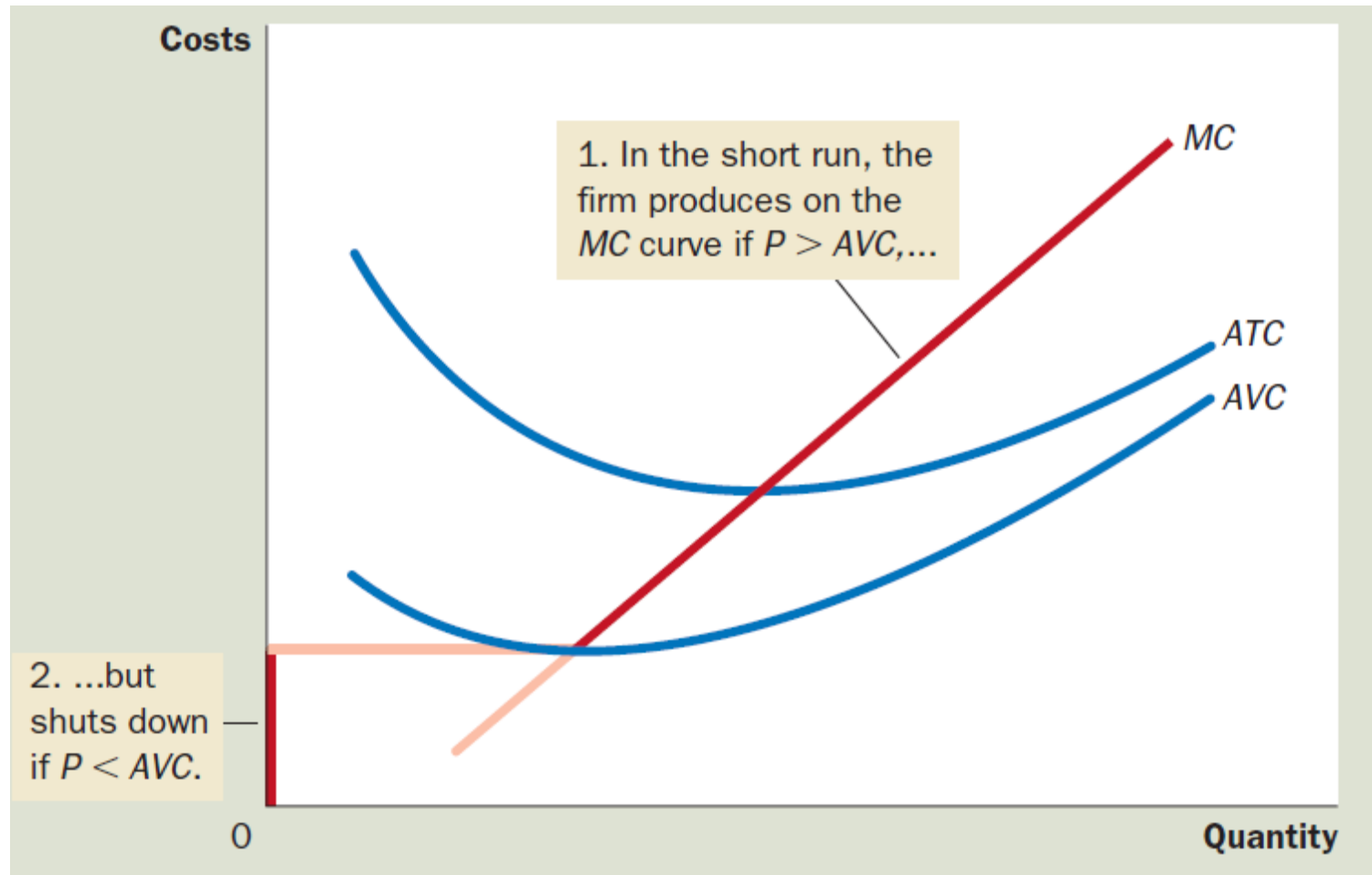
- If a farmer decides not to produce any crops one season, the land lies fallow, and he cannot recover this cost. When making the short-run decision whether to shut down for a season, the fixed cost of land is said to be a *sunk cost*. By contrast, if the farmer decides to leave farming altogether, he can sell the land. When making the long-run decision whether to exit the market, the cost of land is not sunk.
- If the firm shuts down, it loses all revenue from the sale of its product. At the same time, it saves the variable costs of making its product (but must still pay the fixed costs).
- Thus, **the firm shuts down if the revenue that it would get from producing is less than its variable costs of production.**

- The firm shuts down if total revenue is less than variable cost. By dividing both sides of this inequality by the quantity  $Q$ , we get

**Shut down if  $P < AVC$**

- That is, a firm chooses to shut down if the price of the good is less than the average variable cost of production. When choosing to produce, the firm compares the price it receives for the typical unit to the average variable cost that it must incur to produce the typical unit. If the price doesn't cover the average variable cost, the firm is better off stopping production altogether.
- The firm will be losing money (since it still has to pay fixed costs), but it would lose even more money staying open. The firm can reopen in the future if conditions change so that price exceeds average variable cost.

- The competitive firm's short-run supply curve is the portion of its marginal-cost curve that lies above average variable cost.



# Long run decision to enter/exit a market

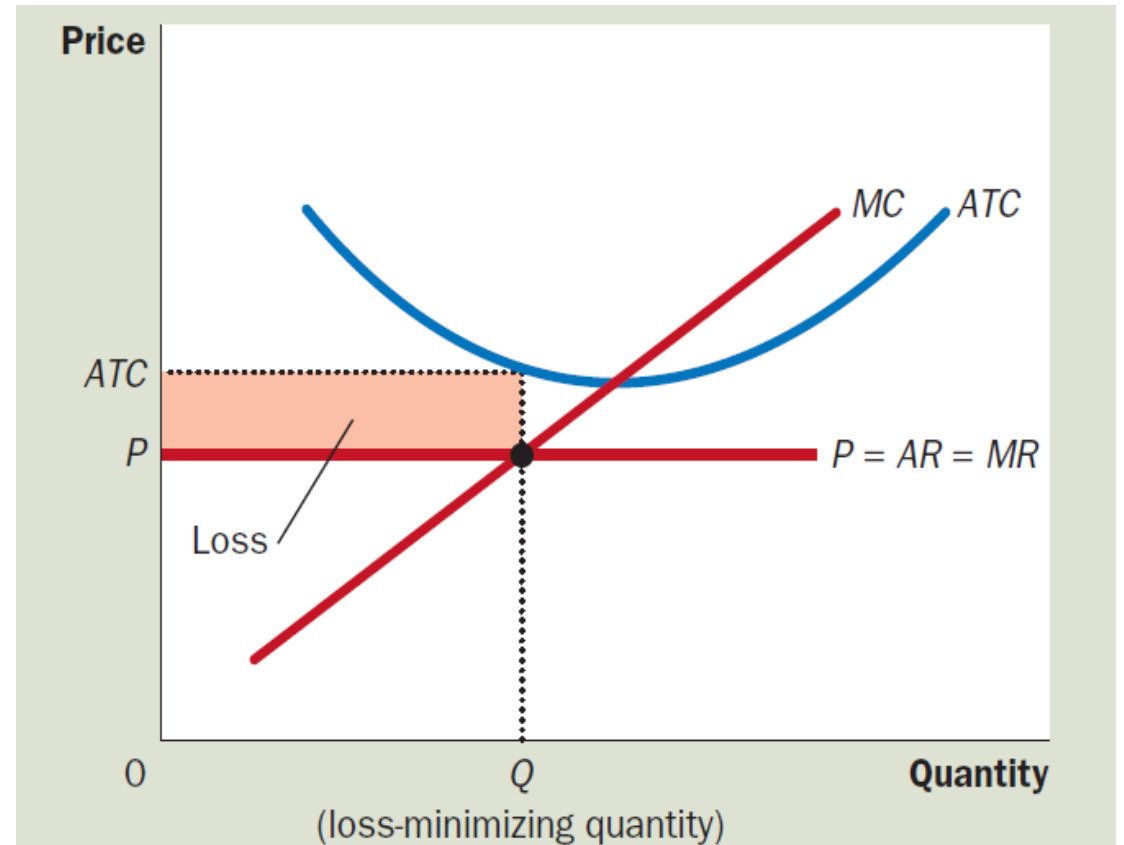
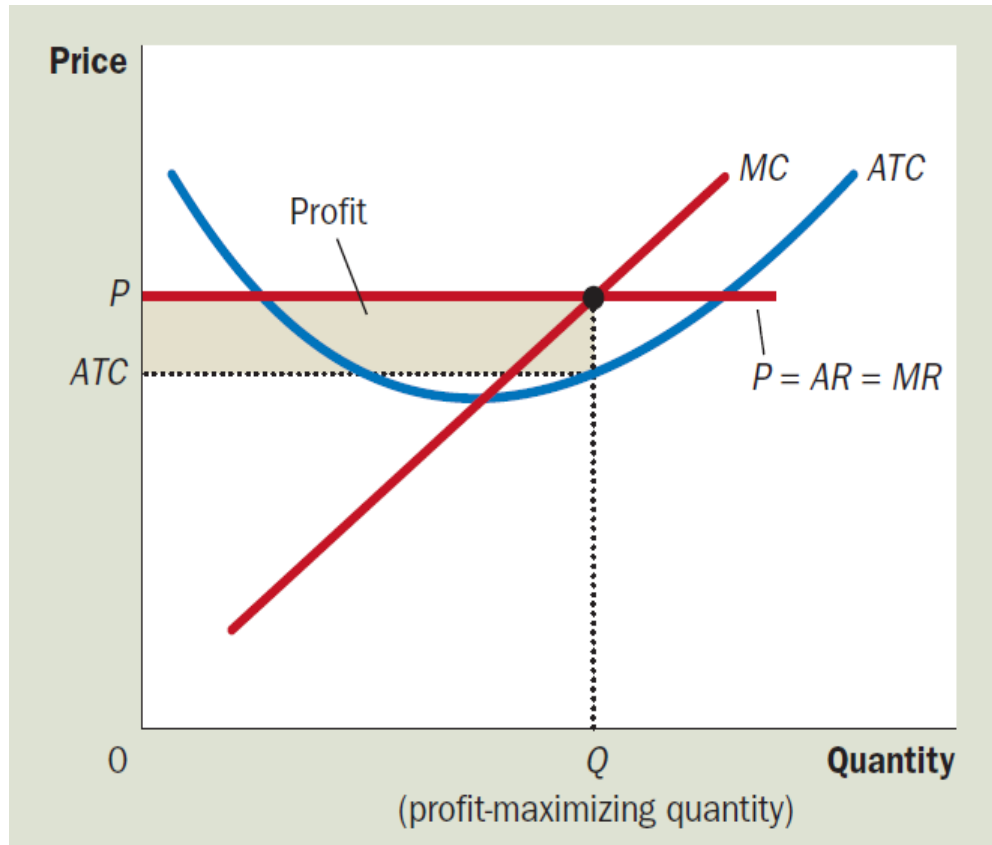
- A firm's long-run decision to exit a market is similar to its shutdown decision. If the firm exits, it will again lose all revenue from the sale of its product, but now it will save not only its variable costs of production but also its fixed costs. Thus, **the firm exits the market if the revenue it would get from producing is less than its total costs.** By dividing both sides of this inequality by the quantity  $Q$ , we get

**Exit if  $P < ATC$**

- That is, a firm chooses to exit if the price of its good is less than the average total cost of production.

- A parallel analysis applies to an entrepreneur who is considering starting a firm. The firm will enter the market if such an action would be profitable, which occurs if the price of the good exceeds the average total cost of production.
- **The competitive firm's long-run supply curve is the portion of its marginal-cost curve that lies above average total cost.**

# Measuring profit/loss in graphs



# Market Supply in the Long Run

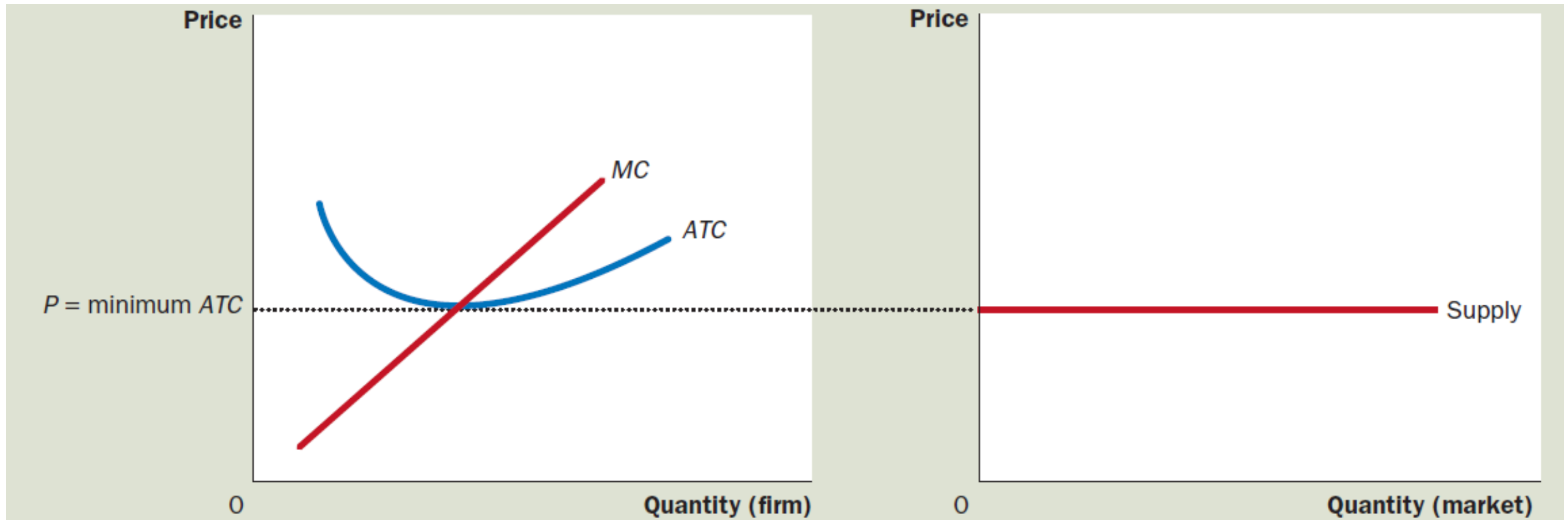
- Consider what happens if firms are able to enter or exit the market. Let's suppose that everyone has access to the same technology for producing the good and access to the same markets to buy the inputs into production. Therefore, all firms and all potential firms have the same cost curves.
- If firms already in the market are profitable, then new firms will have an incentive to enter the market. This entry will expand the number of firms, increase the quantity of the good supplied, and drive down prices and profits. Conversely, if firms in the market are making losses, then some existing firms will exit the market. Their exit will reduce the number of firms, decrease the quantity of the good supplied, and drive up prices and profits.



- **At the end of this process of entry and exit, firms that remain in the market must be making zero economic profit.** The process of entry and exit ends only when price and average total cost are driven to equality.
- We noted that competitive firms maximize profits by choosing a quantity at which price equals marginal cost. We just noted that free entry and exit force price to equal average total cost. But if price is to equal both marginal cost and average total cost, these two measures of cost must equal each other. Marginal cost and average total cost are equal, however, only when the firm is operating at the minimum of average total cost.
- **Therefore, in the long-run equilibrium of a competitive market with free entry and exit, firms must be operating at their efficient scale.**

- Now we can determine the long-run supply curve for the market. In a market with free entry and exit, there is only one price consistent with zero profit—the minimum of average total cost. As a result, **the long-run market supply curve must be horizontal at this price.**
- Any price above this level would generate profit, leading to entry and an increase in the total quantity supplied. Any price below this level would generate losses, leading to exit and a decrease in the total quantity supplied.

# Zero Profit Condition and Market Supply



# Zero profit?

- To understand the zero-profit condition more fully, recall that profit equals total revenue minus total cost and that total cost includes all the opportunity costs of the firm.
- In particular, total cost includes the time and money that the firm owners devote to the business. In the zero-profit equilibrium, the firm's revenue must compensate the owners for these opportunity costs.
- As a result, in the zero-profit equilibrium, **economic profit is zero, but accounting profit is positive.**

# Why long run supply curve might slope upward?

- The long-run market supply curve is horizontal at the minimum of average total cost. When the demand for the good increases, the long-run result is an increase in the number of firms and in the total quantity supplied, without any change in the price.
- There are, however, **two reasons that the long-run market supply curve might slope upward**. The **first is that some resource used in production may be available only in limited quantities**. For example, consider the market for farm products. Anyone can choose to buy land and start a farm, but the quantity of land is limited. As more people become farmers, the price of farmland is bid up, which raises the costs of all farmers in the market. Thus, an increase in demand for farm products cannot induce an increase in quantity supplied without also inducing a rise in farmers' costs, which in turn means a rise in price.

- A second reason for an upward-sloping supply curve is that **firms may have different costs**. Costs vary in part because some people work faster than others and in part because some people have better alternative uses of their time than others. For any given price, those with lower costs are more likely to enter than those with higher costs. As incentive for these new entrants with higher costs, price must rise to make entry profitable for them.
- If firms have different costs, some firms earn profit even in the long run. In this case, the price in the market reflects the average total cost of the *marginal firm*—the firm that would exit the market if the price were any lower. This firm earns zero profit, but firms with lower costs earn positive profit. Entry does not eliminate this profit because would-be entrants have higher costs than firms already in the market. **Higher-cost firms will enter only if the price rises, making the market profitable for them.**
- Thus, for these two reasons, a higher price may be necessary to induce a larger quantity supplied, in which case the long-run supply curve is upward sloping rather than horizontal. **Because firms can enter and exit more easily in the long run than in the short run, the long-run supply curve is typically more elastic than the short-run supply curve.**