Microeconomics Learning Units 1 & 2

NB- Get all the notes from microeconomics first year boy.

The word *economy* comes from a Greek word for "one who manages a household.

Definition of **Economics:** the study of how society manages its scares resources.

How do we go from managing a household to managing an economy?

- A household and an economy face many decisions:
    - Who will work?
    - What goods and many of them should be produced?
    - What resources should be used in production?
    - At what price should the goods be sold?

Society and scare resources:

> The management of society's resources is important because resources are scare.
>
> Scarcity: means that society has limited resources and therefore cannot produce all the goods and services people with to have.

Decision-making is at the heart of economics. The individual must decide how much to save for retirement, how much to spend on different good and services, how many hours a week to work. The firm must decide how much to produce, what kind of labour to hire. Society as a whole must decide how much to send on national defence versus how much to spend on consumer goods.

How people make decisions: "there is no such thing as a free lunch!" - and ALL decisions involve tradeoffs.

Society faces and important tradeoff: Efficiency vs Equality

Efficiency: when society gets the most from its scarce resources

Equality: when prosperity is distributed uniformly among society's members/

Tradeoff: to achieve greater equality cold redistribute income from wealthy to poor. But this reduces incentive to work and produce, shirks the size of the economic "pie".

"The cost of something is what you give up"

- Making decisions requires comparing the costs and benefits of alternative choicecs
- The **Opportunity cost of any item is whatever must be given up to obtain it.**
- It is the relevant cost for decision making.

Rational people

- Systematically and purposefully do the best they can to achieve their objectives.
- Make decisions by evaluating costs and benefits of marginal changes – which mean incremental adjustments to an existing plan

Incentive: something that induces a person to act i.e. to prospect of a reward or punishment.

- Rational people respond to incentive.

    - Examples: when gas prices rise, consumers buy more hybrid cars and fewer gas guzzling SUVs.
    - When cigarette taxes increase, teen smoking falls

"Trade can make everyone better off"

- Rather than being self-sufficient, people can specialize in production one good or service and exchange it for other goods.
- Countries also benefit from trade and specialization:
    - Get a better price abroad for goods they produce
    - Buy other goods more cheaply from abroad than could be produced at home

"Markets are usually a good way to organize economic activity

- Market: a group of buyers and sellers
- "organize economic activity" means determining
    - What goods to produce
    - How to produce them
    - How much of each to produce
    - Who gets them
- A market economy: allocates resources through the decentralized decisions of many households and firms as they interact in markets
- The invisible hand works through the price system:
    - The interaction of buyers and sellers determines prices.
    - Each price reflects the good's value to buyers and the cost of producing the good.
    - Prices guide self-interested households and firms to make decisions that, in many cases, maximize society's economic well-being.

"Governments can sometimes improve market outcomes"

- Important role for government: enforce property rights (with courts and police)
- People are less inclined to work, produce, invest, or purchase if large risk of their property being stolen.
- Market failure: when the market fails to allocate society's resources efficiently.
    - Causes:
        - Externalities, when the production or consumptions of a good affects bystanders (i.e. pollution)
        - Market power, a single buyer or seller has substantial influence on market price (i.e monopoly)
    - In such cases, public policy may promote efficiency.
    - Government may alter market outcome to promote equity
    - If the market's distribution of economic well-being is not desirable, tax or welfare policies can change how the economic "pie" is divided

"A country's standard of living depends on its ability to produce goods and services"

- Huge variation in living standards across countries and over time:
    - Average income in rich countries is more than ten times average income in poor countries.
- The most important determinant of living standards: productivity, the amount of goods and services produced per unit of labour.
- Productivity depends on the equipment, skills, and technology available to workers.
- Other factors (e.g. labour unions, competition from abroad) have far less impact on living standards.

"Prices rise when the government prints too much money"

- Inflation: increases in the general level of prices.
- In the long run, inflation is almost always caused by excessive growth in the quantity of money, which causes the value of money to fall.

- The faster the government creates money, the greater the inflation rate.

”Society faces a short-run tradeoff between inflation and unemployment”

- In the short-run (1-2 years), many economic policies push inflation and unemployment in opposite directions.
- Other factors can make this tradeoff always present.

Chapter 1 Preliminaries

Microeconomics: branch of economics that deals with the behaviour of individual economics units – consumers, firms, workers, and investors – as well as the markets that these units comprise

Macroeconomics: Branch of economics that deals with aggregate economic variables such as the level and growth rate of national output, interest rates, unemployment, and inflations.

Microeconomics describes the trade-offs that consumers, workers, and firms face, and shows how these trade-offs are best made.

Positive analysis: analysis describing relationships of cause and effect.

Normative analysis: analysis examining questions of what ought to be.

Market: collection of buyers and sellers that, through their actual or potential interactions, determine the price of a product or set of products.

Market definition: Determination of the buyers, sellers, and range of products that should be included in a particular market.

Arbitrage: practice of buying at a low price at one location and selling at a higher price in another.

Perfectly competitive market: market with many buyers or seller, so that no single buyer or seller has a significant impact on price.

Noncompetitive markets: this where firms can jointly affect the price. The world of oil is one example.

Market price: price prevailing in a competitive market.

Extent of a market: boundaries of a market, both geographical and in terms of range of products produced and sold within it.

Nominal price: absolute price of a good, unadjusted for inflation.

Real price: price of a good relative to an aggregate measure of prices; price adjusted for inflation.

Consumer price Index: measure of the aggregate price level.

Producer Price index: measure of the aggregate price level for intermediate products and wholesale goods.

Calculating real price formulas:

- **Real Price$_z$ = (Nominal Price$_z$) x (Adjustment Factor)**
- **Real Price$_z$ = (Nominal Price$_z$) x (CPI$_{\text{base year}}$ / CPI$_z$)**

Percentage change in real price =

(real price in 2010 - real price in 1970)/

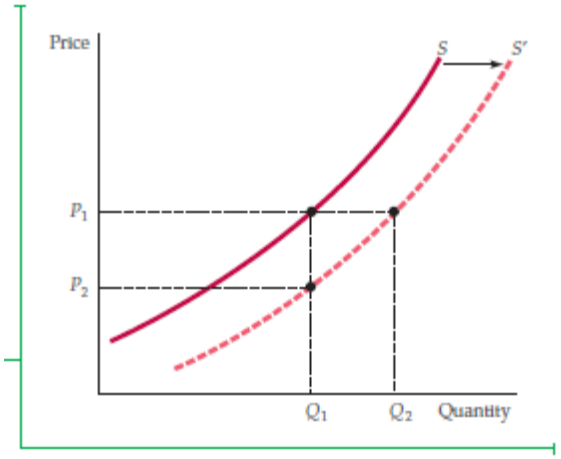
- (real price in 1970)

Chapter 2 The basics of supply and demand

Supply curve: relationship between the quantity of a good that producers are willing to sell and the price of the goods. Thus the supply curve is a relationship between the quantity supplied and the price. We can write this relationship as an equations:

- Qs = Qs(p)

- **THE SUPPLY CURVE**
- The supply curve, labeled *S* in the figure, shows how the quantity
- of a good offered for sale changes as the price of the good
- changes. The supply curve is upward sloping: The higher the
- price, the more firms are able and willing to produce and sell.
- If production costs fall, firms can produce the same quantity at
- a lower price or a larger quantity at the same price. The supply
- curve then shifts to the right (from *S* to *S*').



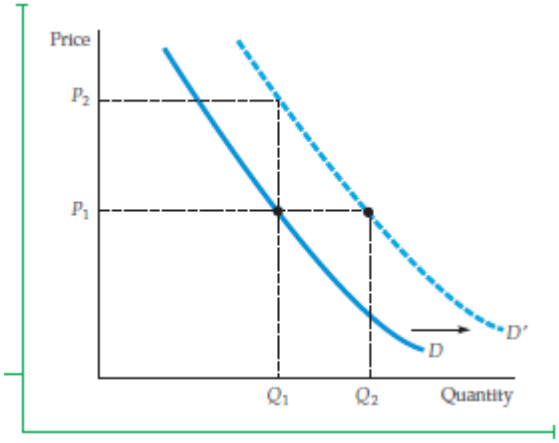
Other variables that affect supply: the quantity supplied can depend on other variables besides price. For exampple, the quantity that producers are will to sell depends not only on the price they receive but also on their produciton costs, including wages, interest charges, and the cost of raw materials. A change in the values of one or more of these variables translates into a shift in the supply curve. We know that the response of quanitity supplied to changes in price can be repreented by movement along the supplu curve. However, the response of supply to changes in other supply-determining varianles is shown graphically as a shift of the supply curve itself.

- Change is supply = shift in supply curve
- Change in quantity supply = movement along the supply curve

Demand curve: relationship betweein the quanityt of a good that consumers are will to buy and the price of the good. We can write this relationship between quantity demanded and price as an equation:

- Qd = Qd(P)
  The demand curve, labeled *D*, shows how the quantity of a good demanded by consumers depends on its price. The demand curve is downward sloping; holding other things equal, consumers will want to purchase more of a good as its price goes down.

The quantity demanded may also depend on other variables, such as income, the weather, and the prices of other goods. For most products, the quantity demanded increases when income rises. A higher income level shifts the demand curve to the right (from *D* to *D*').



Shifting of the demand curve: If income levels income levels increase and the market price stays the same then you would expent to see an iincrease in quantity demanded. With more income consumers are willing to pay higher prices.

Substitutes: two goods for which an increase in the price of one leads to an increase in the quantity demanded of the other.

Complimentes: two goods for which an increase in the price of one leads to a decrease in the quantity demanded of the other.

Equlibrium (or market clearing price): price that equates the quantity supplied to the quantity demanded.

Marcket mechanism: tendency in a free market for price to change until the market clears.

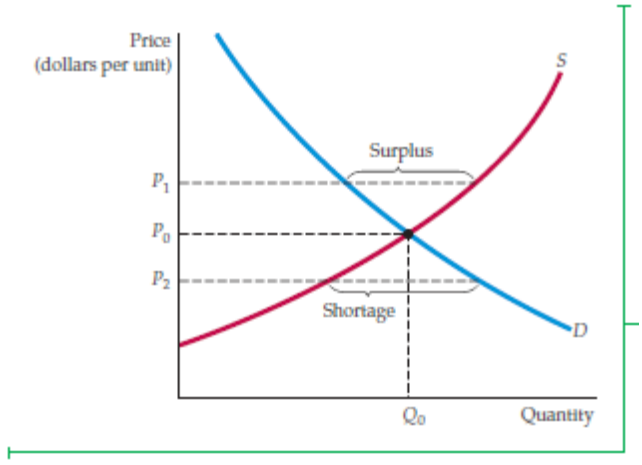
Surplus: situation in which the quantity supplied exceeds the quantity demanded.

Shortage: situation in which the quantity demanded exceeds the quanitty supplied.

Supply and demand

The market clears at price P_0 and quantity Q_0. At

the higher price P_1, a surplus develops, so price falls. At the lower price P_2, there is a shortage, so price is bid up.



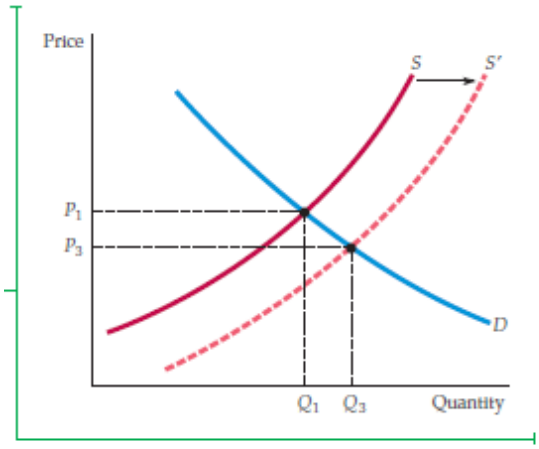
WHEN CAN WE USE THE SUPPLY-DEMAND MODEL?

When we draw and use supply and demand curves, we are assuming that at any given price, a given quantity will be produced and sold. This assumption makes sense only if a market is at least roughly *competitive*. By this we mean that both sellers and buyers should have little *market power*—i.e., little ability *individually* to affect the market price.
Suppose instead that supply were controlled by a single producer—a monopolist.
In this case, there will no longer be a simple one-to-one relationship between price and the quantity supplied. Why? Because a monopolist's behaviour depends on the shape and position of the demand curve. If the demand curve shifts in a particular way, it may be in the monopolist's interest to keep the quantity fixed but change the price, or to keep the price fixed and change the quantity. (How this could occur is explained in Chapter 10.)
Thus when we work with supply and demand curves, we implicitly assume that we are referring to a competitive market.

Changes is market Equilibrium

New Equilibrium following shift in supply

When the supply curve shifts to the right, the market clears at a lower price P3 and a larger quantity Q3.

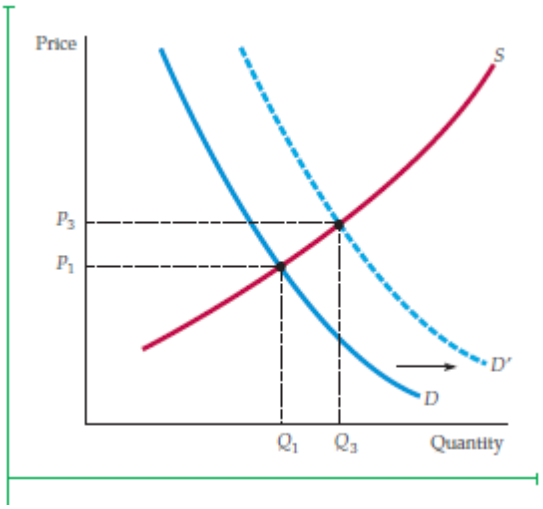


Let's begin with a shift in the supply curve. The supply curve has shifted perhaps as a result of a decrease in the price of raw materials. As a result, the market drops and the total quantity produced increases. This is what we would expect: Lower costs result in lower prices and increased sales. (indeed, gradual decreases in costs resulting from technological progress and better management are important driving force behind economic growth).

New equilibrium following shift in demand

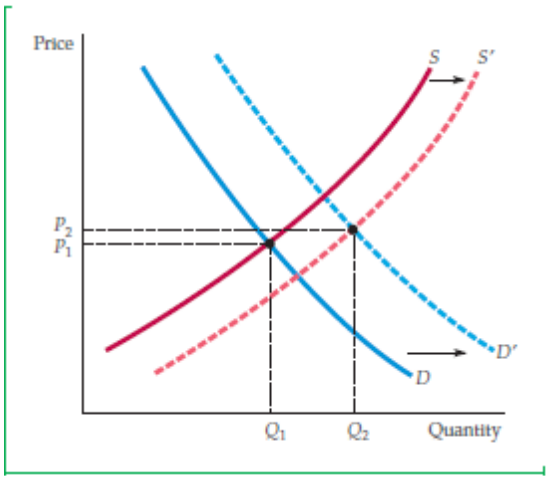
When the demand curve shifts to the right, the market

clears at a higher price P3 and a larger quantity Q3.



New equilibrium following shifts in supply and demand

Supply and demand curves shift over time as market conditions change. In this example, rightward shifts of the supply and demand curves lead to a slightly higher price and a much larger quantity. In general, changes in price and quantity depend on the amount by which each curve shifts and the shape of each curve.



Elasticities of Supply and Demand

An elasticity measures the sensitivity of one variable to another. Specifically it is a number that tells us the percentage change that will occur in one variable in response to a 1-percant increase in another variable. For example, the price elasticity of demand measures the sensitivity of quantity demand to price changes. It tells us what the percentage change in the quantity demanded for a good will be following a 1-percent increase in the price of that food.

Elasticity: percentage change in one variable resulting from a 1-percent increase in another.

Price elasticity of demand: percentage change in quantity demanded of a good resulting from a 1-percent increase in its price.

Price elasticity of demand let's look at this more in detail. We write the price elasticity of demand, Ep, as:

- Ep = (%ΔQ)/(% ΔP)

where % ΔQ means "percentage change in quantity demanded" and %ΔP means "percentage change in price." (the symbol Δ is the Greek capital letter delta; it means "the change in." so ΔX means "the change in the variable X," say from one year to the next.) the percentage change in a variable is just the absolute change in the variable divided by the original level of the variable, (if the Consumer Price Index were 200 at the beginning of the year and increased to 204 by the end of the year, the percentage change – or annual rate of inflation – would be 4/200 = 0.02, or 2 percent.) Thus we can also write the price elasticity if demand as follows:

$$E_p = \frac{\Delta Q/Q}{\Delta P/P} = \frac{P}{Q}\frac{\Delta Q}{\Delta P}$$

-

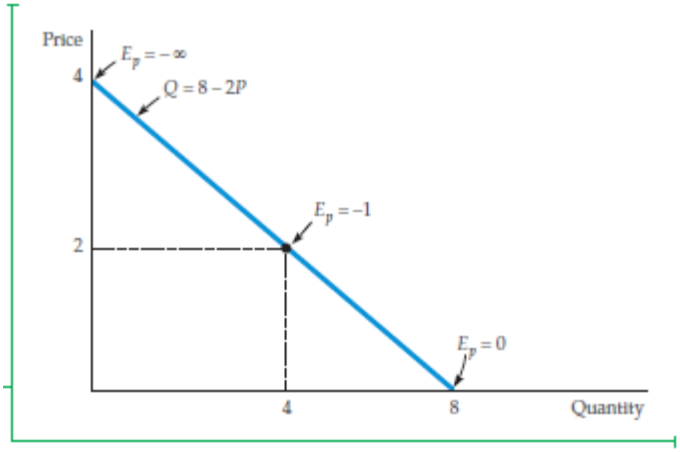
The price elasticity of demand is usually a negative number. When the price of a good increases, the quantity demanded usually falls. Thus ΔQ/ ΔP (the change in quantity for a change in price) is negative, as is Ep. Sometimes we refer to the magnitude of the price elasticity – i.e., its absolute size. For example, Ep = -2, we sat that the elasticity is 2 in magnitude.

When the price elasticity is greater than 1 in magnitude, we say that demand is price elastic because the percentage decline in quantity demanded is greater than the percentage increase in price. If the price elasticity is less than 1 in magnitude, demand is said to be price inelastic. In general, the price elasticity of demand for a good depends on the availability of other goods that can be substituted for it. Where there are close substitutes, a price increase will cause the consumer to buy less of the good and more of the substitute. Demand will then be highly price elastic. When there are no close substitutes, demand will tend to be price inelastic.

Linear Demand curve

The price elasticity of demand depends not only on the slope of the demand curve but also on the price and quantity. The elasticity, therefore, varies

along the curve as price and quantity change.
Slope is constant for this linear demand curve.
Near the top, because price is high and quantity is small, the elasticity is large in magnitude. The elasticity becomes smaller as we move down the curve



Linear demand curve: Demand curve that is a straight line

Linear Demand Curve says that the price elasticity of demand is the change in quantity associated with a change in price (ΔQ/ ΔP) times the ratio of price quantity (P/Q). But as we move down the demand curve, ΔQ/ ΔP may change, and the price and quantity will always change. Therefore, the price elasticity of demand must be measured at a particular point on the demand curve and will generally change as we move along the curve.

This principle is easiest to see for a linear demand curve – that is, a demand curve of the form

$$Q = a - bP$$

As an example, consider the demand curve

$$Q = 8 - 2P$$

-

For this curve, $\Delta Q/\Delta P$ is constant and equal to -2 (a ΔP of 1 results in a ΔQ of -2). However, the curve does *not* have a constant elasticity. Observe from Figure 2.11 that as we move down the curve, the ratio P/Q falls; the elasticity therefore decreases in magnitude. Near the intersection of the curve with the price axis, Q is very small, so $E_p = -2(P/Q)$ is large in magnitude. When $P = 2$ and $Q = 4$, $E_p = -1$. At the intersection with the quantity axis, $P = 0$ so $E_P = 0$.
Because we draw demand (and supply) curves with price on the vertical axis and quantity on the horizontal axis, $\Delta Q/\Delta P$ = (1/slope of curve). As a result, for any price and quantity combination, the steeper the slope of the curve, the less elastic is demand. Figure 2.12 shows two special cases. Figure 2.12(a) shows a demand curve reflecting **infinitely elastic demand:** Consumers will buy as much as they can at a single price P^*. For even the smallest increase in price above this level, quantity demanded drops to zero, and for any decrease in price, quantity demanded increases without limit. The demand curve in Figure 2.12(b), on the other hand, reflects **completely inelastic demand:** Consumers will buy a fixed quantity Q^*, no matter what the price.

(a) Infinitely elastic demand (b) completely inelastic demand

(a) For a horizontal demand curve, $\Delta Q/\Delta P$ is infinite. Because a tiny change in price leads to an enormous change

in demand, the elasticity of demand is infinite. (b) For a vertical demand curve, _Q/_P is zero. Because the quantity
demanded is the same no matter what the price, the elasticity of demand is zero.

Infinitely elastic demand: principle that consumers will buy as much of a good as the can get at a single price, but for any higher price the quantity demanded drops to zero, while for any lower price the quantity demanded increases without limit.

Completely inelastic demand: Principle that consumers will buy a fixed quantity of a good regardless of its price.

Other demand elasticities: We are also interested in elasticities of demand with respect to other variables besides price. For example, demand for most goods usually rises when aggregate income rises. The income elasticity of demand is the percentage change in the quantity demanded, Q, resulting from a 1-percent increase in income I:

$$E_I = \frac{\Delta Q/Q}{\Delta I/I} = \frac{I}{Q}\frac{\Delta Q}{\Delta I}$$

The demand of some goods is also affected by the prices of other goods. For example, because butter and margarine can easily be substituted for each other, the demand for each depend on the price of the other. A cross-price elasticity of demand refers to the percentage change in the quantity demanded for a good that results from a 1-percent increase in the price of another good. So the elasticity of demand for butter with respect to the price of margarine would be written as

$$E_{Q_b P_m} = \frac{\Delta Q_b/Q_b}{\Delta P_m/P_m} = \frac{P_m}{Q_b}\frac{\Delta Q_b}{\Delta P_m}$$

where Qb is the quantity of butter and Pm is the price of margarine.

In this example, the cross-price elasticities will be positive because the goods are substitutes: Because they compete in the market, a rise in the price of margarine, which make butter cheaper relative to margarine, leads to an increase in the quantity of butter demanded. (Because the demand curve for butter will shift to the right, the price of butter will rise.) But this is not always the case. Some goods are complements: Because they tend to be used together, and increase in the price of one tends to push down the consumption of the other. Take gasoline and motor oil. If the price of gasoline goes up, the quantity of gasoline demanded falls – motorists will drive less. And because people are driving less, the demand for motor oil also falls. (The entire demand curve for motor oil shifts to the left.) Thus, the cross-price elasticity of motor oil with respect to gasoline is negative.

Income elasticity of demand: Percentage change in the quantity demanded resulting from a 1- percent increase in income.

Cross-price elasticity of demand: Percentage change in the quantity demanded of one good resulting from a 1-percent increase in the price of another.

Elasticities of Supply are defined in a similar manner. The price elasticity of supply is the percentage change in the quantity supplied resulting from a 1-percent increase in price. This elasticity is usually positive because a higher price gives producers an incentive to increase output. We can also refer to elasticities of supply with respect to such variables as interest rates, wage rates, and the prices of raw materials and other intermediate goods, the elasticities of supply with respect to the prices of raw materials are negative. An increase in the price of a raw material input means higher costs from the firm; other thing being equal, therefore, the quantity supplied will fall

Price elasticity of supply: Percentage change of quantity supplied resulting from a 1-percent increase in price.

Point versus Arc Elasticities

The **point elasticityof demand,** for example, is *the price elasticity of demand at a particular point on the demand curve.*

Point elasticity of demand: Price elasticity at a particular point on the demand curve

Arc elasticity of demand We can resolve this problem by using the arc elasticity of demand: the elasticity calculated over a range of prices. Rather than choose either the initial or the final price, we use an average of the two *P*; for the quantity demanded, we use *Q*. Thus the arc elasticity of demand is given by

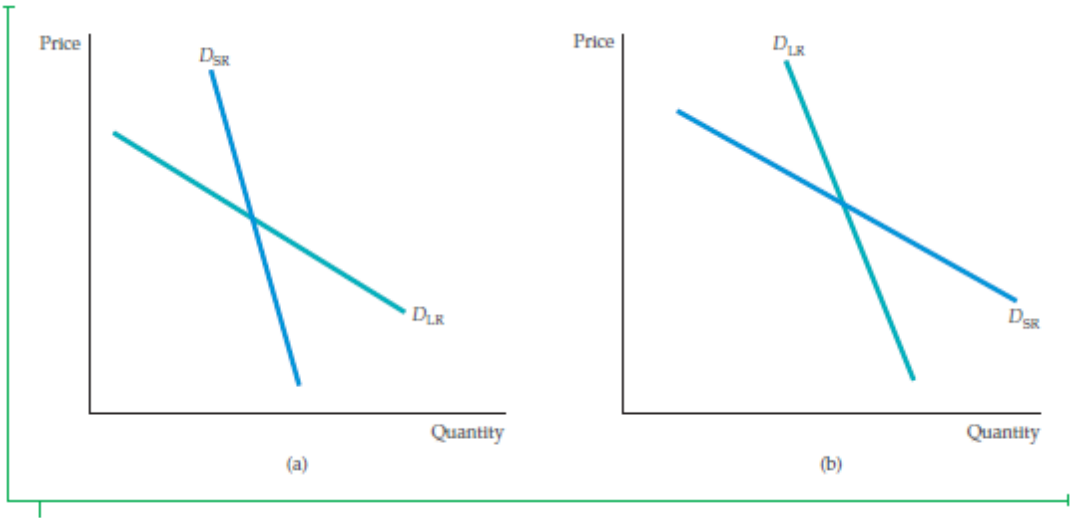
- Formula: $$\text{Arc elasticity: } E_p = (\Delta Q/\Delta P)(\overline{P}/\overline{Q})$$

Arc elasticity of demand: Price elasticity calculated over a rage of prices.

The arc elasticity will always lie somewhere (but not necessarily halfway) between the point elasticities calculated at the lower and the higher prices. Although the arc elasticity of demand is sometimes useful, economists generally use the word "elasticity" to refer to a point elasticity.

Short-run versus Long-run Elasticities

When analyzing demand and supply, we must distinguish between the short run and the long run. In other words, if we ask how much demand or supply changes in response to a change in price, we must be clear about how much time is allowed to pass before we measure the changes in the quantity demanded or supplied. If we allow only a short time to pass—say, one year or less—then we are dealing with the short run. When we refer to the long run we mean that enough time is allowed for consumers or producers to adjust fully to the price change. In general, short-run demand and supply curves look very different from their long-run counterparts.



(a) GASOLINE: SHORT-RUN AND LONG-RUN DEMAND CURVES
(b) AUTOMOBILES: SHORT-RUN AND LONG-RUN DEMAND CURVES
(a) In the short run, an increase in price has only a small effect on the quantity of gasoline demanded. Motorists may drive less, but they will not change the kinds of cars they are driving overnight. In the longer run, however, because they will shift to smaller and more fuel-efficient cars, the effect of the price increase will be larger. Demand, therefore, is more elastic in the long run than in the short run.
(b) The opposite is true for automobile demand. If price increases, consumers initially defer buying new cars; thus annual quantity demanded falls sharply. In the longer run, however, old cars wear out and must be replaced; thus annual quantity demanded picks up. Demand, therefore, is less elastic in the long run than in the short run.

For many goods, demand is much more price elastic in the long run than in the short run. For one thing, it takes time for people to change their consumption habits. If gas goes up people won't stop driving overnight.

Demand and durability On the other hand, for some goods just the opposite is true – demand is more elastic in the short run than in the long run. Because these goods (automobiles, refrigerators, televisions, or the capital equipment purchased by industry) are durable, the total stock of each good owned by consumers is large relative to annual production. As a result, a small change in the total stock that consumers want to hold can result in a large percentage change in the level of purchases.

Income elasticities also differ from the short run to the long run. For most goods and services – foods, beverages, fuel, entertainment and so forth – the income elasticity of demand is larger in the long run than in the short run. Consider the behaviour of gasoline consumption during a period of strong economic growth during which aggregate income rises by 10 percent. Eventually people will increase gasoline consumption because they can afford to take more trips and perhaps own larger cars. But this change in consumption takes time, and demand initially increases only by a small amount. Thus, the long-run elasticity will be larger than the short-run elasticity.

For a durable good, the opposite is true. Consider automobiles. If aggregate income rises by 10 percent, the total stock of cars that consumers will want to own will also rise – say, by 5 percent. But this means a much larger increase in current purchases of cars.

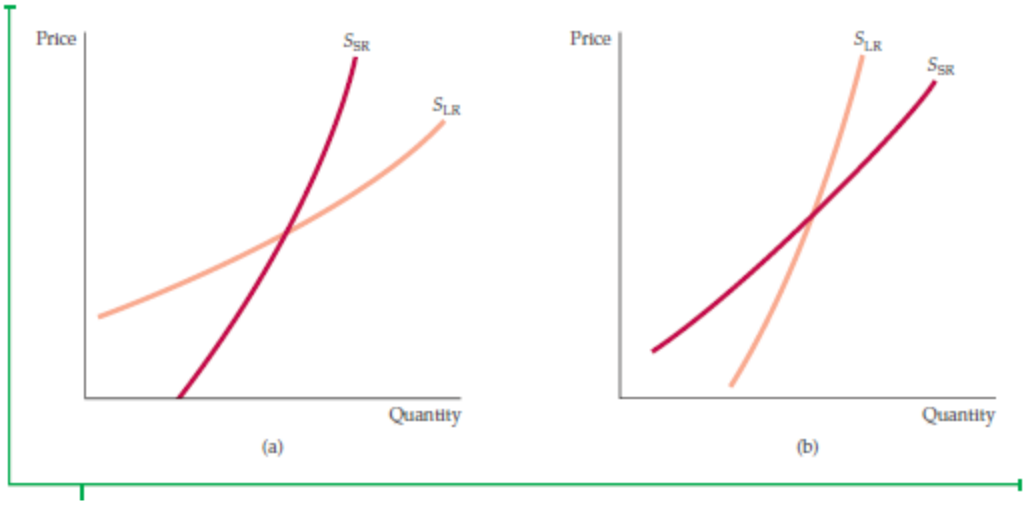
Cyclical industries Because the demand for durable goods fluctuates so sharply in response to short-run changes in income, the industries that produce these goods are quite vulnerable to changing macroeconomic conditions, and in particular to the business cycle – recessions and booms. Thus, these industries are often call cyclical industries – their sales patterns tend to magnify changes in gross domestic product (GDP) and national income.

Cyclical industries: Industries in which sales tend to magnify cyclical changes in gross domestic product and national income.

Supply

Elasticities of supply also differ from the long run to the short run. For most products, long-run supply is much more price elastic than short-run supply: Firms face capacity constraints in the short run and need time to expand capacity by building new production facilities and hiring workers to staff them. This is not to say that the quantity supplied will not increase in the short run if price goes up sharply. Even in the short run, firms can increase output by using their existing facilities for more hours per week, paying workers to work overtime, and hiring some new workers immediately. But firms will be able to expand output much more when they have the time to expand their facilities and hire larger permanent workforces.
For some goods and services, short-run supply is completely inelastic. Rental housing in most cities is an example. In the very short run, there is only a fixed number of rental units. Thus an increase in demand only pushes rents up. In the longer run, and without rent controls, higher rents provide an incentive to renovate existing buildings and construct new ones. As a result, the quantity supplied increases.
For most goods, however, firms can find ways to increase output even in the short run—if the price incentive is strong enough. However, because various constraints make it costly to increase output rapidly, it may require large price increases to elicit small short-run increases in the quantity supplied.

Supply and durability For some goods, supply is more elastic in the short run than in the long run. Such goods are durable and can be recycled as part of supply if price goes up. An example is the *secondary supply* of metals: the supply from *scrap metal*, which is often melted down and refabricated. When the price of copper goes up, it increases the incentive to convert scrap copper into new supply, so that, initially, secondary supply increases sharply. Eventually, however, the stock of good-quality scrap falls, making the melting, purifying, and refabricating more costly. Secondary supply then contracts. Thus the long-run price elasticity of secondary supply is smaller than the short-run elasticity.

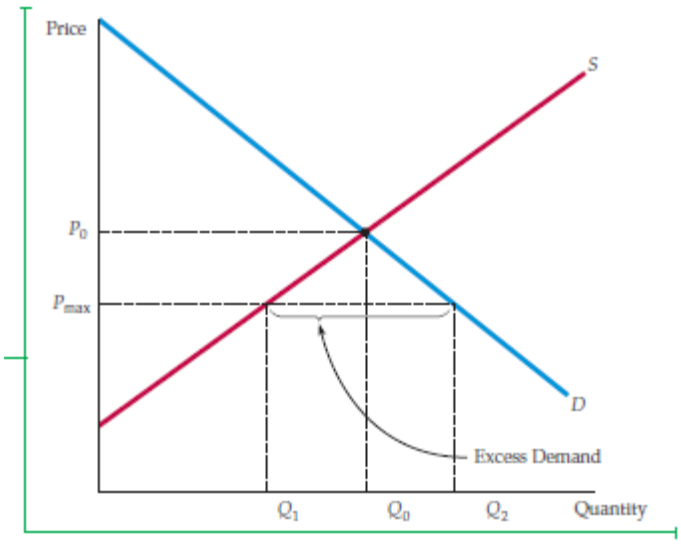


Copper: Short-run and Long-run supply curves

Like that of most goods, the supply of primary copper, shown in part (a), is more elastic in the long run. If price increases, firms would like to produce more but are limited by capacity constraints in the short run. In the longer run, they can add to capacity and produce more. Part (b) shows supply curves for secondary copper. If the price increases, there is a greater incentive to convert scrap copper into new supply. Initially, therefore, secondary supply (i.e., supply from scrap) increases sharply. But later, as the stock of scrap falls, secondary supply contracts. Secondary supply is therefore less elastic in the long run than in the short run.

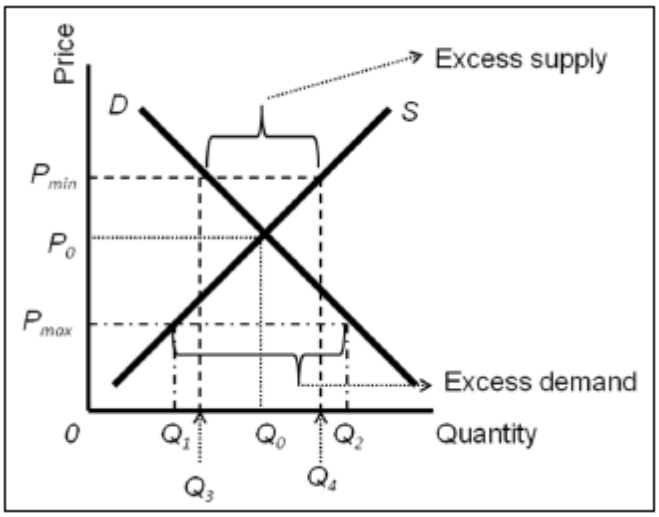
Effects of Government Intervention – Price controls

Government intervention in the market mechanism may take place in a number of ways.



Without price controls, the market clears at the equilibrium price and quantity P_0 and Q_0. If price is regulated to be no higher than P_{max}, the quantity supplied falls to Q_1, the quantity demanded increases to Q_2, and a shortage develops.

In the case of price ceiling prices, government officials regard the equilibrium price (or market clearing price) as too high, and a price lower than the equilibrium price set. In the case of a floor price, the officials feel that the equilibrium price is too low and set a (floor) price which is above the equilibrium price. Such a floor price will give an excess supply, as producers are more than willing to produce at such a high price, but consumers regard the price as too high.



Setting of a floor (minimum) price and ceiling (maximum) price

Summary Ceiling and floor prices

Problem	Government action	Result		Type	Example
Equilibrium price too high	Set price below equilibrium price	Quantity demanded > quantity supplied	Excess demand because price is low	Ceiling price (maximum price)	Rented housing Sale of petrol
Equilibrium price too low	Set price above equilibrium price	Quantity demanded < quantity supplied	Excess supply because price is high	Floor price (minimum price)	Agricultural products

2.4

1. The words elasticity and slope are synonymous. True or False
2. The elasticity of a single point on the demand curve can be determined. True or False
3. Essential products have a negative income elasticity. True or False
4. Cross-elasticity is only relevant in the case of related products. True or False
5. Price elasticity of demand is a theoretical concept with no practical value. True or False

Elasticity measures the percentage change in one variable in response to a 1% increase in another variable

The price of elasticity of demand for a demand curve that has a zero slope is infinite.

A vertical demand curve is completely inelastic

Along any downward-sloping straight-line demand curve the price elasticity varies, but the slope is constant.

If two goods are substitutes, the cross-price elasticity of demand must be positive.

2.7

1. In a real competitive market, government intervention is never needed. True or False
2. To help the poor a floor price is needed on the level of rent for housing. True or False
3. The price of cigarettes is a typical price on which a maximum will be set. True or False

When the government controls the price of a product, causing the market price to below the free market equilibrium price, some consumers gain from the price controls and other consumers lose.

What happens if price falls below the market clearing price?
Quantity demanded increases, quantity supplied decreases, and price rises.

Other things being equal, the increase in rents that occurs after rent controls are abolished is smaller when, the own price elasticity of demand for rental homes is price elastic.

Learning Unit 3: Consumer behaviour

Economists must use assumptions to simplify reality. To do this and to answer the question on how these choices are made, three related assumptions about the consumer are used, namely :

- Consumers have needs, which are expressed as preferences for certain goods and services.

- Consumers cannot satisfy all the needs, and are therefore subject to a budget constraint.
- Consumers try to maximise their satisfaction, given their preferences and budget constraint.

Consumer Behaviour

Consumer behavior is best understood in three distinct steps:

- 1. Consumer Preferences: The first step is to find a practical way to describe the reasons people might prefer one good to another. We will see how a consumer's preferences for various goods can be described graphically and algebraically.
- 2. Budget Constraints: Of course, consumers also consider prices. In Step 2, therefore, we take into account the fact that consumers have limited incomes which restrict the quantities of goods they can buy. What does a consumer do in this situation? We find the answer to this question by putting consumer preferences and budget constraints together in the third step.
- 3. Consumer Choices: Given their preferences and limited incomes, consumers choose to buy combinations of goods that maximize their satisfaction. These combinations will depend on the prices of various goods. Thus, understanding consumer choice will help us understand demand—i.e., how the quantity of a good that consumers choose to purchase depends on its price.

Theory of consumer behaviour: Description of how consumers allocate incomes among different goods and services to maximize their well-being.

Consumer prefernece s

Market baskets (or bundle) We use the term market basket to refer to such a group of items. Specifically, a market basket is a list with specific quantities of one or more goods. A market basket might contain various food items in a grocery cart. It might also refer to the quantities of food, clothing, and housing that a consumer buys each month.

To explain the theory of consumer behaviour, we will ask whether consumers prefer one market basket to another. Note that the theory assumes that consumers' preferences are consistent and make sense.

Some basic assumptions about preferences

The theory of consumer behaviour begins with three basic assumptions about people's preferences for one market basket versus another. We believe that these assumptions hold for most people in most situations.

- 1. Completeness: preferences are assumed to be complete. In other words, consumers can compare and rank all possible baskets. Thus, for any two market baskets A and B, a consumer will prefer A to B, will prefer B to A, or will be indifferent between the two. By indifferent we mean that a person will be equally satisfied with either basket. Note that these preferences ignore costs. A consumer might prefer steak to hamburger but buy hamburger because it is cheaper.
- 2. Transitivity: Preferences are transitive. Transitivity means that if a consumer prefers basket A to basket B and basket B to basket C, then the consumer also prefers A to C. For

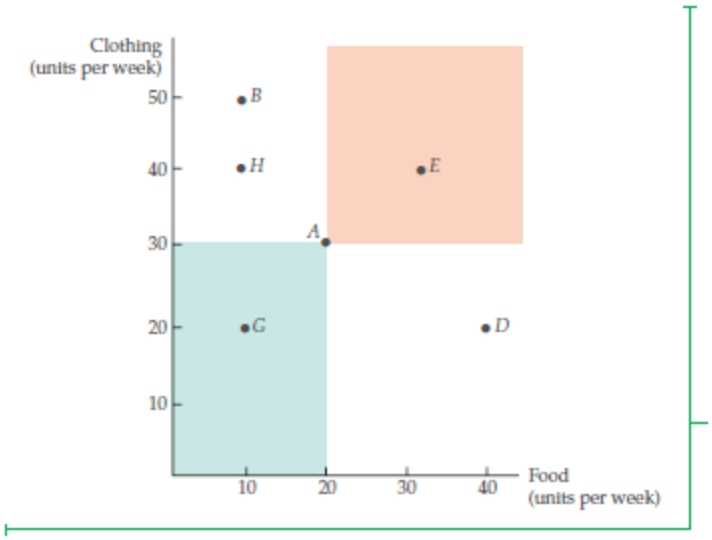
example, if a Porsche is preferred to a GTI5 and a GTI5 to a Fiat Uno, then a Porsche is also preferred to a Fiat Uno. Transitivity is normally regarded as necessary for consumer consistency.

- 3. More is better than less. Goods are assumed to be desirable – i.e., to be good. Consequently, consumers always prefer more of any good to less. In addition, consumers are never satisfied or satiated; more is always better even if just a little better. This assumption is made for pedagogic reasons; namely, it simplifies the graphical analysis. Of course, some goods, such as air pollution, may be undesirable, and consumers will always prefer less. We ignore these "bads" in the context of our immediate discussion of consumer choice because most consumers would not choose to purchase them.
    - There three assumptions form the basis of consumer theory. They do not explain consumer preferences, but they do impose a degree of rationality and reasonableness on them.

Indifference Curves We can show a consumer's preference with the use of indifference curves. An indifference curve represents all combinations of market baskets that provide a consumer with the same level of satisfaction. That person is therefore indifferent among the market baskets represented by the points graphed on the curve.

Indifference curve: Curve representing all combinations of market baskets that provide a consumer with the same level of satisfaction.

Given our three assumptions about preferences, we know that a consumer can always indicate either a preference for one market basket over another or indifference between the two. We can then use this information to rank all possible consumption choices.

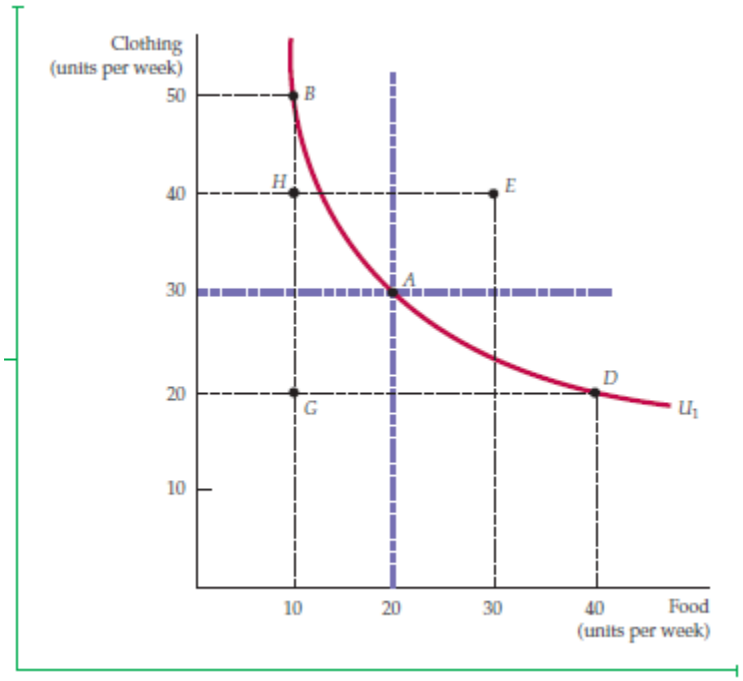


DESCRIBING INDIVIDUAL PREFERENCES

Because more of each good is preferred to less, we can compare market baskets in the shaded areas. Basket is clearly preferred to basket G, while E is clearly preferred to A. However, A cannot be compared to B, D, or H without additional information. Note, however, that *B* contains more clothing but less food than *A.* Similarly, *D* contains more food but less clothing than *A.* Therefore, comparisons of market basket *A* with baskets *B*, *D*, and *H* are not possible without more information about the consumer's ranking.

This additional information is provided in the next graph which shows an indifference curve, labeled U_1, that passes through points *A*, *B*, and *D.* This curve indicates

that the consumer is indifferent among these three market baskets. It tells
us that in moving from market basket *A* to market basket *B*, the consumer feels
neither better nor worse off in giving up 10 units of food to obtain 20 additional units of clothing.



INDIFFERENCE CURVE

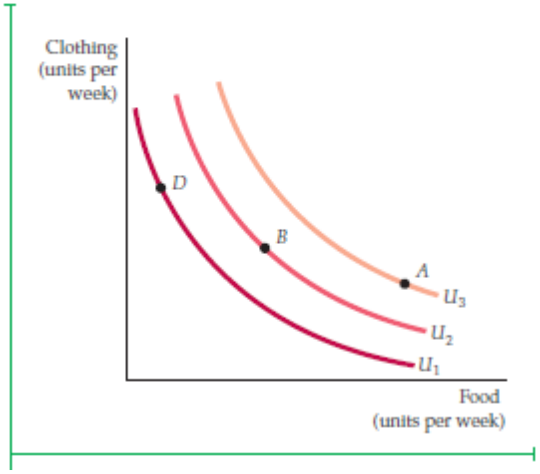
The indifference curve U1, that passes through market basket A shows all baskets that give the consumer the same level of satisfaction as does market basket A; these include baskets B and D. Our consumer prefers basket E, which lies above U1, to A, but prefers A to H or G, which lie below U1.

Likewise, the consumer is indifferent between points *A* and *D*:
He or she will give up 10 units of clothing to obtain 20 more units of food. On the
other hand, the consumer prefers *A* to *H*, which lies below U_1.
Note that the indifference curve in graph slopes downward from left to right.
To understand why this must be the case, suppose instead that it sloped upward
from *A* to *E*. This would violate the assumption that more of any commodity is
preferred to less. Because market basket *E* has more of both food and clothing than
market basket *A*, it must be preferred to *A* and therefore cannot be on the same
indifference curve as *A*. In fact, any market basket lying *above and to the right of*
indifference curve U_1 in the graph is preferred to any market basket on U_1.

Indifference Maps To describe a person's preference for all combinations of food and clothing, we can graph a set of indifference curves called an indifference map. Each indifference curve in the map shows the market baskets among which the person is indifferent.

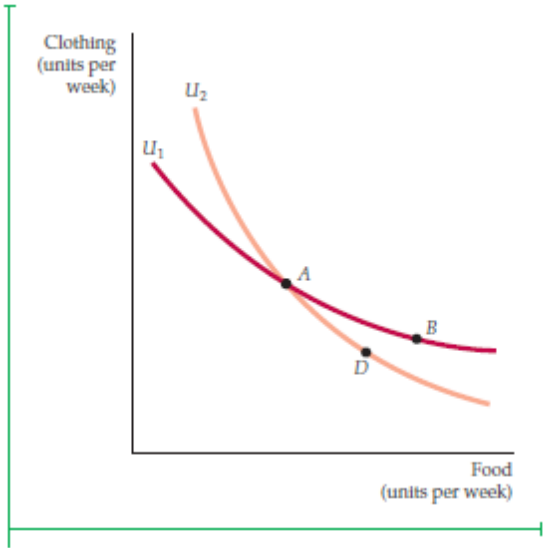
Indifference map: Graph containing a set of indifference curves showing the market baskets among which a consumer is indifferent.

Indifference curves cannot intersect! To see why, we must assume the contrary and see how the resulting graph violates our assumptions about consumer behaviour.



AN INDIFFERENCE MAP

An indifference map is a set of indifference curves that describe a person's preferences. Any market basket on indifference curve U3, such as basket A, is preferred to any basket on curve U2, (e.g. basket B), which in turn is preferred to any basket on U1, such as D.

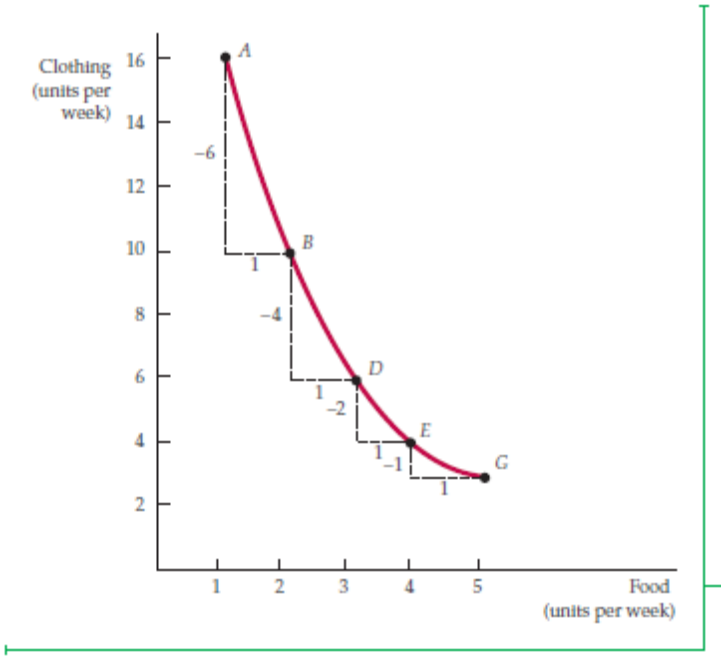


INDIFFERENCE CURVE CANNOT INTERSECT

If indifference curve U1 and U2 intersect, one of the assumptions of consumer theory is violated. According to this diagram, the consumer should be indifferent among market baskets A, B, and D. Yet B should be preferred to D because B has more of both goods.

The Marginal Rate of Substitution To quantify the amount of one good that a consumer will give up to obtain more of another, we use a measure called the marginal rate of substitution (MRS). The MRS of food F for clothing C is the maximum amount of clothing that a person is willing to give up to obtain one additional unit of food. Suppose, for example, the MRS is 3. This means that the consumer will give up 3 units of clothing to obtain 1 additional unit of food. If the MRS is 1/2 , the consumer is willing to give up on ½ unit of clothing. Thus, the MRS measures the value that the individual places on 1 extra unit of a good in terms of another

Marginal rate of substitution: Maximum amount of a good that a consumer is will to give up in order to obtain one additional unit of another good.



THE MARGINAL RATE OF SUBSTITUTION

The magnitude of the slope of an indifference curve measures the consumer's marginal rate of substitution (MRS) between two goods. In this figure, the MRS between two goods. In this figure, the MRS between clothing (C) and food (F) falls from 6 (between A and B) to 2 (between D and E) to 1 (between E and G). When the MRS diminishes along an indifference curve, the curve is convex.

Note that clothing appears on the vertical axis and food on the horizontal axis. When we describe the MRS, we must be clear about which good we are giving up and which we are getting more of. To be consistent throughout the book, we will define the MRS in terms of *the amount of the good on the vertical axis that the consumer is willing to give up in order to obtain 1 extra unit of the good on the horizontal axis.*

Thus the MRS refers to the amount of clothing that the consumer is willing to give up to obtain an additional unit of food. If we denote the *change* in clothing by ΔC and the change in food by ΔF, the MRS can be written as $-\Delta C/\Delta F$. We add the negative sign to make the marginal rate of substitution a positive number. (Remember that ΔC is always negative; the consumer *gives up* clothing to obtain additional food.) Thus the MRS at any point is equal in magnitude to the slope of the indifference curve. In the graph, for example, the MRS between points *A* and *B* is 6: The consumer is willing to give up 6 units of clothing to obtain 1 additional unit of food. Between points *B* and *D*, however, the MRS is 4: With these quantities of food and clothing, the consumer is willing to give up only 4 units of clothing to obtain 1 additional unit of food.

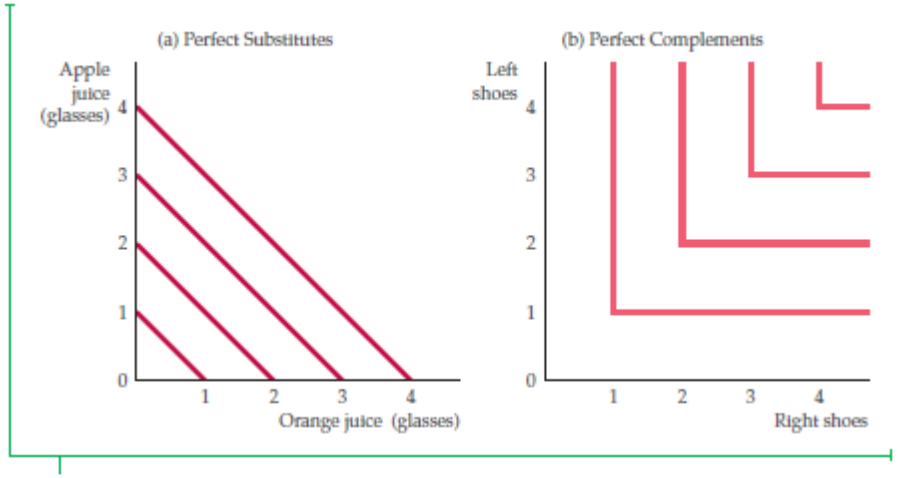
Convexity Also observed in the graph above that the MRS falls as we move down the indifference curve. This is not a coincidence. This decline in the MRS reflects an important characteristic of consumer preferences. To understand this, we will add an additional assumption regarding consumer preferences to the three that we discussed earlier.

- 4. Diminishing marginal rate of substitution: indifference curves are usually convex, or bowed inwards. The term convex means that the slope of the indifference curve increase (i.e,. becomes less negative) as we move down along the curve. in other words, an indifference curve is convex if the MRS diminishes along the curve. The indifference curve in the graph above is convex. As we have seen, starting with market basket A in the graph and moving to basket B, the MRS of food F for clothing C is $-\Delta C/\Delta F$ = -

(-6)/1 = 6. However, when we start at basket D and move to E, the MRS is 2. Starting at E and moving to G, we get an MRS of 1. As food consumption increases, the slope of the indifference curve falls in magnitude. Thus the MRS also falls.

Another way of describing this principle is to say that consumers generally prefer balanced market baskets to market baskets that contain all of one good and none of another.

Perfect substitutes and Perfect Complements The shape of an indifference curve describes the willingness of a consumer to substitute one good for another. An indifference curve with a different shape implies a different willingness to substitute.



PERFECT SUBSTITUTES AND PERFECT COMPLEMENTS

In *(a)*, Bob views orange juice and apple juice as perfect substitutes: He is always indifferent between a glass of one and a glass of the other. In *(b)*, Jane views left shoes and right shoes as perfect complements: An additional left shoe gives her no extra satisfaction unless she also obtains the matching right shoe.

Perfect substitutes: Two goods for which the marginal rate of substitution of one for the other is a constant.

Perfect complements: Two goods for which the MRS is zero of infinite; the indifference curves are shaped as right angles.

Bads Air pollution is a bad; asbestos in housing insulation is another. How do we account for bads in the analysis preferences? The answer is simple: We redefine the product under study so that consumer tastes are represented as a preference for less of the bad. This reversal turns the bad into a good. Thus, for example, instead of a preference for air pollution, we will discuss the preference for clean air, which we can measure as the degree of reduction in air pollution.

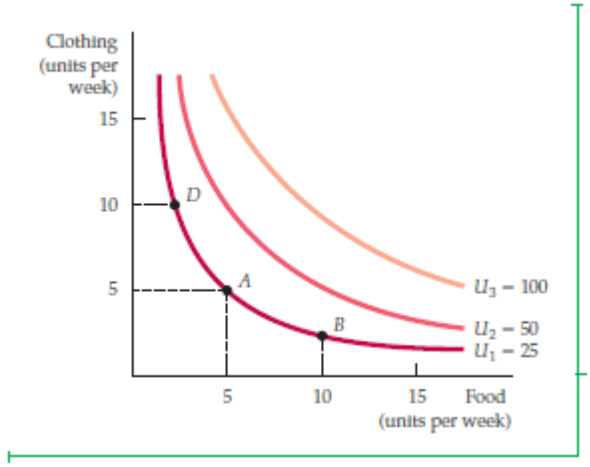
Bad: Good for which less is preferred rather than more.

Utility : Numerical score representing the satisfaction that a consumer gets from a given market basket. So if buy three copies of a textbook makes you happier than buying one shirt, then we say that the three books give you more utility than the shirt.

Utility Functions A utility function is a formula that assigns a level of utility to each market basket. Suppose, for example, that Phil's utility function for food (*F*) and clothing (*C*) is $u(F,C) = F + 2C$. In that case, a market basket consisting of 8 units of food and 3 units of clothing generates a utility of $8 + (2)(3) = 14$. Phil is therefore indifferent between this market basket and a market basket containing 6 units of food and 4 units of clothing [6

_ (2)(4) _ 14]. On the other hand, either market basket is preferred to a third containing 4 units of food and 4 units of clothing. Why? Because this last market basket has a utility level of only 4 _ (4)(2) _ 12.

Utility function: Formula that assigns a level of utility to individual market baskets.



UTILITY FUNCTIONS AND INDIFFERENCE CURVES

A utility function can be represented by a set of indifference curves, each with a numerical indicator. This figure shows three indifferent curves (with utility levels of 25, 50 and 100, respectively) associated with the utility function FC.

Ordinal Versus Cardinal Utility

Ordinal utility function: Utility function that generates a ranking or market baskets in order of most to least preferred.

Cardinal utility function: Utility function describing by how much one market basket is preferred to another.

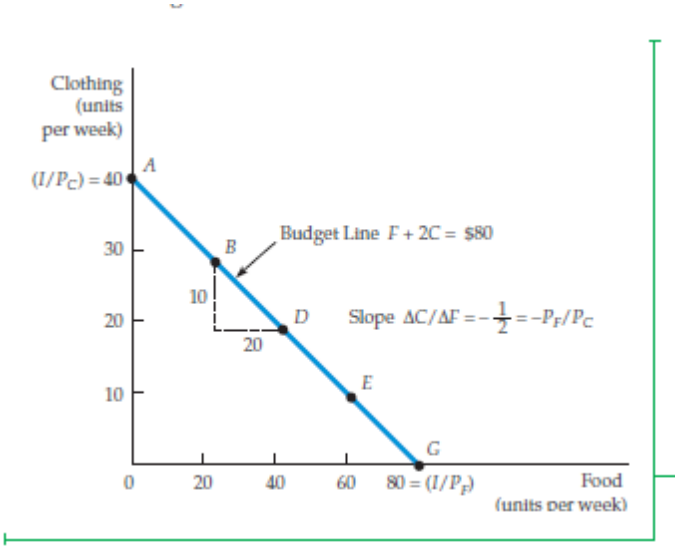
Budget constraints

Budget constraints: Constraints that consumers face as a result of limited incomes.

The Budget Line indicates all combinations of F(food purchased) and C(clothing purchased) for which the total amount of money spent is equal to income

Budget line: All combinations of goods for which the total amount of money spent is equal to income.
As a result, the combinations of food and
clothing that she can buy will all lie on this line:

- $P_F F + P_C C = I$



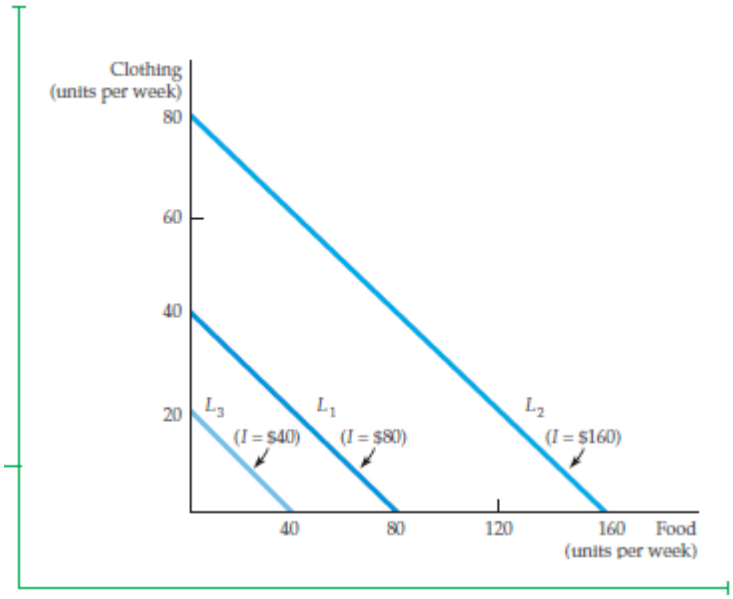
A BUDGET LINE

A budget line describes the combinations of goods that can be purchased given the consumer's income and the prices of the goods. Line AG (which passes through points B,D, and E) shows the budget associated with an income of $80, a price of food P_F = $1 per unit, and a price of clothing of P_C = $2 per unit. The slope of the budget line (measured between points B and D) is $-P_F/P_C = -10/20 = -1/2$.

Using the equation, we can see how much of C must be given up to consume more of F. We divide both sides of the equation by P_C and then solve for C:
$C = (I/P_C) - (P_F/P_C)F$

The Effects of Changes in Income and Prices

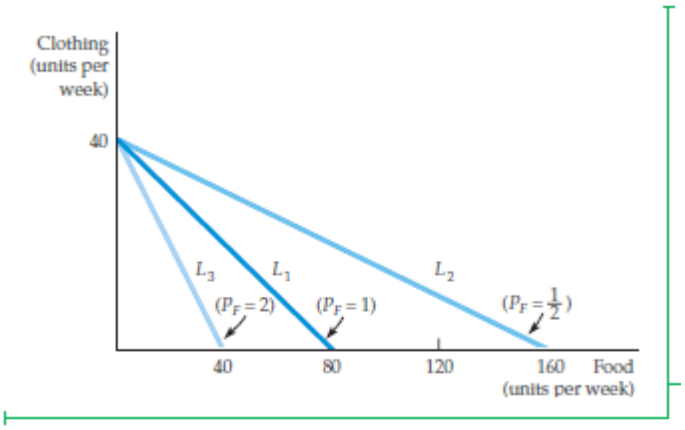
Income Changes



EFFECTS OF A CHANGE IN INCOME ON THE BUDGET LINE

A change in income (with price unchanged) causes the budget line to shift parallel to the original line (L1). When the income of $80 (on L1) is increased to $160, the budget line shifts outwards to L2. If the income falls to $40, the line shifts inwards to L3

Price Changes



EFFECTS OF A CHANGE IN PRICE ON THE BUDGET LINE

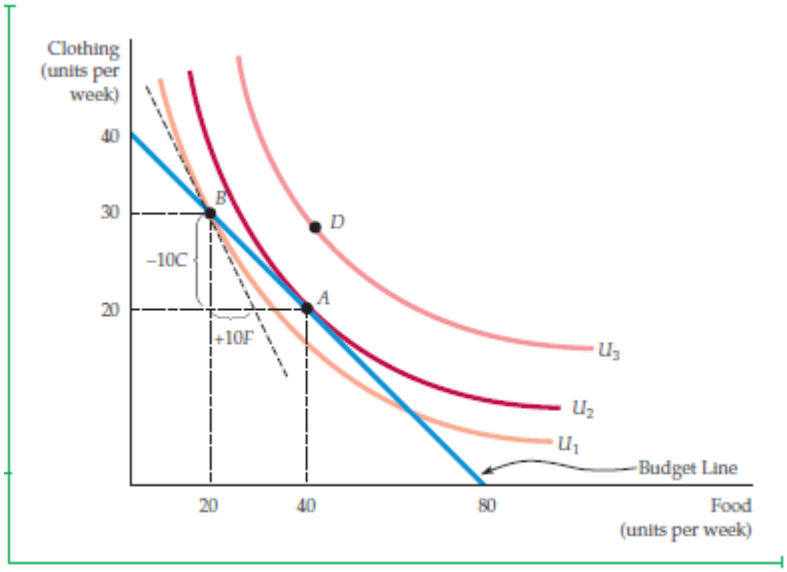
A change in the price of one good (with income unchanged) causes the budget line to rotate about one intercept. When the price of food falls from $1.00 to $0.50, the budget line rotates outward from L1 to L2. However, when the price increases from $1.00 to $2.00, the line rotatrs inward from L1 to L3.

Consumer choice

Given preferences and budget constraints, we can now determine how individual consumers choose how much of each good to buy. We assume that consumers make this choice in a rational way—that they choose goods to *maximize the satisfaction they can achieve, given the limited budget available to them.* The maximizing market basket must satisfy two conditions:

- 1. It must be located on the budget line. To see why, note that any market basket to the left of an below the budget line leave some income unallocated – income which, if spent, could increase the consumer's satisfaction. Consumers can –and often do- save some of their incomes for future consumption. In that case, the choice is not just between food and clothing, but between consuming food or clothing now and consuming food or clothing in the future. Note also that any market basket to the right of and above the budget line cannot be purchased with available income. Thus, the only rational and feasible choice is a basket on the budget line.
- 2. It must give the consumer the most proffered combination of goods and services.

These two conditions reduce the problem of maximizing consumer satisfaction to one of picking an appropriate point on the budget lime.



MAXIMIZING CONSUMER SATISFACTION

A consumer maximizes satisfaction by choosing market basket A. At this point, the budget line and indifference curve U2 are tangent, and no higher level of satisfaction (e.g. , market basket D) can be attained. At A, the point of maxumuzation, the MRS between the two goods equals the price ration. At B, however, because the MRS [-(10/10) = 1] is greater than the price ration (1/2), satisfaction is not maximized.

Because the MRS ($-\Delta C/\Delta F$) is the negative of the slope of the indifference curve, we can say that satisfaction is maximized (given the budget constraint) at the point where

- MRS= P_F/P_C

Marginal benefit: Benefit from the consumption of one additional unit of a good.

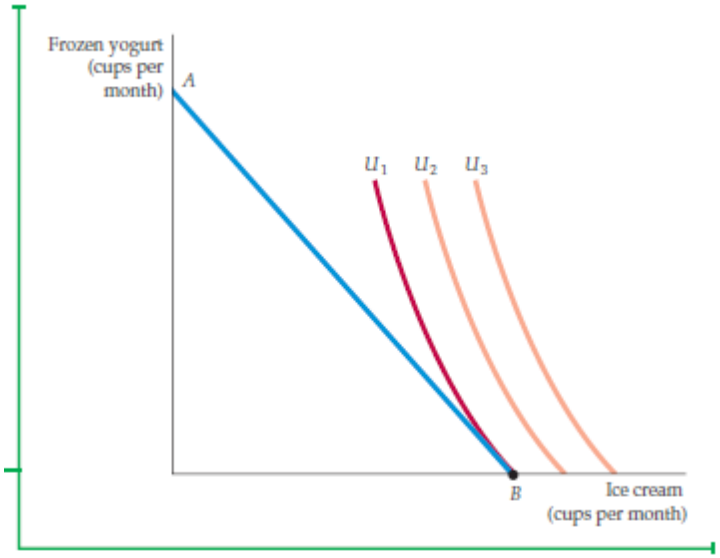
Marginal cost: Cost of one additional unit of a good.

Corner Solutions

Corner solutions: Situation in which the marginal rate of substitution of one good for another in a chosen market basket is not equal to the slope of the budget line.

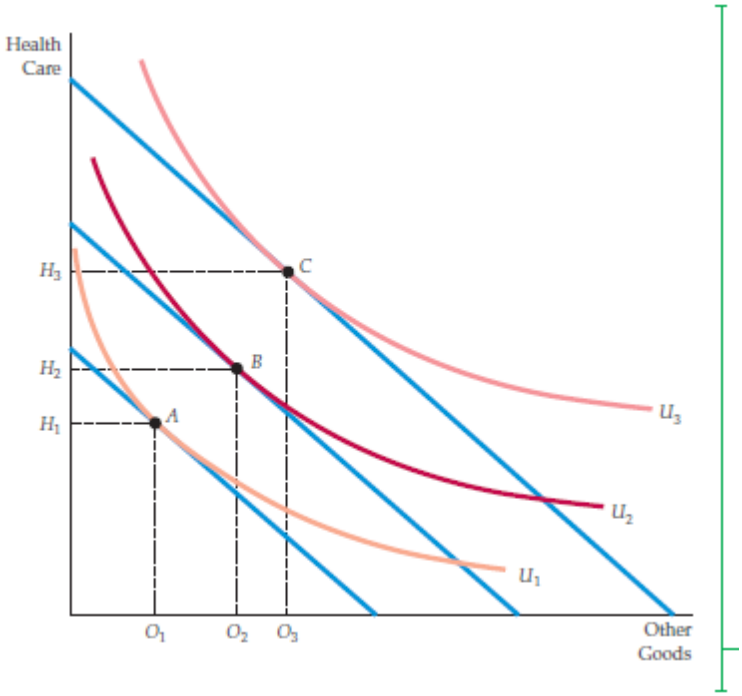
the necessary condition for
satisfaction to be maximized when choosing between ice cream and frozen yogurt
in a corner solution is given by the following inequality.[9]

- MRS $\geq P_{IC}/P_Y$



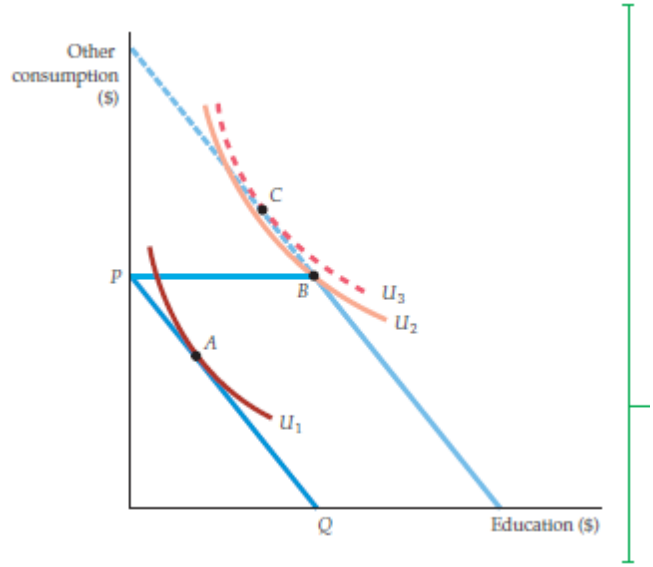
A CORNER SOLUTION

When the consumer's marginal rate of substitution is not equal to the price ratio for all levels of consumption, a corner solution arises. The consumer maximizes satisfaction by consuming only one of the two goods. Given budget line AB, the highest level of satisfaction is achieved at B on indifference curve U1, where the MRS (of ice cream for frozen yogurt) is greater than the ratio of price of ice cream to the price of frozen yogurt.



CONSUMER PREFERENCE FOR HEALTH CARE VERSUS OTHER GOODS

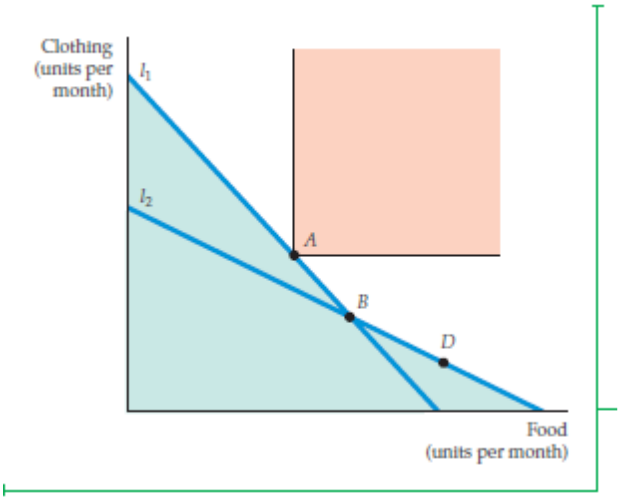
These indifference curves show the trade-off between consumption of health care (H) versus other goods (O). Curve U1 applies to a consumer with low income; given the consumer's budget constraint, satisfaction is maximized at point A. As income increases the budget line shifts to the right, and curve U2 becomes feasible. The consumer moves to point B, with greater consumption of both health care and other goods. Curve U3 applies to a high-income consumer, and implies less willingness to give up health care for other goods. Moving from point B to point C, the consumer's consumption of health care increases considerably (from H2 to H3), while her consumption of other goods increases only modestly (from O2 to O3).



A COLLEGE TRUST FUND

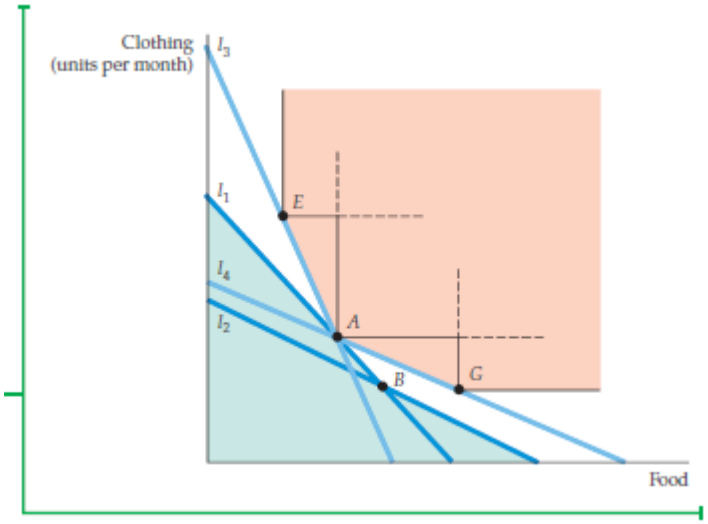
When given a college trust fund that must be spent on education, the student moves from A to B, a corner solution. If, however, the trust fund could be spent on other consumption as well as education, the student would be better off at C.

Revealed Preference



REVEALED PREFERENCE: TWO BUDGET LINES

If an individual facing budget line l1 chose market basket A rather than market basket B, A is revealed to be preferred to B. Likewise, the individual facing budget line l2 chooses market basket B, which is then revealed to be preferred to market basket D. whereas A is preferred to all market baskets in the green-shaded area, all baskets in the pink-shaded area are preferred to A



REVEALD PREFERENCE: FOUR BUDGET LINES

Facing budget line l3, the individual chooses E1 which is revealed to be preferred to A (because A could have been chosen). Likewise, facing line l4, the individual chooses G which is also revealed to be preferred to A. Whereas A is preferred to all market baskets in the green-shaded area, all market baskets in the pink-shaded area are preferred to A.

Marginal Utility and Consumer Choice

Marginal utility (MU): Additional satisfaction obtained from consuming one additional unit of a good.

Diminishing marginal utility: Principle that as more of a good is consumed, the consumption of additional amounts will yield smaller additions to utility.

Because all points on an indifference curve generate the same level of utility, the total gain in utility associated with the increase in *F* must balance the loss due to the lower consumption of *C.* Formally,

$0 = MU_F(\Delta F) + MU_C(\Delta C)$

Now we can rearrange this equation so that

$-(\Delta C/\Delta F) = MU_F/MU_C$

But because −(_*C*/_*F*) is the MRS of *F* for *C*, it follows that

$MRS = MU_F/MU_C$ **(3.5)**

Equation (3.5) tells us that the MRS is the ratio of the marginal utility of *F* to the marginal utility of *C.* As the consumer gives up more and more of *C* to obtain more of *F*, the marginal utility of *F* falls and that of *C* increases, so MRS decreases.
We saw earlier in this chapter that when consumers maximize their satisfaction,
the MRS of *F* for *C* is equal to the ratio of the prices of the two goods:

$MRS = P_F/P_C$ **(3.6)**

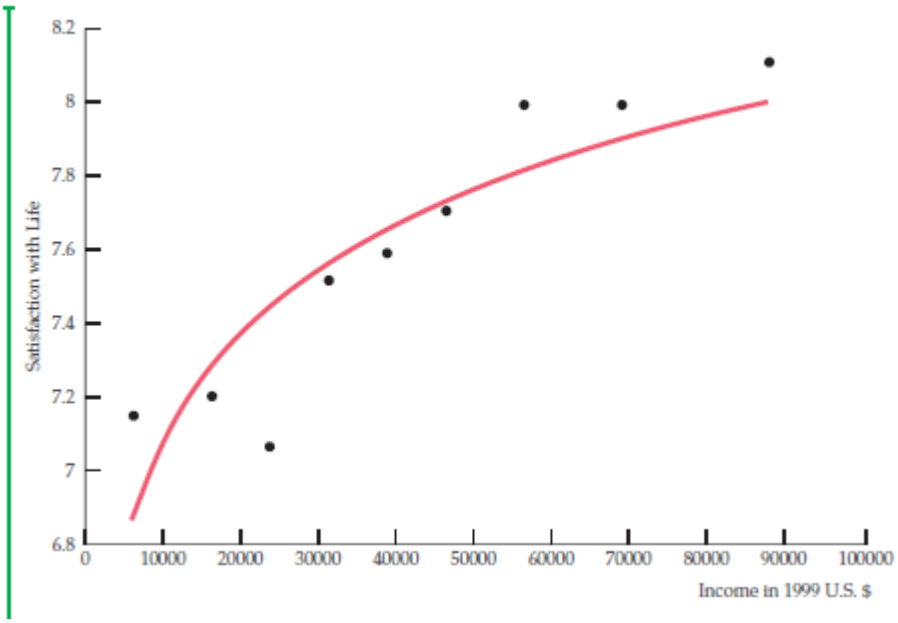
Because the MRS is also equal to the ratio of the marginal utilities of consuming
F and *C* (from equation 3.5), it follows that

$MU_F/MU_C = P_F/P_C$

or

$MU_F/P_F = MU_C/P_C$ **(3.7)**

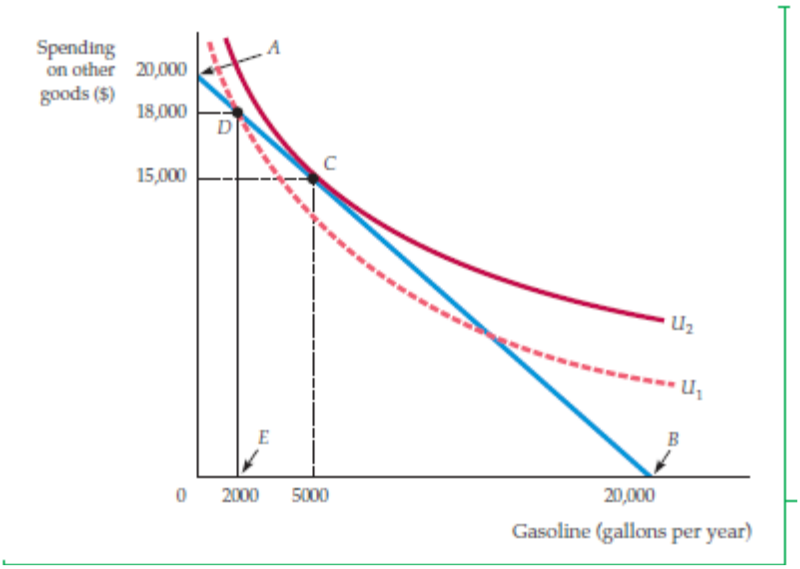
Equal marginal principle: Principle that utility is maximized when the consumer has equalized the marginal utility Rand of expenditure across all goods.



MARGINAL UTILITY AND HAPPINESS

A comparison of mean levels of satisfaction with life across income classes in the United states show that happiness increases with income but at a diminishing rate.

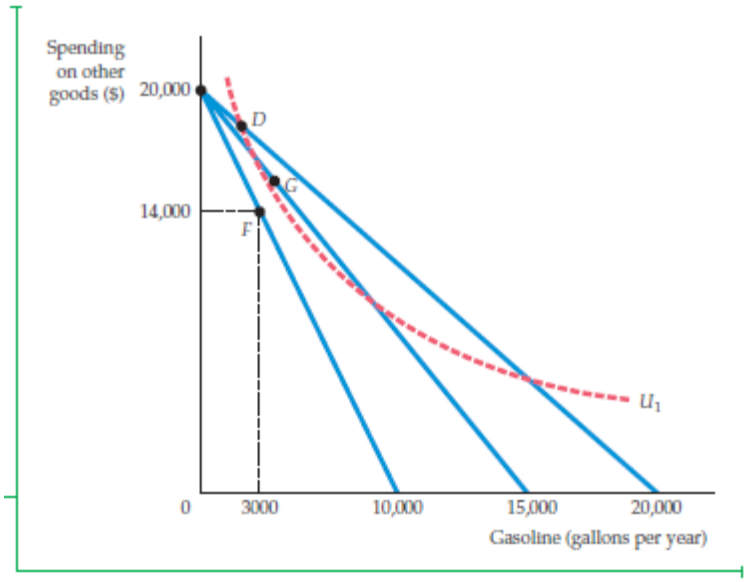
Rationing



INEFFICIENCY OF GASOLINE RATIONING

When a good is rationed, less is available than consumers would like to buy. Consumers may be worse off. Without gasoline rationing, up to 20 000 gallons of gasoline are available for consumption (at point B). The consumer chooses point C on indifference curve U2, consuming 5000 gallons of gasoline. However, with a

limit of 2000 gallons of gasoline under rationing (at point E), the consumer moves to D on the lower indifference curve U1.



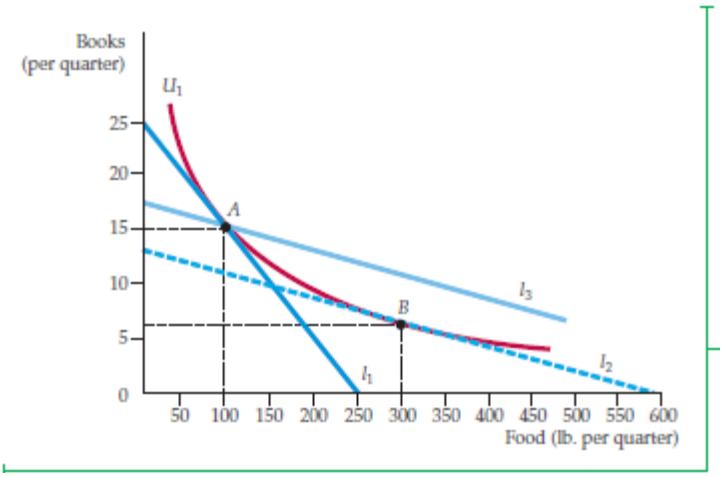
COMPARING GASOLINE RATIONING TO THE FREE MARKET

Some consumers will be worse off, but others may be better off with rationing. With rationing and a gasoline price of $1.00 she buys the maximum allowable 2000 gallons per year, putting her on indifference curve U1. Had the competitive market price been $2.00 per gallon with no rationing, she would have chosen point F, which lies below indifference curve U1. However, had the price of gasoline been only $1.33 per gallon, she would have chosen point G, which lies above indifference curve U1.

Cost-of-Living Indexes

Cost-of-living index: Ratio of the present cost of a typical bundle of consumer goods and services compared with the cost during a based period.

Producer Price Index: Accurately measures the change over time in the cost of production.



COST-OF-LIVING INDEXES

A price index, which represents the cost of buying bundle A at current prices relative to the cost of bundle A at base-year prices, overstates the ideal cost-of-living index.

Ideal cost-of-living Index

Ideal cost-of-living index: Cost of attaining a given level of utility at current prices relative to the cost of attaining the same utility at base-year prices

Laspeyres Index

Laspeyres price index: Amount of money at current year prices that an individual required to purchase a bundle of goods and services chosen in a base year divided by the cost of purchasing the same bundle at base-year prices.

COMPARING IDEAL COST-OF-LIVING AND LASPEYRES INDEXES

Figure this out in the study guide.

Paasche Index

COMPARING THE LASPEYRES AND PAASCHE INDEXES it is helpful to compare the Laspeyres and the Passche cost-of-living indexes.

- Laspeyres index: The amount of money at current prices that an individual requires to purchase the bundle of goods and services that was chosen in the base year divided by the cost of purchasing the same bundle at base-year prices.
- Paasche index: The amount of money at current-year prices that an individual requires to purchase the bundle of goods and services chosen in the current year divided by the cost of purchasing the same bundle in the base year.

Both the Laspeyres (LI) and Paasche (PI) indexes are fixed-weight indexes: The quantities of the various goods and services in each index remain unchanged. For the Laspeyres index, however, the quantities remain unchanged at base-year levels; for the Paasche they remain unchanged at current –year levels. Suppose generally that there are two goods, foods (F) and clothing (C). Let:

P_{Ft} and P_{Ct} be current-year prices
P_{Fb} and P_{Cb} be base-year prices
F_t and C_t be current-year quantities
F_b and C_b be base-year quantities

We can write the two indexes as:

$$\text{LI} = \frac{P_{Ft}F_b + P_{Ct}C_b}{P_{Fb}F_b + P_{Cb}C_b}$$

$$\text{PI} = \frac{P_{Ft}F_t + P_{Ct}C_t}{P_{Fb}F_t + P_{Cb}C_t}$$

Fixed-weight index: Cost-of-living index in which the quantities of goods and services remain unchanged.

Chain-weighted price index

Chain-weighted price index: Cost-of-living index that accounts for changes in quantities of goods and services.

Summary

1. The theory of consumer choice rests on the assumption that people behave rationally in an attempt to maximize the satisfaction that they can obtain by purchasing a particular combination of goods and services.

2. Consumer choice has two related parts: the study of the consumer's preferences and the analysis of the budget line that constrains consumer choices.

3. Consumers make choices by comparing market baskets or bundles of commodities. Preferences are assumed to be complete (consumers can compare all possible market baskets) and transitive (if they prefer basket *A* to *B*, and *B* to *C*, then they prefer *A* to *C*). In addition, economists assume that more of each good is always preferred to less.

4. Indifference curves, which represent all combinations of goods and services that give the same level of satisfaction, are downward-sloping and cannot intersect one another.

5. Consumer preferences can be completely described by a set of indifference curves known as an indifference map. An indifference map provides an ordinal ranking of all choices that the consumer might make.

6. The marginal rate of substitution (MRS) of *F* for *C* is the maximum amount of *C* that a person is willing to give up to obtain 1 additional unit of *F.* The MRS diminishes as we move down along an indifference curve. When there is a diminishing MRS, indifference curves are convex.

7. Budget lines represent all combinations of goods for which consumers expend all their income. Budget lines shift outward in response to an increase in consumer income. When the price of one good (on the horizontal axis) changes while income and the price of the other good do not, budget lines pivot and rotate about a fixed point (on the vertical axis).

8. Consumers maximize satisfaction subject to budget constraints. When a consumer maximizes satisfaction by consuming some of each of two goods, the marginal rate of substitution is equal to the ratio of the prices of the two goods being purchased.

9. Maximization is sometimes achieved at a corner solution in which one good is not consumed. In such cases, the marginal rate of substitution need not equal the ratio of the prices.

10. The theory of revealed preference shows how the choices that individuals make when prices and income vary can be used to determine their preferences. When an individual chooses basket *A* even though he or she could afford *B*, we know that *A* is preferred to *B.*

11. The theory of the consumer can be presented by two different approaches. The indifference curve approach uses the ordinal properties of utility (that is, it allows for the ranking of alternatives). The utility function approach obtains a utility function by attaching a number to each market basket; if basket
A is preferred to basket *B*, *A* generates more utility than *B.*

12. When risky choices are analyzed or when comparisons must be made among individuals, the cardinal properties of the utility function can be important. Usually the utility function will show diminishing marginal utility: As more and more of a good is consumed, the consumer obtains smaller and smaller increments of utility.

13. When the utility function approach is used and both goods are consumed, utility maximization occurs when the ratio of the marginal utilities of the two goods (which is the marginal rate of substitution) is equal to the ratio of the prices.

14. In times of war and other crises, governments sometimes ration food, gasoline, and other products, rather than allow prices to increase to competitive levels.
Some consider nonprice rationing to be more equitable than relying on uncontested market forces.

15. An ideal cost-of-living index measures the cost of buying, at current prices, a bundle of goods that generates the same level of *utility* as was provided by the bundle of goods consumed at base-year prices. The Laspeyres price index, however, represents the cost of buying the bundle of goods chosen in the base year at current prices relative to the cost of buying *the same bundle* at base-year prices. The CPI, even with chain weighting, overstates the ideal cost-of-living index. By contrast, the Paasche index measures the cost at current-year prices of buying a bundle of goods chosen in the current year divided by the cost of buying the same bundle at base-year prices. It thus understates the ideal cost-of-living index.

3.1 (41112)

1. A curve that represents all combinations or market baskets that provide the same level of utility to a consumer is called isoquant. True or False

2. If indifference curves cross, then the assumption of a diminishing marginal rate of substitution is violated. True or False

Which of the following is NOT an assumption regarding people's preferences in the theory of consumer behaviour?

1. Preferences are complete
2. Preferences are transitive
3. Consumers prefer more of a good to less
4. All of the above are basic assumptions about consumer preferences

The assumption of transitive preferences implies that indifference curves must: Not cross one another.

If a market basket is changed by adding more of at least one good, then rational consumers will: rank the market basket more highly after the change.

A consumer prefers market basket A to market basket B, and prefers market basket B to market basket C. Therefore, A is preferred to C. The assumption that leads to this conclusion is: Transitivity

The slope of an indifference curve reveals: the marginal rate of substitution of one good for another good.

3.2 (13334)

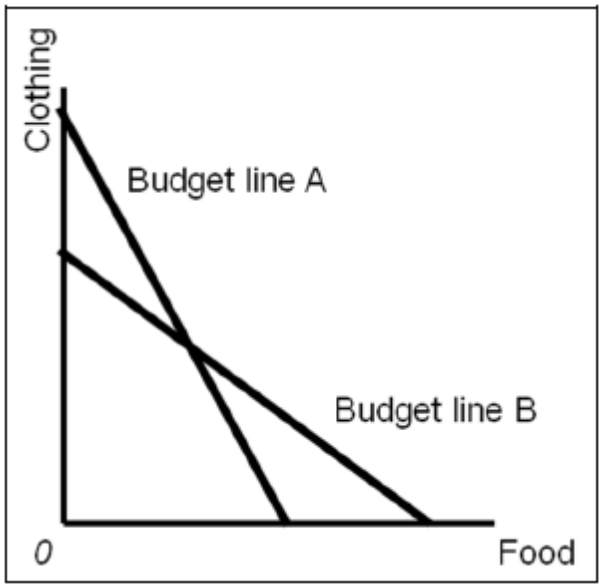
1. An increase in income, holding prices constant, can be represented as a change in the slope of the budget line. True of False
2. If prices and income in a two-good society double, there will be no effect on the budget line. True of False

A consumer has R100.00 per day to spend on product A, which has a unit price of R7.00, and product B, which has a unit price of R15.00. What is the slope of the budget line if good A is on the horizontal axis and good B is on the vertical axis?

1. -7/15
2. -7/100
3. -15/7
4. 7/15

Suppose that the prices of good A and good B were to suddenly doubled. If good A is plotted along the horizontal axis,

1. The budget line will come steeper.
2. The budget line will become flatter.
3. The slope of the budget line will not change
4. The slope of the budget line will change, but in an indeterminate way



Theodore's budget line has changed from A to B (above). Which of the following explains the change in Theodore's budget line?

1. The price of food and the price of clothing increased
2. The price of food increased, and the price of clothing decreased
3. The price of food decreased, and the price of clothing increased.
4. The price of food and the price of clothing decreased
5. None of the above

If the quantity of good A (Qa) is plotted along the horizontal axis, the quantity of good B (Qb) is plotted along the vertical axis, the price of good A is Pa, the price of B is Pb and the consumer's income is 1, then the slope of the consumer's budget constraint is

1. –Qa/Qb
2. –Qb/Qa
3. –Pa/Pb
4. –Pb/Pa
5. 1/Pa or 1/Pb

The endpoints (horizontal and vertical intercepts) of the budget line:

1. Measure its slope
2. Measure the rate at which one good can be substituted for another.
3. Measure the rate at which a consumer is willing to trade one good for another.
4. Represent the quantity of each good that could be purchases if all of the budget were allocated to that good.
5. Indicate the highest level of satisfaction the consumer can achieve.

3.3 (32441)

A consumer maximises satisfaction at the point where his valuation of good X, measured as the amount of good Y he would willingly give up to obtain an additional unit of X, equals:

1. The magnitude of the slope of the indifference curve through that point
2. One over the magnitude of the slope of the indifference curve through that point.
3. Px/Py
4. Py/Px

Pencils sell for 10 cents and pens sell for 50 cents. Suppose Jack, whose preferences satisfy all of the basic assumptions, buys 5 pens and one pencil each semester. With this consumption bundle, his MRS of pencils for pens is 3. Which of the following true?

1. Jack could increase his utility by buying more pens and fewer pencils.
2. Jack could increase his utility by buying more pencils and fewer pens.
3. Jack could increase his utility by buying more pencils and more pens.
4. Jack could increase his utility by buying fewer pencils and fewer pens
5. Jack is at a corner solution and is maximising his utility

An individual consumes only two goods, X and Y. Which of the following expressions represents the utility maximising market basket?

1. MRSxy is at a maximum
2. Px/Py = money income
3. MRSxy = money income
4. MRSxy = Px/Py
5. All of the above

The fact that Alice spends no money on travel:

1. Implies that she does not derive any satisfaction from travel.
2. Implies that she is at a corner solution.
3. Implies that her MRS does not equal the price ratio
4. Any of the above

The price of lemonade is R0.50, the price or popcorn is R1.00. if Fred has maximised his utility by purchasing lemonade and popcorn, his marginal rate of substitution will be:

1. 2 lemonades for each popcorn.
2. 1 lemonade for each popcorn
3. ½ lemonade for each popcorn
4. Indeterminate unless more information on Fred's marginal utilities is provided

3.5 (24)

Marginal utility measures:

1. The slope of the indifference curve.
2. The additional satisfaction from consuming one more unit of a good.
3. The slope of the budget line
4. The marginal rate of substitution.
5. None of the above

When someone consumes two goods (A and B), that person's utility is maximised when the budget is allocated such that:

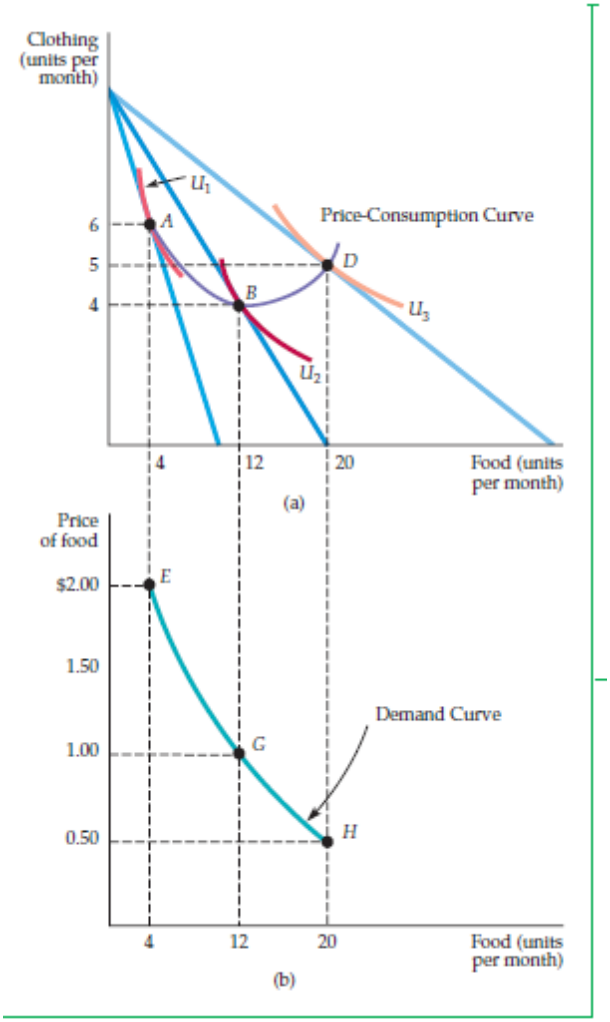
1. The marginal utility of A equals the marginal utility of B.
2. The marginal utility of A times the price of A equals the marginal utility of B times the price of B.
3. The ratio of total utility of A to the price of A equals the ratio of the marginal utility of B to the price of A
4. The ratio of the marginal utility of A to the price of A equals the ratio of the marginal utility of B to the price of B

Learning Unit 4: Individual and market demand

The Individual demand curve

Price-consumption curve: Curve tracing the utility-maximizing combinations of two goods as the price of one changes

Individual demand curve: Curve relating the quantity of a good that a single consumer will buy to its price.

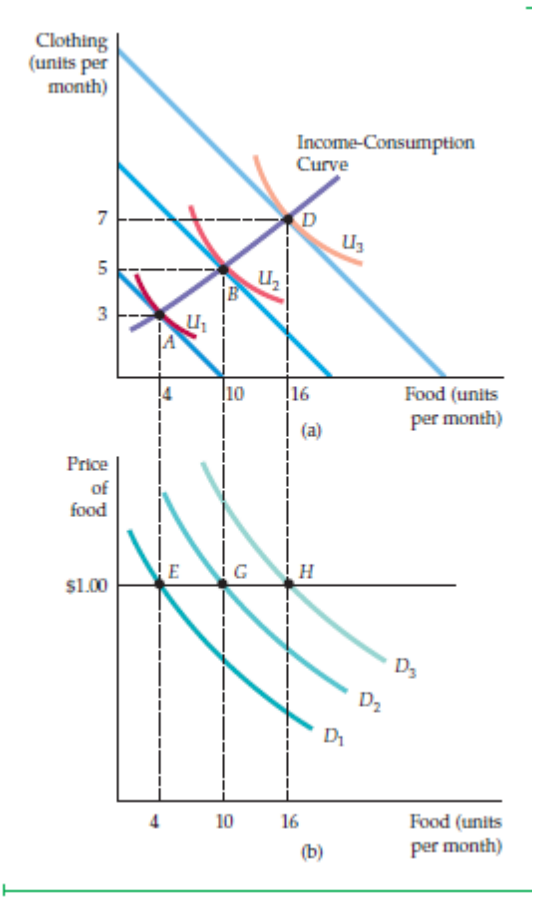


EFFECT OF PRICE CHANGES

A reduction in the price of food, with income and the price of clothing fixed, causes this consumer to choose a different market basket. In (a), the baskets that maximize utility for various prices of food (point *A*, $2; *B*, $1; *D*, $0.50) trace out the price-consumption curve. Part (b) gives the demand curve, which relates the price of food to the quantity demanded. (Points *E, G*, and *H* correspond to points *A, B*, and *D*, respectively).

Income changes

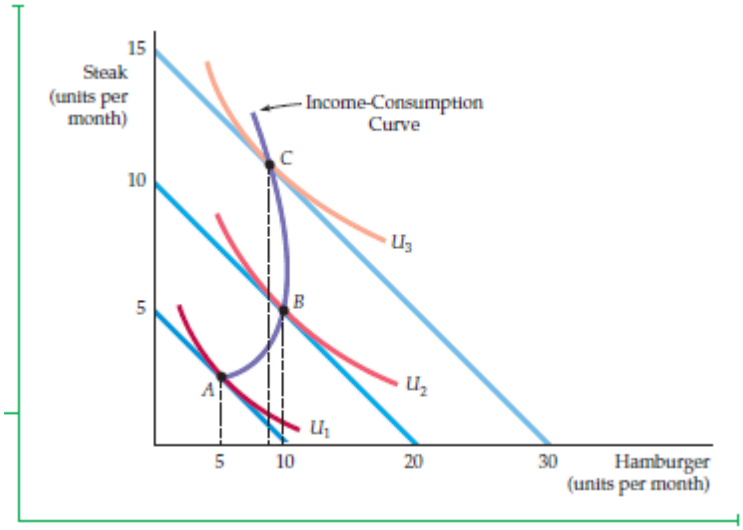
Income-consumption curve: Curve tracing the utility maximizing combinations of two goods as a consumer's income changes



EFFECT OF INCOME CHANGES

An increase in income, with the prices of all goods fixed, causes consumers to alter their choice of market baskets. In part (a), the baskets that maximize consumer satisfaction for various incomes (point *A*, $10; *B*, $20; *D*, $30) trace out the income-consumption curve. The shift to the right of the demand curve in response to the increases in income is shown in part (b). (Points *E, G*, and *H* correspond to points *A, B*, and *D*, respectively.)

Normative versus inferior goods

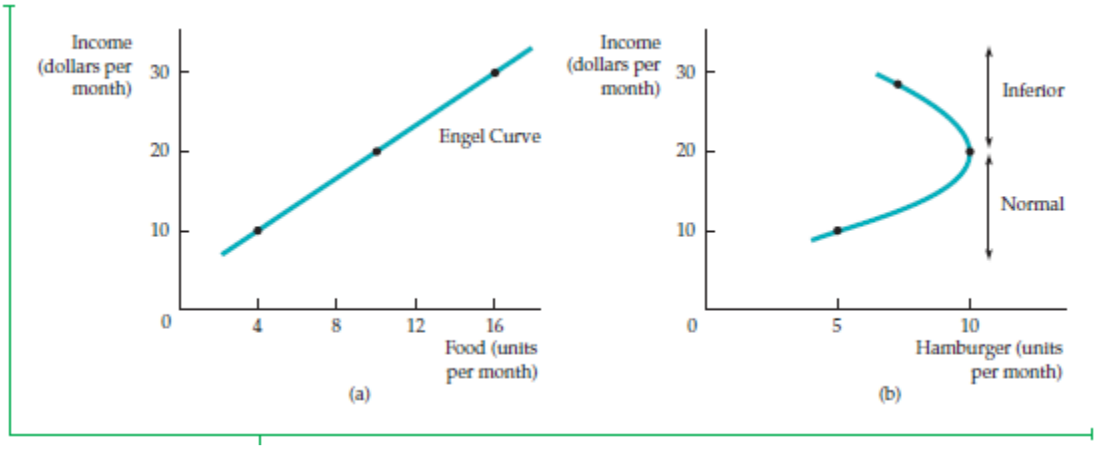


AN INFERIOR GOOD

An increase in a person's income can lead to less consumption of one of the two goods being purchased. Here, hamburger, though a normal good between *A* and *B*, becomes an inferior good when the income-consumption curve bends backward between *B* and *C*.

Engel curves

Engel curve: curve relating the quantity of a good consumed to income.



ENGEL CURVES

Engel curves relate the quantity of a good consumed to income. In (a), food is a normal good and the Engel curve is upward sloping. In (b), however, hamburger is a normal good for income less than $20 per month and an inferior good for income greater than $20 per month.

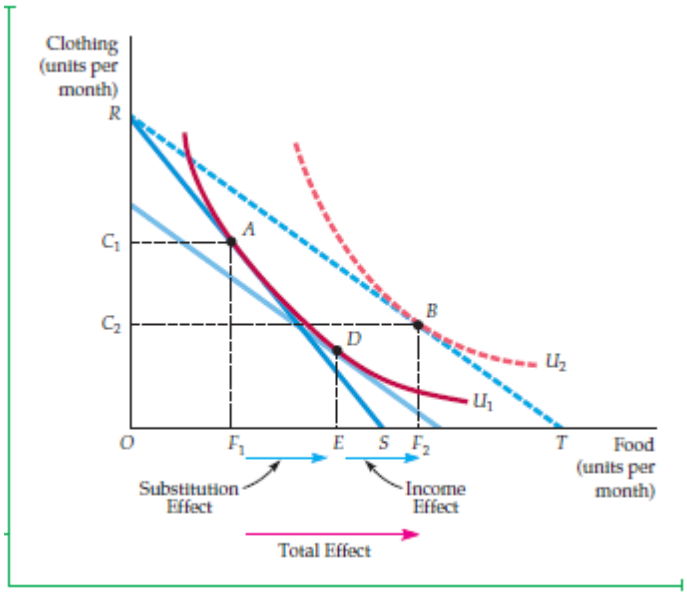
Substitutes and complements

Income and substitution effects

A fall in the price of a good has two effects:

1. *Consumers will tend to buy more of the good that has become cheaper and less of those goods that are now relatively more expensive*. This response to a change in the relative prices of goods is called the *substitution effect.*

2. *Because one of the goods is now cheaper, consumers enjoy an increase in real purchasing power*. They are better off because they can buy the same amount of the good for less money, and thus have money left over for additional purchases. The change in demand resulting from this change in real purchasing power is called the *income effect.*



INCOME AND SUBSTITUTION EFFECT: NORMAL GOOD

A decrease in the price of food has both an income effect and a substitution effect. The consumer is initially at *A*, on budget line *RS.* When the price of food falls, consumption increases by F_1F_2 as the consumer moves to *B.* The substitution effect F_1E (associated with a move from *A* to *D*) changes the relative prices of food and clothing but keeps real income (satisfaction) constant. The income effect EF_2 (associated with a move from *D* to *B*) keeps relative prices constant but increases purchasing power. Food is a normal good because the income effect EF_2 is positive.

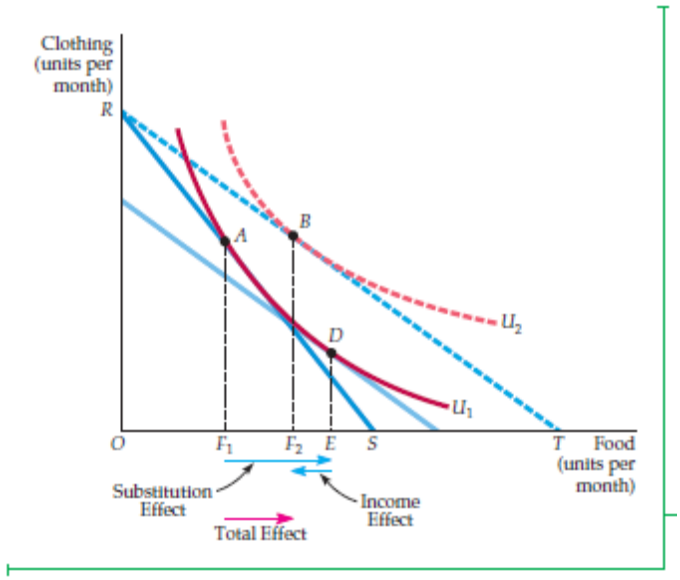
Substitution effect

Substitution effect: Change in consumption of a good associated with a change in its price, with the level of utility held constant.

Income effect

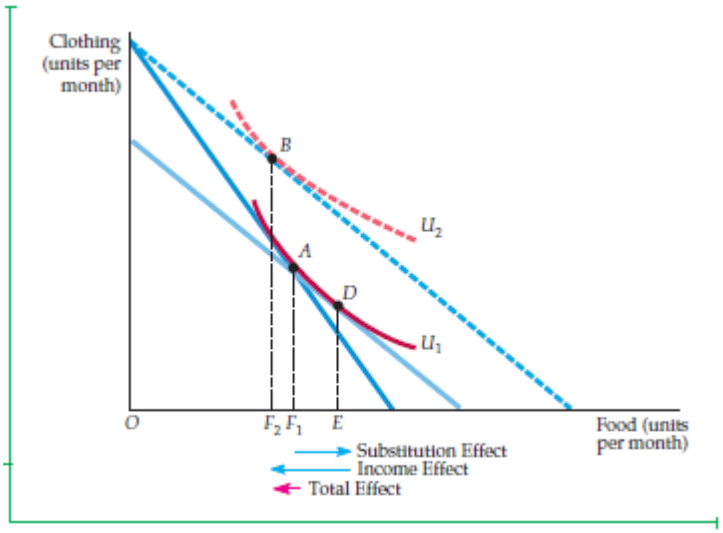
Income effect: change in consumption of a good resulting from an increase in purchasing power, with relative prices held constant.

Inferior good: a good that has a negative income effect.



INCOME AND SUBSTITUTION EFFECTS: INFERIOR GOOD

The consumer is initially at *A* on budget line *RS.* With a decrease in the price of food, the consumer moves to *B.* The resulting change in food purchased can be broken down into a substitution effect, F_1E (associated with a move from *A* to *D*), and an income effect, EF_2 (associated with a move from *D* to *B*). In this case, food is an inferior good because the income effect is negative. However, because the substitution effect exceeds the income effect, the decrease in the price of food leads to an increase in the quantity of food demanded.



UPWARD-SLOPING DEMAND CURVE: THE GIFFEN GOOD

When food is an inferior good, and when the income effect is large enough to dominate

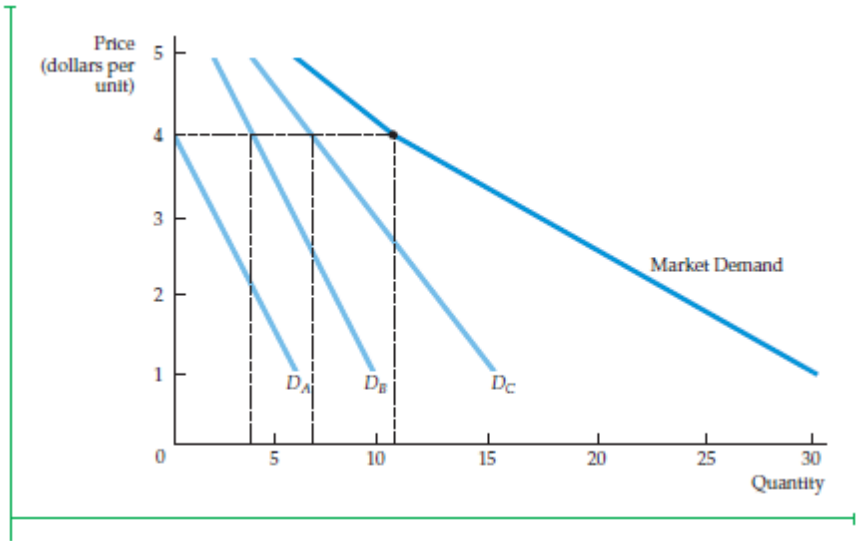
the substitution effect, the demand curve will be upward-sloping. The consumer is initially at point *A*, but, after the price of food falls, moves to *B* and consumes less food. Because the income effect EF_2 is larger than the substitution effect F_1E, the decrease in the price of food leads to a lower quantity of food demanded.

A Special Case: The Giffen Good

Giffen good: Good whose demand curve slopes upwards because the (negative) income effect is larger than the substitution effect.

Market Demand

Market demand curve: Curve relating the quantity of a good that all consumers in a market will buy to its price.



SUMMING TO OBTAIN A MARKET DEMAND CURVE

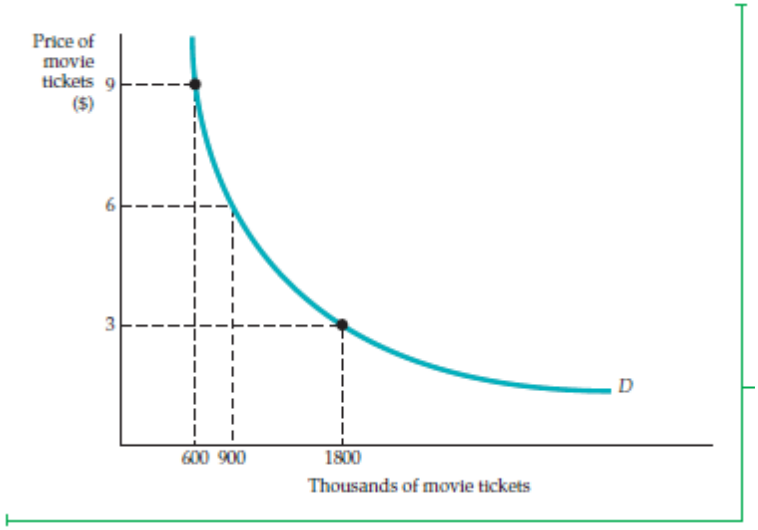
The market demand curve is obtained by summing our three consumers' demand curves D_A, D_B, and D_C. At each price, the quantity of coffee demanded by the market is the sum of the quantities demanded by each consumer. At a price of $4, for example, the quantity demanded by the market (11 units) is the sum of the quantity demanded by *A* (no units), *B* (4 units), and *C* (7 units).

Two points should be noted as a result of this analysis:

1. *The market demand curve will shift to the right as more consumers enter the market.*
2. *Factors that influence the demands of many consumers will also affect market demand.* Suppose, for example, that most consumers in a particular market earn more income and, as a result, increase their demands for coffee. Because each consumer's demand curve shifts to the right, so will the market demand curve.

Inelastic demand: when demand is inelastic(i.e., Ep is less than 1 in absolute value), the quantity demanded is relatively unresponsive to changes in price.

Elastic demand: in contrast, when demand is elastic (Ep is greater than 1 in absolute value), total expenditure on the product decreases as the price goes up.



UNIT-ELASTIC DEMAND CURVE

When the price elasticity of demand is −1.0 at every price, the total expenditure is constant along the demand curve *D.*

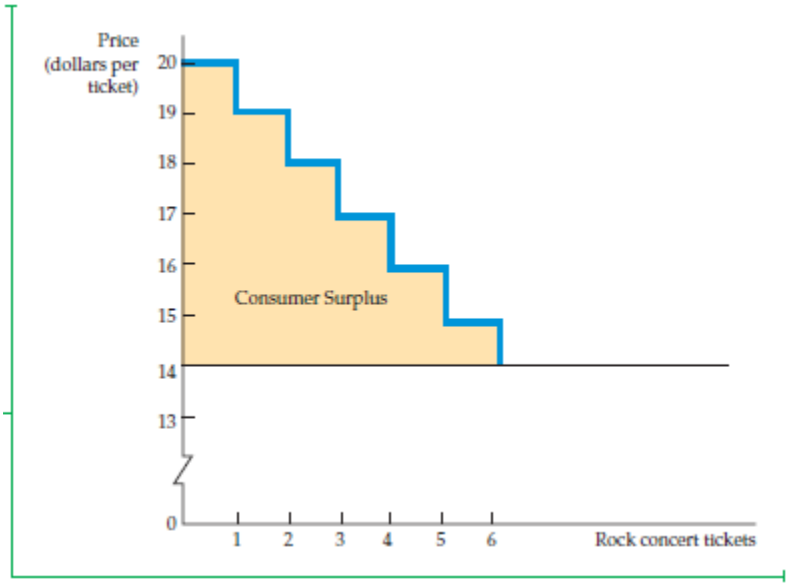
Isoelastic demand curve: Demand curve with a constant price elasticity

Speculative Demand

Speculative demand: Demand driven not by the direct benefits one obtains from owning or consuming a good but instead by an expectation that the price of the good will increase.

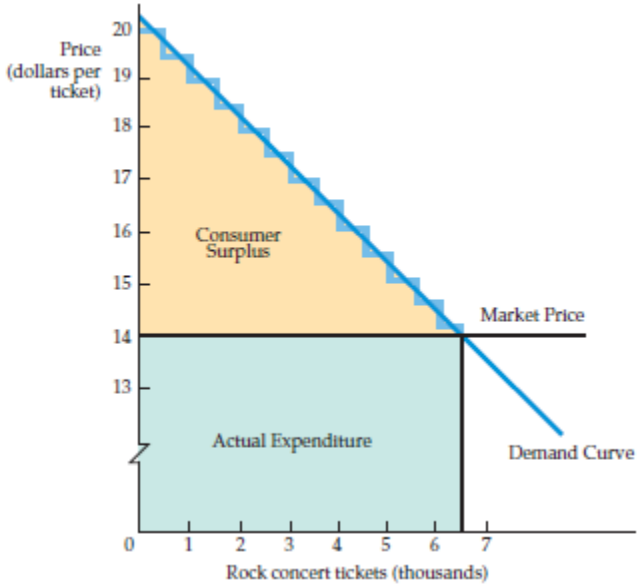
Consumer surplus

Consumer surplus: Difference between what a consumer is willing to pay for a good and the amount actually paid.



CONSUMER SURPLUS

Consumer surplus is the total benefit from the consumption of a product, less the total cost of purchasing it. Here, the consumer surplus associated with six concert tickets (purchased at $14 per ticket) is given by the yellow-shaded area.



CONSUMER SURPLUS GENERALIZED

For the market as a whole, consumer surplus is measured by the area under the demand curve and above the line representing the purchase price of the good. Here, the consumer surplus is given by the yellow-shaded triangle and is equal to 1/2 _ ($20 _ $14) _ 6500 _

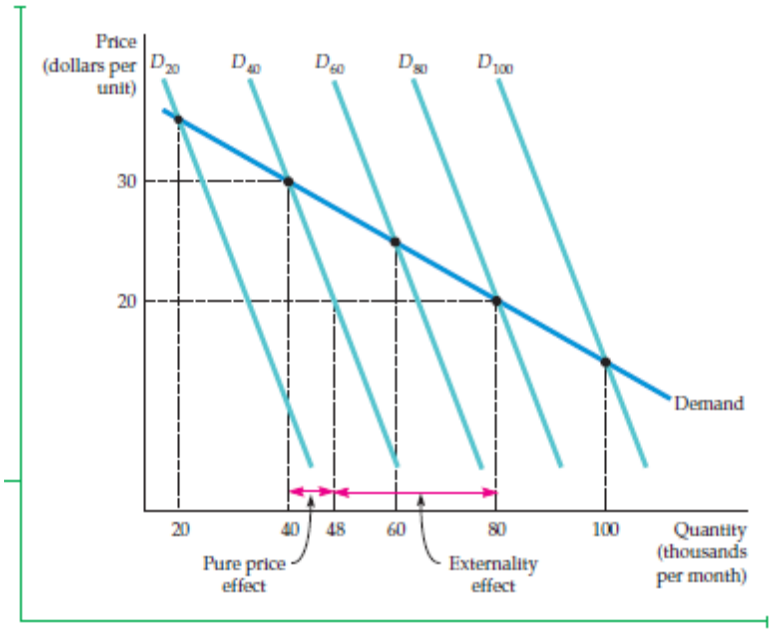
$19,500.

Network Externalitites

Network externality: Situation in which each individual's demand depends on the purchases of other individuals.

Positive Network Externalities

Bandwagon effect: Positive network externality in which a consumer wishes to possess a good in part because others do.

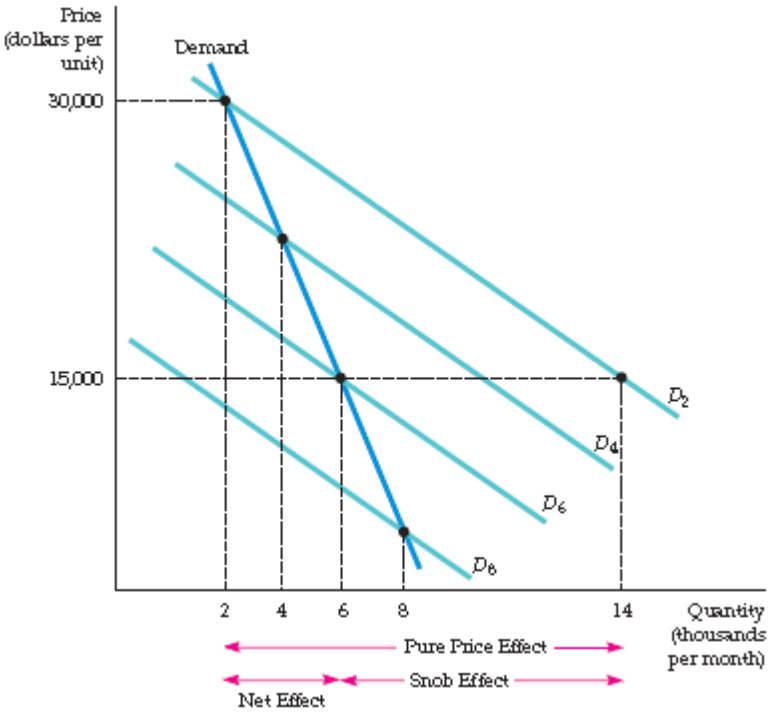


POSITIVE NETWORK EXTERNALITY

With a positive network externality, the quantity of a good that an individual demands grows in response to the growth of purchases by other individuals. Here, as the price of the product falls from $30 to $20, the positive externality causes the demand for the good to shift to the right, from D_{40} to D_{80}.

Negative Network Externalities

Snob effect: negative network externality in which a consumer wishes to own an exclusive or unique good.



NEGATIVE NETWORK EXTERNALITY: SNOB EFFECT

The snob effect is a negative network externality in which the quantity of a good that an individual demands falls in response to the growth of purchases by other individuals. Here, as the price falls from $30,000 to $15,000 and more people buy the good, the snob effect causes the demand for the good to shift to the left, from D_2 to D_6.

Empirical estimation of demand

The statistical approach to demand estimation

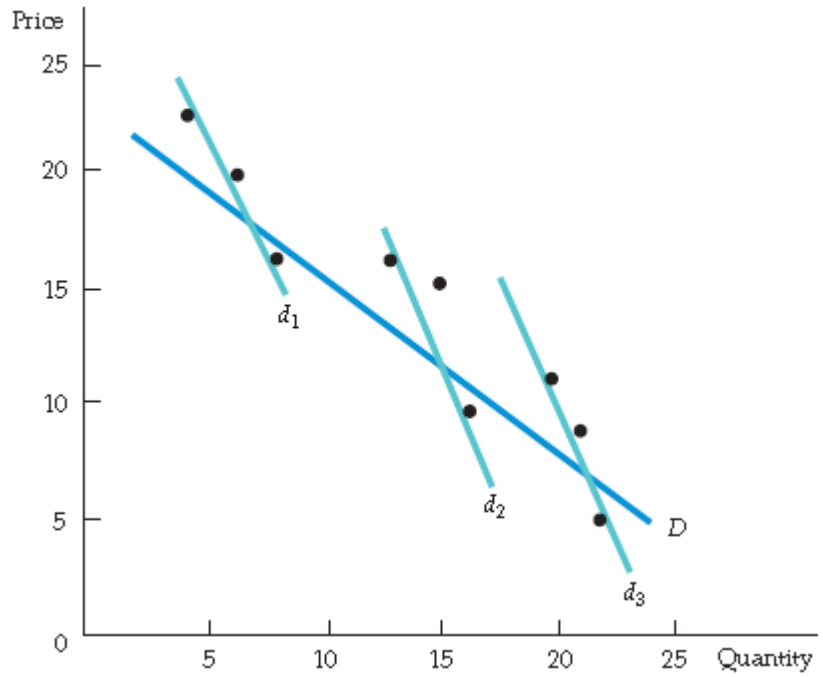
The linear demand curve would be described algebraically as

$Q = a - bP + cI$

The form of the Demand Relationship

Because the demand relationships discussed above are straight lines, the effect of a change in price on quantity demanded in constant. However, the price elasticity of demand varies with the price level. For the demand equation $Q = a - bP$, for example, the price elasticity of E_P is

$E_P = (\_Q/\_P)(P/Q) = -b(P/Q)$



ESTIMATING DEMAND

Price and quantity data can be used to determine the form of a demand relationship. But the same data could describe a single demand curve *D* or three demand curves d_1, d_2, and d_3 that shift over time.

There is no reason to expect elasticities of demand to be constant. Nevertheless, we often find it useful to work with the *isoelastic demand curve*, in which the price elasticity and the income elasticity are constant. When written in its *log-linear form*, the isoelastic demand curve appears as follows:
$\log(Q) = a - b \log(P) + c \log(I)$

Learning Unit 5: Uncertainty and consumer behaviour

Describing risk

Probability: likelihood that a given outcome will occur.

Expected value: probability weighted average of the payoffs associated with all possible outcomes

Payoff: value associated with a possible outcome

More generally, if there are two possible outcomes having payoffs X_1 and X_2 and if the probabilities of each outcome are given by Pr_1 and Pr_2, then the expected value is

$E(X) = Pr_1X_1 + Pr_2X_2$

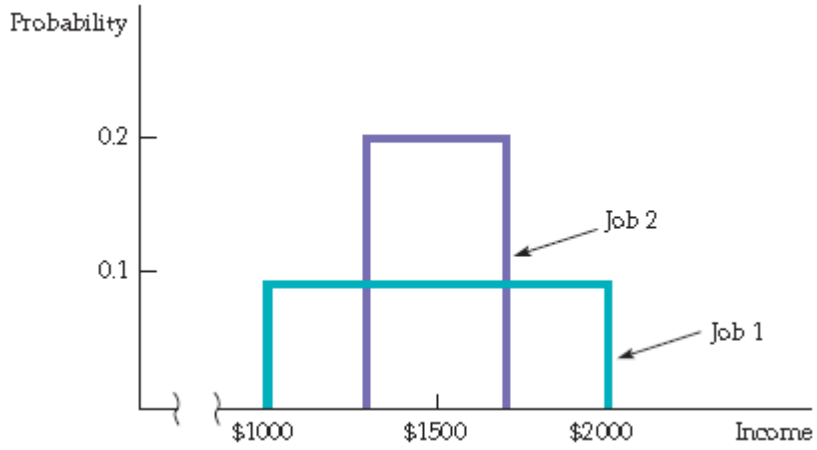
When there are n possible outcomes, the expected value becomes
$E(X) = Pr_1X_1 + Pr_2X_2 + c + Pr_nX_n$

Variability

Variability: Extent to which possible outcomes of an uncertain event differ.

Deviation: difference between expected payoff and actual payoff.

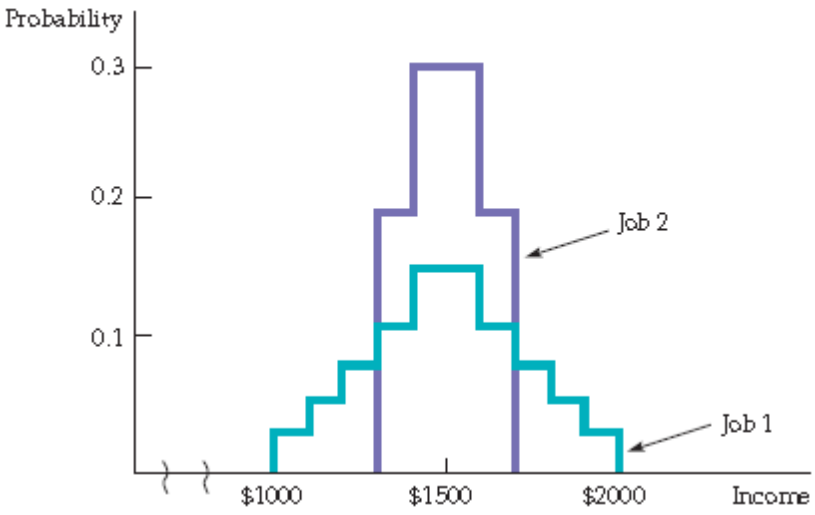
Standard deviation: Square root of the weighted average of the squares of the deviations of the payoffs associated with each outcome from their expected values.



OUTCOME PROBABILITIES FOR TWO JOBS

The distribution of payoffs associated with Job 1 has a greater spread and a greater standard deviation than the distribution of payoffs associated with Job 2. Both distributions are flat because all outcomes are equally likely.

Decision making



UNEQUAL PROBABILITY OUTCOMES

The distribution of payoffs associated with Job 1 has a greater spread and a greater standard deviation than the distribution of payoffs associated with Job 2. Both distributions are peaked because the extreme payoffs are less likely than those near the middle of the distribution.

Preferences Toward Risk

Expected utility: Sum of the utilities associated with all possible outcomes, weighted by the probability that each outcome will occur.

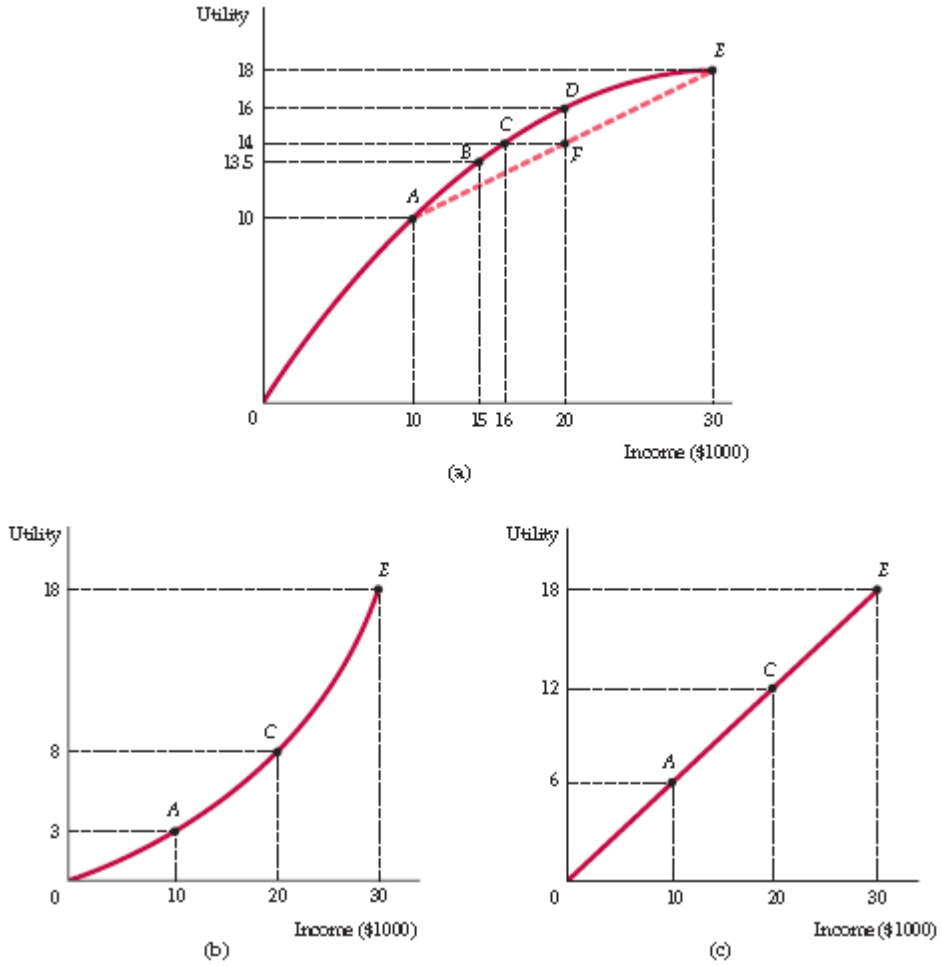
Different preferences Toward Risk

Risk averse: condition of preferring a certain income to a risky income with the same expected value.

Risk neutral: condition of being indifferent between a certain income and an uncertain income with the same expected value.

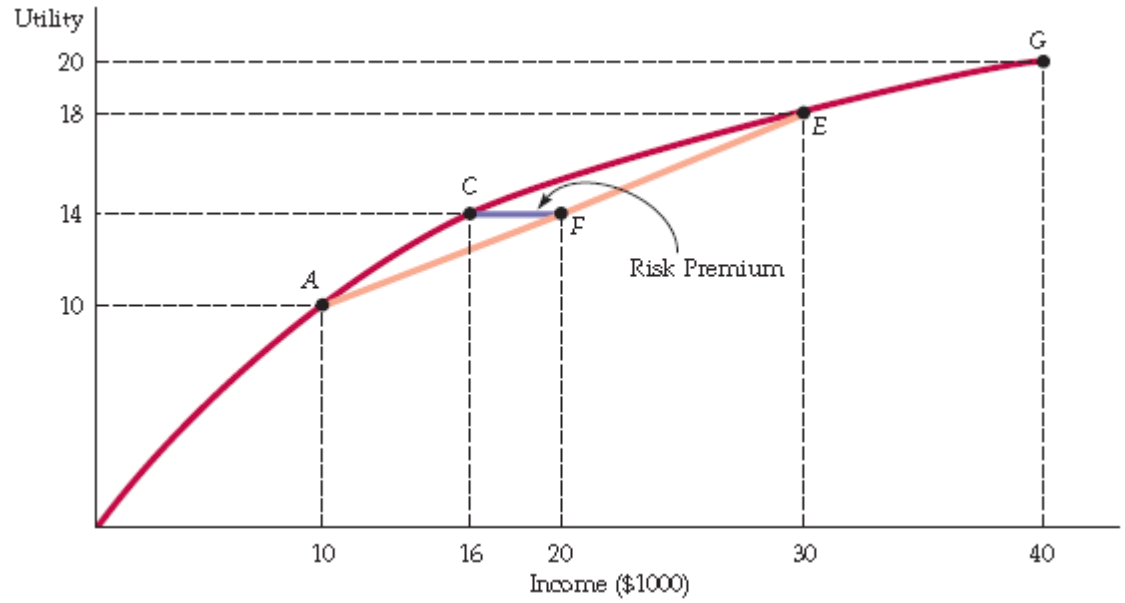
Risk loving: Condition of preferring a risky income to a certain income with the same expected value.

Risk premium: Maximum amount of money that a risk-averse person will pay to avoid taking a risk.



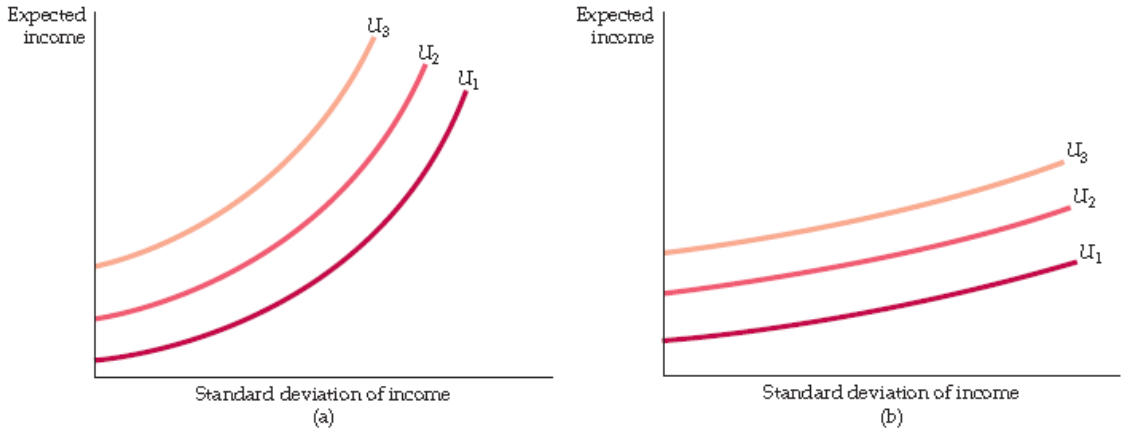
RISK AVERSE, RISK LOVING, AND RISK NEUTRAL

People differ in their preferences toward risk. In (a), a consumer's marginal utility diminishes as income increases.
The consumer is risk averse because she would prefer a certain income of $20,000 (with a utility of 16) to a gamble with a .5 probability of $10,000 and a .5 probability of $30,000 (and expected utility of 14). In (b), the consumer is risk loving: She would prefer the same gamble (with expected utility of 10.5) to the certain income (with a utility of 8). Finally, the consumer in (c) is risk neutral and indifferent between certain and uncertain events with the same expected income.



RISK PREMIUM

The risk premium, *CF*, measures the amount of income that an individual would give up to leave her indifferent between a risky choice and a certain one. Here, the risk premium is $4000 because a certain income of $16,000 (at point *C*) gives her the same expected utility (14) as the uncertain income (a .5 probability of being at point *A* and a .5 probability of being at point *E*) that has an expected value of $20,000.



RISK AVERSION AND INDIFFERENCE CURVES

Part (a) applies to a person who is highly risk averse: An increase in this individual's standard deviation of income requires a large increase in expected income if he or she is to remain equally well off. Part (b) applies to a person who is only slightly risk averse: An increase in the standard deviation of income requires only a small increase in expected income if he or she is to remain equally well off.

Reducing Risk

Diversification

Diversification: Practice of reducing risk by allocating resources to a variety of activities whose outcomes are not closely related.

Negatively correlated variables: Variables having a tendency to move in opposite directions.

Mutual fund: Organization that pools funds of individual investors to buy a large number of different stocks or other financial assets.

Positively correlated variables: Variables having a tendency to move in the same direction.

Actuarially fair: Characterising a situation in which an insurance premium is equal to the expected payout.

The value of information

Value of complete information: Difference between the expected value of a choice when there is complete information and the expected value when information is incomplete.

The Demand for Risky Assets

Asset: Something that provides a flow of money or service to its owner.

Risky asset: Asset that provides an uncertain flow of money or services to its owner

Riskless (or risk-free) asset: Asset that provides a flow of money or services that is known with certainty.

Return: Total monetary flow of an asset as a fraction of its price

Real return: Simple (or nominal) return on an asset, less the rate of inflation.

Expected return: Return that an asset should earn on average

Actual return: Return that an asset earns.

The Trade-Off Between Risk and Return

THE INVESTMENT PORTFOLIO To determine how much money the investor should put in each asset, let's set b equal to the fraction of her savings placed in the stock market and $(1 - b)$ the fraction used to purchase Treasury bills. The expected return on her total portfolio, R_p, is a weighted average of the expected return on the two assets:

$$R_p = bR_m + (1 - b)R_f$$

The Investor's Choice Problem

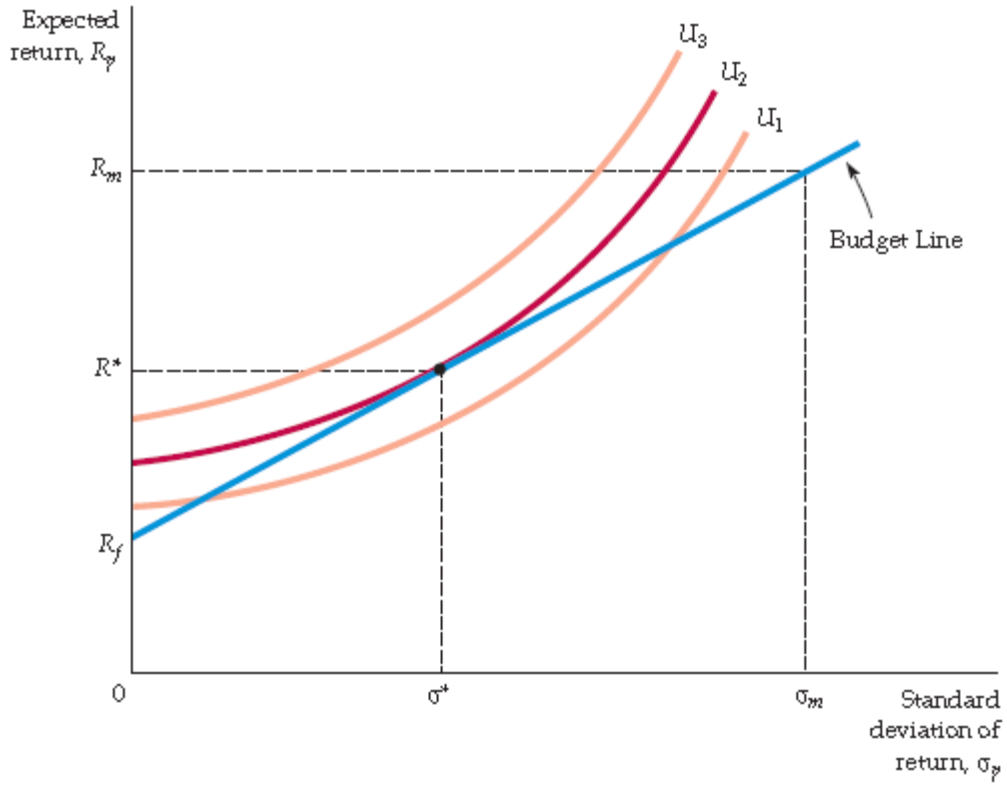
We have still not determined how the investor should choose this fraction b. To do so, we must first show that she faces a risk-return trade-off analogous to a consumer's budget line. To identify this trade-off, note that equation (5.1) for the expected return on the portfolio can be rewritten as

$$R_p = R_f + b(R_m - R_f)$$

Now, from equation (5.2) we see that $b = \sigma_p / \sigma_m$, so that

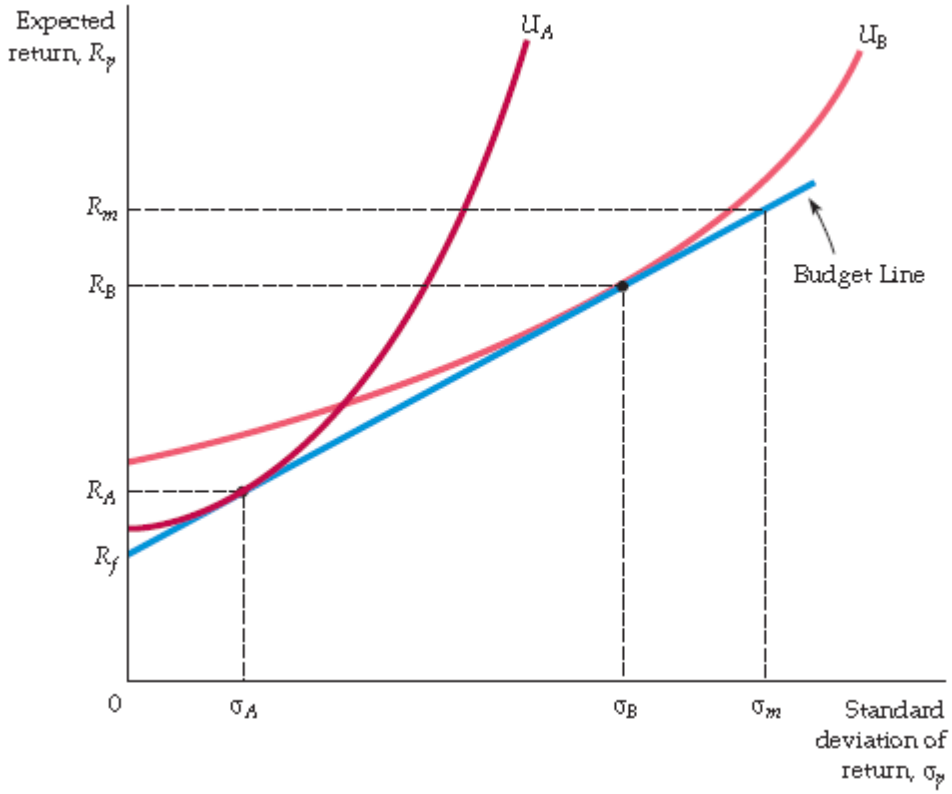
$$R_p = R_f + \frac{(R_m - R_f)}{\sigma_m}\sigma_p$$

Price of risk: Extra risk that an investor must incur to enjoy a higher expected return.



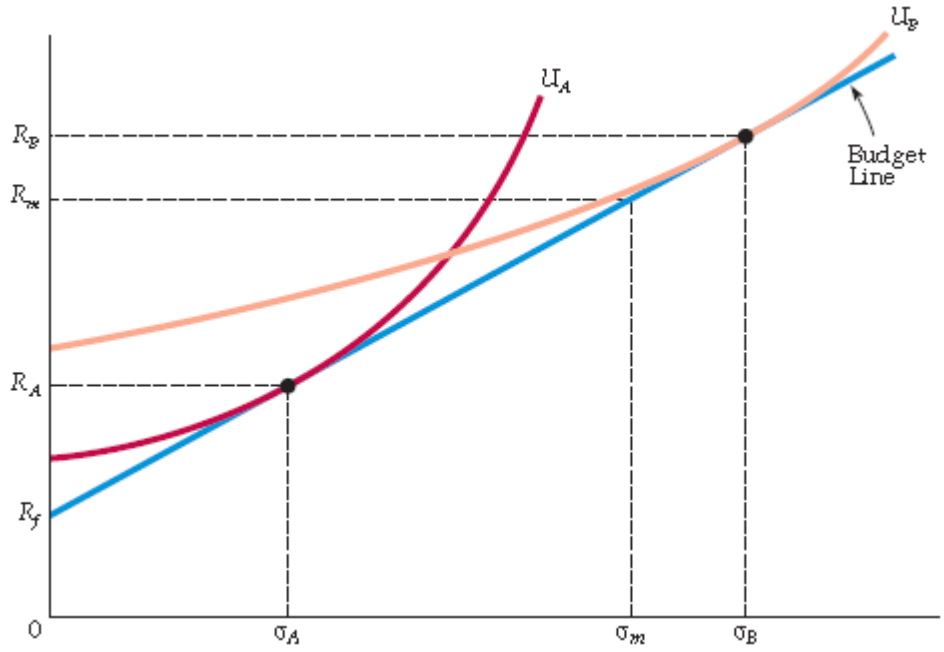
CHOOSING BETWEEN RISK AND RETURN

An investor is dividing her funds between two assets—Treasury bills, which are risk free, and stocks. The budget line describes the trade-off between the expected return and its riskiness, as measured by the standard deviation of the return. The slope of the budget line is $(R_m - R_f)/\sigma_m$, which is the price of risk. Three indifference curves are drawn, each showing combinations of risk and return that leave an investor equally satisfied. The curves are upward-sloping because a risk-averse investor will require a higher expected return if she is to bear a greater amount of risk. The utility-maximizing investment portfolio is at the point where indifference curve U_2 is tangent to the budget line.



THE CHOICES OF TWO DIFFERENT INVESTORS

Investor *A* is highly risk averse. Because his portfolio will consist mostly of the risk-free asset, his expected return R_A will be only slightly greater than the risk-free return. His risk $\_{A}$, however, will be small. Investor *B* is less risk averse. She will invest a large fraction of her funds in stocks. Although the expected return on her portfolio R_B will be larger, it will also be riskier.



BUYING STOCKS ON MARGIN

Because Investor *A* is risk averse, his portfolio contains a mixture of stocks and risk-free Treasury bills. Investor *B*, however, has a very low degree of risk aversion. Her indifference curve, U_B, is tangent to the budget line at a point where the expected return and standard deviation for her portfolio exceed those for the stock market overall. This implies that she would like to invest *more* than 100 percent of her wealth in the stock market. She does so by buying stocks *on margin*—i.e., by borrowing from a brokerage firm to help finance her investment.

Bubbles

Bubble: An increase in the price of a good based not on the fundamentals of demand or value, but instead on a belief that the price will keep going up.

Informational cascade: An assessment (e.g., of an investment opportunity) based in part on the action of others, which in turn were based on the actions of others.

Reference Points and Consumer Preferences

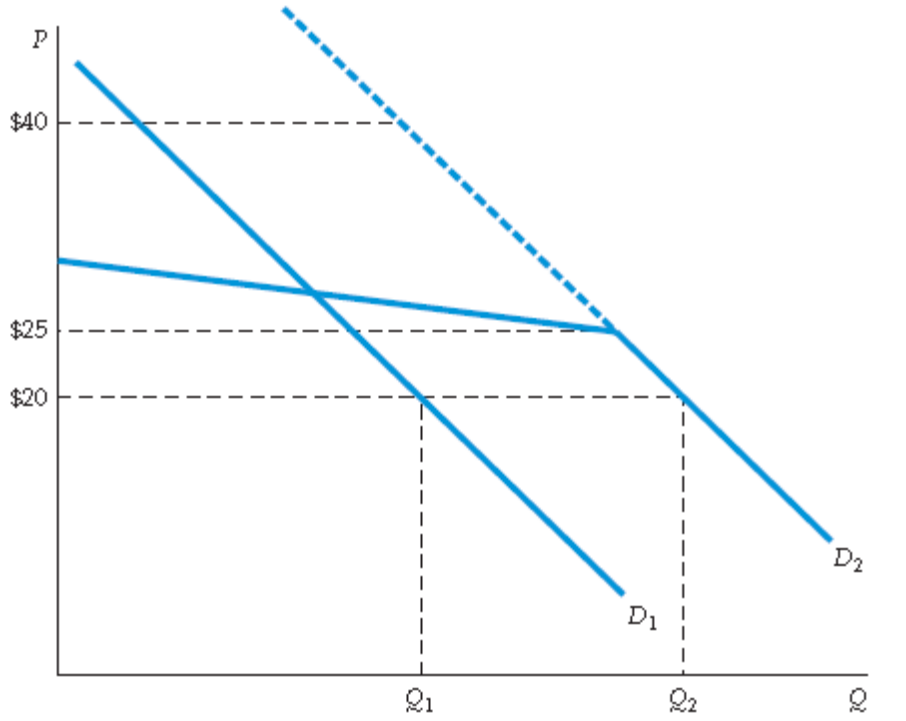
Reference point: The point from which an individual makes a consumption decision.

Endowment effect: Tendency of individuals to value an item more when they own it than when they do not.

Loss aversion: Tendency for individuals to prefer avoiding losses over acquiring gains.

Framing: Tendency to rely on the context in which a choice is described when making a decision.

Fairness



DEMAND FOR SNOW SHOVELS

Demand curve D_1 applies during normal weather. Stores have been charging $20 and sell Q_1 shovels per month. When a snowstorm hits, the demand curve shifts to the right. Had the price remained $20, the quantity demanded would have increased to Q_2. But the new demand curve (D_2) does not extend up as far as the old one. Consumers view an increase in price to, say, $25 as fair, but an increase much above that as unfair gouging. The new demand curve is very elastic at prices above $25, and no shovels can be sold at a price much above $30.

Rules of Thumb and Biases in Decision Making

Anchoring: Tendency to rely heavily on one prior (suggested) piece of information when making a decision.

Law of small numbers: Tendency to overstate the probability that a certain event will occur then faced with relatively little information.

Learning Unit 6: Production

The Production Decisions of a Firm

The production decisions of firms are analogous to the purchasing decisions of consumers, and can likewise be understood in three steps:

1. Production Technology: We need a practical way of describing how *inputs* (such as labor, capital, and raw materials) can be transformed into *outputs* (such as cars and televisions). Just as a consumer can reach a level of satisfaction from buying different combinations of goods, the firm can produce a particular level of output by using different combinations of inputs. For example, an electronics firm might produce 10,000 televisions per month by using a substantial amount of labor (e.g., workers assembling the televisions by hand) and very little capital, or by building a highly automated capital-intensive factory and using very little labor.

2. Cost Constraints: Firms must take into account the *prices* of labor, capital, and other inputs. Just as a consumer is constrained by a limited budget, the firm will be concerned about its cost of production. For example, the firm that produces 10,000 televisions per month will want to do so in a way that minimizes its total production cost, which is determined in part by the prices of the inputs it uses.

3. Input Choices: Given its production technology and the prices of labor, capital, and other inputs, the firm must choose *how much of each input* to use in producing its output. Just as a consumer takes account of the prices of different goods when deciding how much of each good to buy, the firm must take into account the prices of different inputs when deciding how much of each input to use. If our electronics firm operates in a country with low wage rates, it may decide to produce televisions by using a large amount of labor, thereby using very little capital.

Theory of the firm: Explanation of how a firm makes cost-minimizing production decidions and how it cost varies with its output.

Factors of production: Inputs into the production process (e.g., labour, capital and materials)

Production function: Function showing the highest output that a firm can produce for every specified combination of inputs.

The short run verse the Long run

Short run: Period of time in which quantities of one or more production factors cannot be changed.

Fixed input: Production factor that cannot be varied.

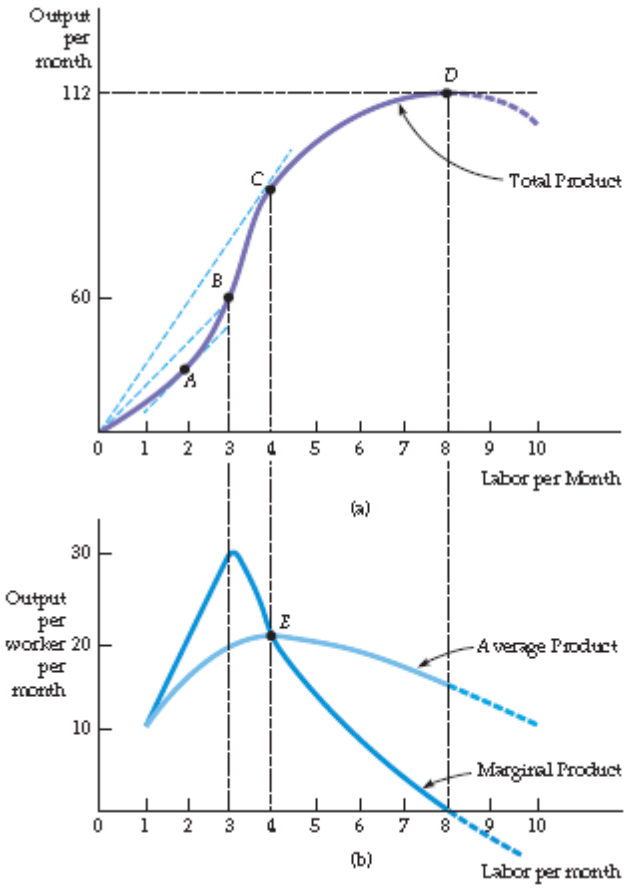
Long run: Amount of time needed to make all production inputs variable.

Production with One variable input (Labour)

Average and Marginal Products

Average product: Output per unit of a particular input.

Marginal product: Additional output produced as an input is increased by one unit.

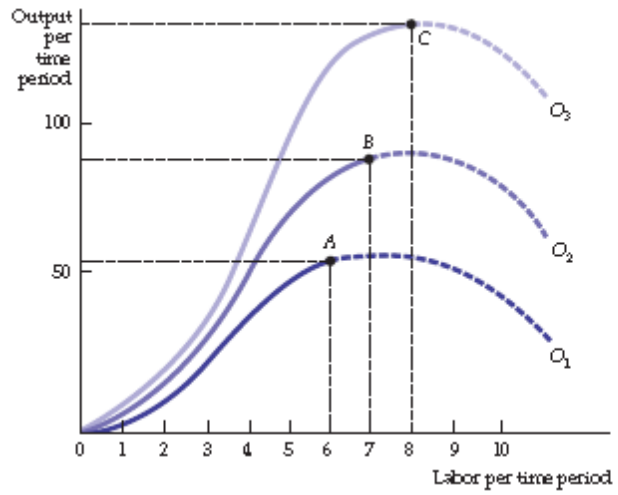


PRODUCTION WITH ONE VARIABLE INPUT

The total product curve in (a) shows the output produced for different amounts of labor input. The average and marginal products in (b) can be obtained (using the data in Table 6.1) from the total product curve. At point *A* in (a), the marginal product is 20 because the tangent to the total product curve has a slope of 20. At point *B* in (a) the average product of labor is 20, which is the slope of the line from the origin to *B*. The average product of labor at point *C* in (a) is given by the slope of the line 0*C*. To the left of point *E* in (b), the marginal product is above the average product and the average is increasing; to the right of *E*, the marginal product is below the average product and the average is decreasing. As a result, *E* represents the point at which the average and marginal products are equal, when the average product reaches its maximum.

The Law of Diminishing Marginal Returns

Law of diminishing marginal returns: Principle that as the use of an input increases with other inputs fixed, the resulting additions to output will eventually decrease.



THE EFFECT OF TECHNOLOGICAL IMPROVEMENT
Labor productivity (output per unit of labor) can increase if there are improvements in technology, even though any given production process exhibits diminishing returns to labor. As we move from point *A* on curve O_1 to *B* on curve O_2 to *C* on curve O_3 over time, labor productivity increases.

Labour productivity

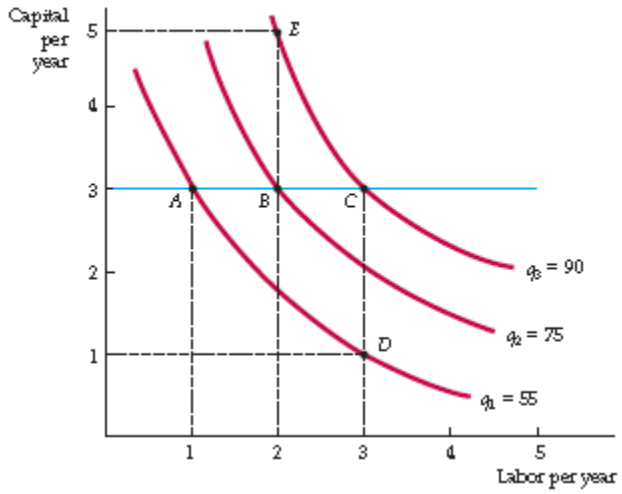
Labour productivity: Average product of labour for an entire industry or for the economy as a whole

Stock of capital: Total amount of capital available for use in production.

Technological change: Development of new technologies allowing factors of production to be used more effectively.

Production with Two Variable inputs

Isoquant: Curve showing all possible combinations of inputs that yield the same output.



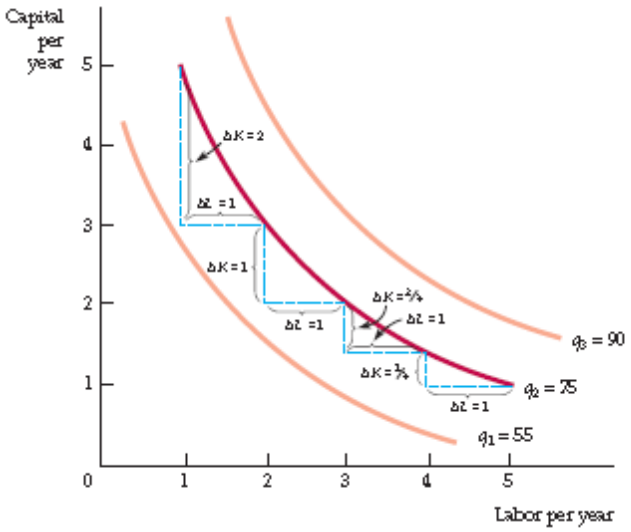
PRODUCTION WITH TWO VARIABLE INPUTS

Production isoquants show the various combinations of inputs necessary for the firm to produce a given output. A set of isoquants, or *isoquant map*, describes the firm's production function. Output increases as we move from isoquant q_1 (at which 55 units per year are produced at points such as *A* and *D*), to isoquant q_2 (75 units per year at points such as *B*), and to isoquant q_3 (90 units per year at points such as *C* and *E*).

Isoquant map: Graph combining a number of isoquants, used to describe a production function.

Substitution among Inputs

Marginal rate of technical substitution (MRTS): amount by which the quantity of one input can be reduced when one extra unit of another input is used, so that output remains constant.

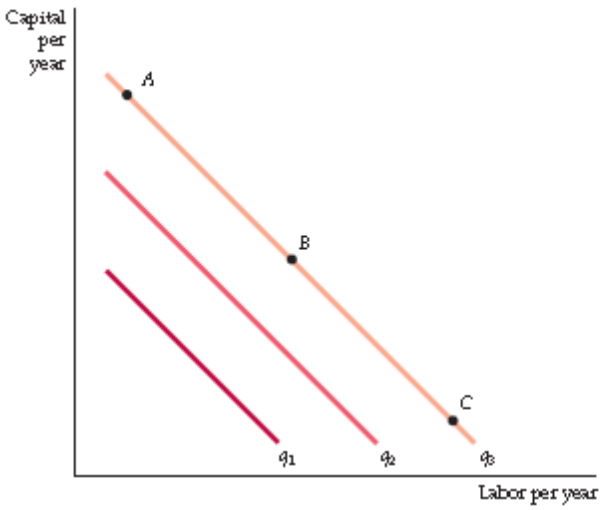


MARGINAL RATE OF TECHNICAL SUBSTITUTION

Like indifference curves, isoquants are downward sloping and convex. The slope of the isoquant at any point measures the marginal rate of technical substitution—the ability of the firm to replace capital with labor while maintaining the same level of output. On isoquant q_2, the MRTS falls from 2 to 1 to 2/3 to 1/3.

Production Functions – Two Special Cases

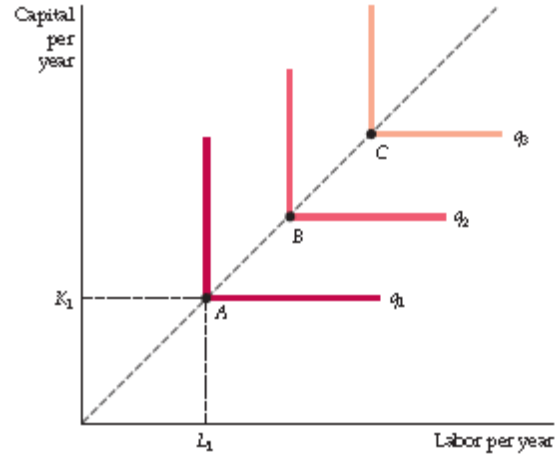
Fixed-proportions production function: Production function with L-shaped isoquants, so that only one combination is labour and capital be used to produce each level of output.



ISOQUANTS WHEN INPUTS ARE PERFECT SUBSTITUTES

When the isoquants are straight lines, the MRTS is constant. Thus the rate at which capital and labor can be substituted for each other is the same no matter what level of inputs is being used. Points

A, *B*, and *C* represent three different capital-labor combinations that generate the same output q_3.



FIXED-PROPORTIONS PRODUCTION FUNCTION

When the isoquants are L-shaped, only one combination of labor and capital can be used to produce a given output (as at point *A* on isoquant q_1, point *B* on isoquant q_2, and point *C* on isoquant q_3). Adding more labor alone does not increase output, nor does adding more capital alone.

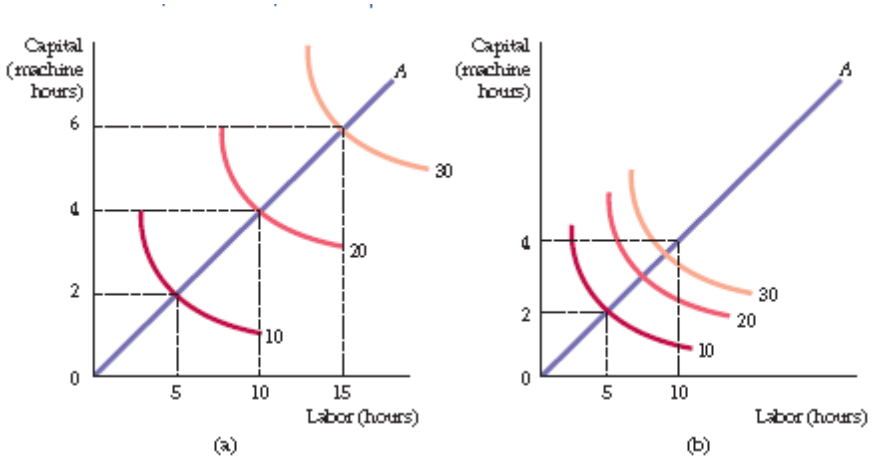
Returns to Scale

Returns to scale: Rate at which output increases as inputs are increased proportionately.

Increasing returns to scale: Situation in which output more than doubles when all inputs are doubles

Constant returns to scale: situation in which output doubles when all inputs are doubled.

Decreasing returns to scale: Situation in which output less than doubles when all inputs are doubled.



RETURNS TO SCALE

When a firm's production process exhibits constant returns to scale as shown by a movement along line 0*A* in part (a), the isoquants are equally spaced as output increases proportionally. However, when there are increasing returns to scale as shown in (b), the isoquants move closer together as inputs are increased along the line.

The theory of the firm is based on three variables, namely:

- The nature of the technology used in production
- Cost constraints
- How much of each input (factors of production) must be used for producing a certain level of output

The law of diminishing marginal returns holds for most production process and is associated with both the short and the long run. Not the following about this law:

- The law has nothing to say on the quality of labour
- It does not necessarily describe a negative return; rather a declining return.
- The law applies to a given level of production technology
- When the level of production technology increases, the total product curve will shift upward. Note that with such a shift, the law of diminishing marginal returns remains relevant.

6.2 (13344323)

1. Labour is an input which is variable in the long run. True or False
2. The marginal product of an input is the increase in total output owing to the addition of the last unit of an input, holding all other inputs constant. True or False
3. When the average product is decreasing, marginal product is increasing. True or False
4. Technological improvement can hide the presence of diminishing returns. True or false

A production function assumes a given

1. Technology
2. Set of input prices
3. Ratio of input prices
4. Amount of capital and labour
5. Amount of output

A function that indicates the maximum output per unit of time that a firm can produce, for every combination of inputs with a given technology, is called

1. An isoquant
2. A production possibility curve
3. A production function
4. An isocost function

A farmer uses L units of Labour and K units of capital to produce Q units of corn using a production function F(K,L). A production plan that uses K' = L' = 10 to produce Q' units of corn where Q' < F (10, 10) is said to be

1. Technically feasible and efficient
2. Technically unfeasible and efficient
3. Technical feasible and inefficient
4. Technically unfeasible and inefficient
5. None of the above

The short run is

1. Less than a year
2. Three years
3. However long it takes to produce the planned output
4. A time period in which at least one input fixed
5. A time period in which at least one set of outputs has been decided upon

Writing total output as Q, change in output as ΔQ, total labour employment as L, and change in labour employment as ΔL, the marginal product of labour can be written algebraically as

1. ΔQ multiply L
2. Q/L
3. $\Delta L/\Delta Q$
4. $\Delta Q/\Delta L$

The slope of the total product curve is the

1. Average product
2. Slope of a line from the origin to the point
3. Marginal product
4. Marginal rate technical substitution

The law of diminishing returns refers to diminishing

1. Total returns
2. Marginal returns
3. Average returns
4. All of these

When labour usage is at 12 units, output is 36 units. From this we may infer that

1. The marginal product of labour is 3
2. The total product of labour is 1/3
3. The average product of labour is 3
4. None of the above.

6.3 (32232)

1. As we move downward along a typical isoquant, the slope of the isoquant becomes steeper. True or False
2. The rate at which one input can be reduced per additional unit of the other input, while holding output constant, is measured by the marginal rate of technical substitution. True or False
3. The marginal rate of technical substitution is equal to the slope of the total product curve. True or False

An isoquant

1. Must be linear
2. Cannot have a negative slope
3. Is a curve that shows all the combinations of inputs that yield the same total output.
4. Is a curve that shows the maximum total output as a function of the level of labour input
5. Is a curve that shows all possible output levels that can be produced at the same cost

Refer to the following two statements to answer this question:

1. Isoquants cannot cross one another
2. An isoquant that is twice the distance from the origin, represents twice the level of output
    a. Both 1 and 2 are true
    b. 1 is true, and 2 is false
    c. 1 is false, and 2 is true
    d. Both 1 and 2 are false

Refer to the following two statements to answer this question.

1. The numerical labels attached to indifference curves are meaningful only in an ordinal way.
2. The numerical labels attached to isoquants are meaningful only in an ordinal way.
    a. Both 1 and 2 are true
    b. 1 is true, and 2 is false
    c. 1 is false, and 2 is true
    d. Both 1 and 2 are false

An upward sloping isoquant

1. Can be derived from a production function with one input
2. Can be derived from a production function that uses more than one input where reductions in the use of any input always reduce output

3. Cannot be derived from a production function when a firm is assumed to maximize profits
4. Can be derived whenever one input to production is available at zero cost to the firm
5. None of the above

Refer to the following two statements to answer this question:

1. If the marginal product of labour is zero, the total product of labour is as its maximum.
2. If the marginal product of labour is at its maximum, the average product of labour is falling
    a. Both 1 and 2 are true
    b. 1 is true and 2 is false
    c. 1 is false and 2 is true
    d. Both 1 and 2 are false

6.4 (12243)

In a production process, all inputs are increased by 10%, but output increases by less than 10%. This means that the firm experiences

1. Decreasing returns to scale
2. Constant returns to scale
3. Increasing returns to scale
4. Negative returns to scale

Increasing returns to scale in production means

1. More than 10% as much of all inputs are required to increase out by 10%
2. Less than twice as much of all inputs are required to double output
3. More than twice as much of only one input is required to double output
4. Isoquants must be linear

With increasing returns to scale, isoquants for units increases in output becomes

1. Farther and farther apart
2. Closer and closer together
3. The same distance apart
4. None of the above

Refer to the following two statements to answer this question:

1. “Decreasing returns to scale” and “diminishing returns to a factor of production” are two phrases that mean the same thing.
2. Diminishing returns to all factors of production implies decreasing returns to scale.

a. Both 1 and 2 are true
b. 1 is true and 2 is false
c. 1 is false and 2 is true.
d. Both 1 and 2 are false

If input prices are constant, a firm with increasing returns to scale can expect

1. Costs to double as output doubles
2. Costs to more than double as output doubles
3. Costs to go up less than double as output doubles.
4. To hire more and more labour for a given amount of capital, since marginal product
5. To never reach the point where the marginal product of labour is equal to the wage

Learning unit 7: The cost of production

Summarising cost

Name	Definition
Economic cost	Opportunity costs which are not shown = implicit costs. Economic costs include implicit and explicit costs.
Accounting cost	The cost of buying production factors (explicit costs).
Opportunity cost	The opportunities forgone by not putting the firm's resources to their best alternative use.
Sunk cost	Expenditure that has been made and cannot be recovered.
Total cost (*TC*)	The total cost incurred to produce an output (fixed cost [*FC*] + variable costs [*VC*]).
Average total cost (*ATC*)	Total cost divided by the firm's level of output ($ATC = TC/q$)
Fixed costs (*FC*)	Costs that do not vary with output (capital, rent, etc).
Average fixed cost (*AFC*)	Fixed cost divided by output (FC/q).
Variable cost (*VC*)	Cost that varies as output varies (labour)
Average variable cost (*AVC*)	Variable cost divided by output (AVC/q)
Marginal cost (*MC*)	The change in total cost that results from producing one extra unit of output. In the case of the short-run marginal cost is equal to the change in the variable cost (labour) ($MC = \Delta TC/\Delta q = \Delta VC/\Delta q$). (*MC* can thus be calculated from the *TC* or *VC*.)

Economic Cost versus Accounting Cost

Accounting cost: Actual expenses plus depreciation charges for capital equipment

Economic Cost to a firm of utilizing economic resources in production.

Opportunity cost: Cost associated with opportunities forgone when a firm's resources are not put to their best alternative use.

Economic cost = Opportunity cost

Sunk Costs

Sunk cost: Expenditure that has been made and cannot be recovered.

Fixed Costs and Variable Costs

Total cost(TC or C): Total economic cost of production consisting of fixed and variable costs.

Fixed Cost (FC): Cost that does not vary with the level of output and that can be eliminated only by shutting down.

Variable cost (VC): Cost that varies as output varies

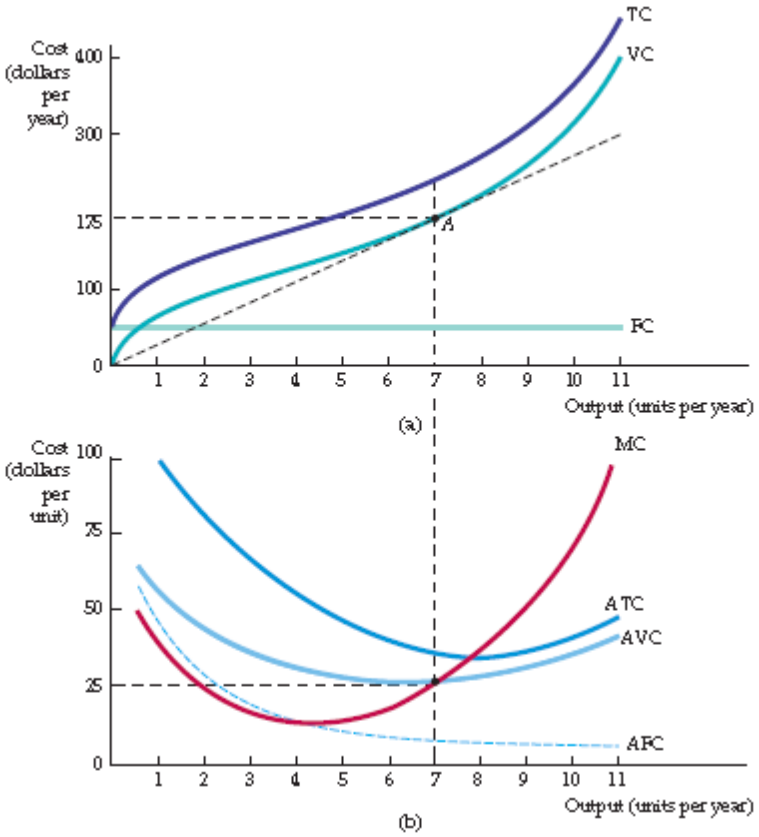
Amortization: Policy of treating a one-time expenditure as an annual cost spread out over some number of years.

Average total cost (ATC): Firm's total cost divided by its level or output.

Average fixed cost (AFC): Fixed cost divided by the level of output.

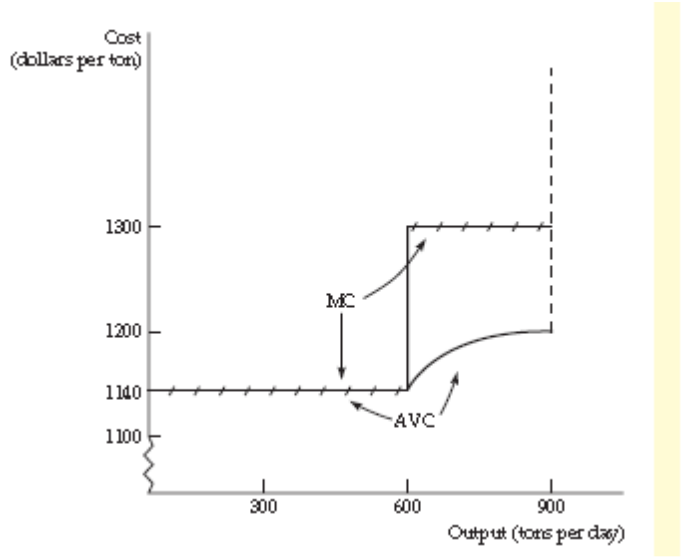
Average variable cost (AVC): Variable cost divided by the level of output.

Diminishing marginal returns and marginal cost: Diminishing marginal returns means that the marginal product of labour declines as the quantity of labour employed increases. As a result, when there are diminishing marginal returns, marginal cost will increase as output increases.



COST CURVES FOR A FIRM

In (a) total cost TC is the vertical sum of fixed cost FC and variable cost VC. In (b) average total cost ATC is the sum of average variable cost AVC and average fixed cost AFC. Marginal cost MC crosses the average variable cost and average total cost curves at their minimum points.



THE SHORT-RUN VARIABLE COSTS OF ALUMINUM SMELTING

The short-run average variable cost of smelting is constant for output levels using up to two labor shifts. When a third shift is added, marginal cost and average variable cost increase until maximum capacity is reached.

Cost in the Long Run

The User Cost of Capital

User cost of capital: Annual cost of owning and using a capital asset, equal to economic depreciation plus forgone interest.

User Cost of Capital = Economics Depreciation + (Interest Rate)(Value of Capital)

r = Depreciation rate + Interest rate

The Cost-Minimizing Input Choice

Rental rate: Cost per year of renting one unit of capital.

Isocost line: Graph showing all possible combinations of labour and capital that can be purchased for a given total cost.

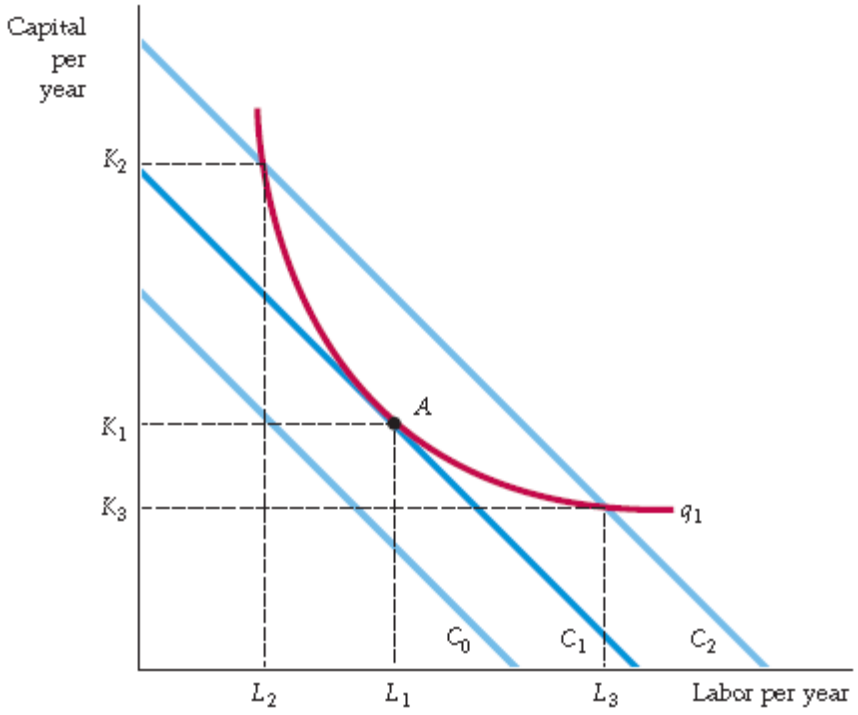
To see what an isocost line looks like, recall that the total cost C of producing any particular output is given by the sum of the firm's labor cost wL and its capital cost rK:

$C = wL + rK$

For each different level of total cost, equation describes a different isocost line. In Figure 7.3, for example, the isocost line C_0 describes all possible combinations of labor and capital that cost a total of C_0 to hire.
If we rewrite the total cost equation as an equation for a straight line, we get

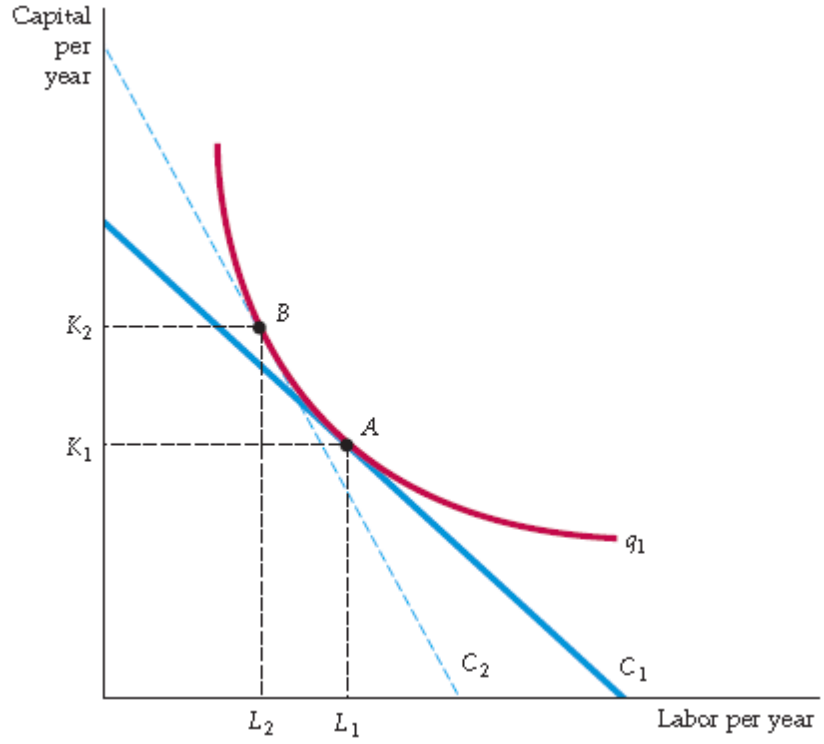
$K = C/r - (w/r)L$

Choosing Inputs



PRODUCING A GIVEN OUTPUT AT MINIMUM COST

Isocost curves describe the combination of inputs to production that cost the same amount to the firm. Isocost curve C_1 is tangent to isoquant q_1 at A and shows that output q_1 can be produced at minimum cost with labor input L_1 and capital input K_1. Other input combinations—L_2, K_2 and L_3, K_3—yield the same output but at higher cost.



INPUT SUBSTITUTION WHEN AN INPUT PRICE CHANGES

Facing an isocost curve C_1, the firm produces output q_1 at point A using L_1 units of labor and K_1 units of capital. When the price of labor increases, the isocost curves become steeper. Output q_1 is now produced at point B on isocost curve C_2 by using L_2 units of labor and K_2 units of capital.

How does the isocost line relate to the firm's production process? Recall that in our analysis of production technology, we showed that the marginal rate of technical substitution of labor for capital (MRTS) is the negative of the slope of the isoquant and is equal to the ratio of the marginal products of labor and capital:

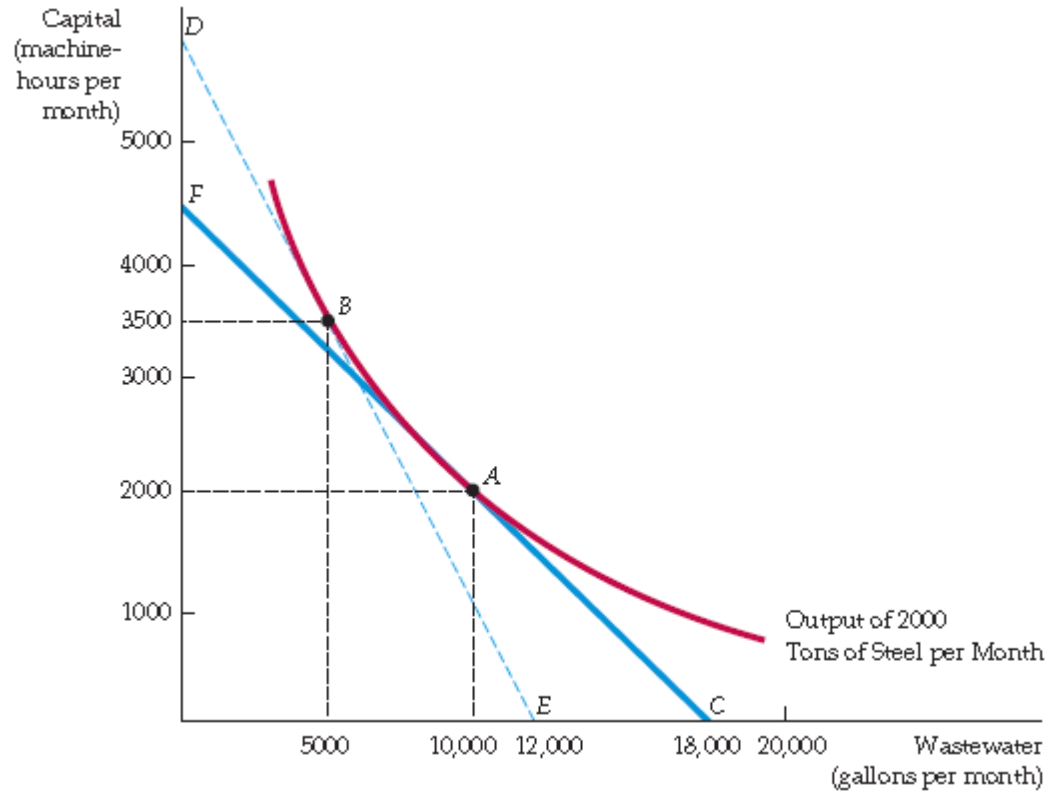
$$MRTS = -\Delta K/\Delta L = MP_L/MP_K$$

Above, we noted that the isocost line has a slope of $\Delta K/\Delta L = -w/r$ It follows that when a firm minimizes the cost of producing a particular output, the following condition holds:

$$MP_L/MP_K = w/r$$

We can rewrite this condition slightly as follows:

$$MP_L/w = MP_K/r$$

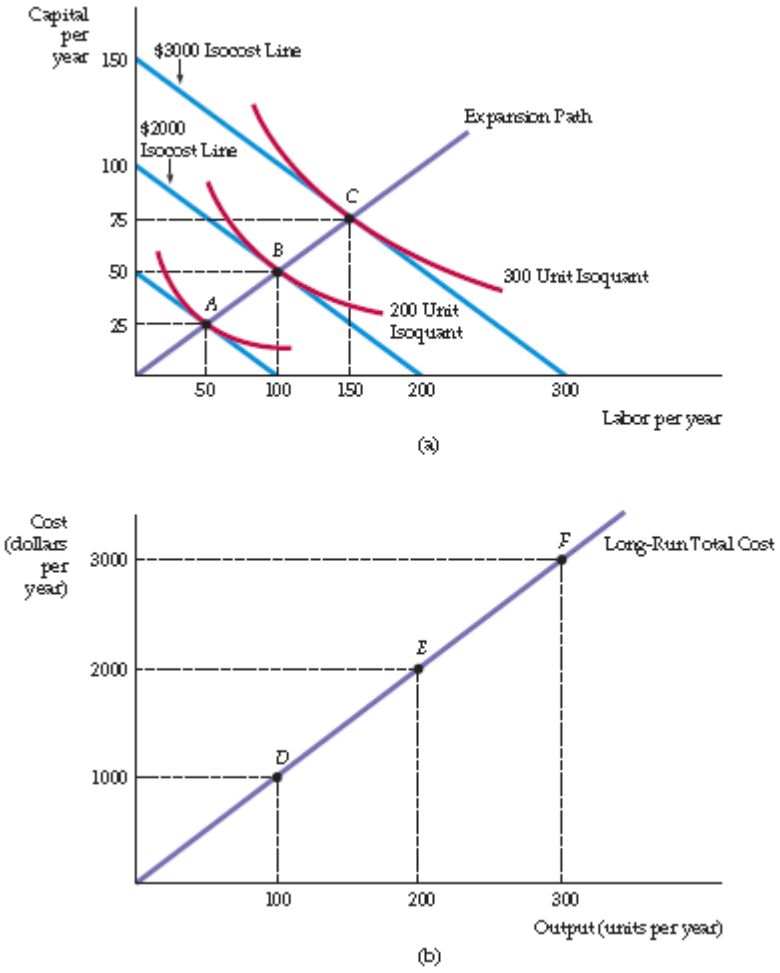


THE COST-MINIMIZING RESPONSE TO AN EFFLUENT FEE

When the firm is not charged for dumping its wastewater in a river, it chooses to produce a given output using 10,000 gallons of wastewater and 2000 machine-hours of capital at *A*. However, an effluent fee raises the cost of wastewater, shifts the isocost curve from *FC* to *DE*, and causes the firm to produce at *B*—a process that results in much less effluent.

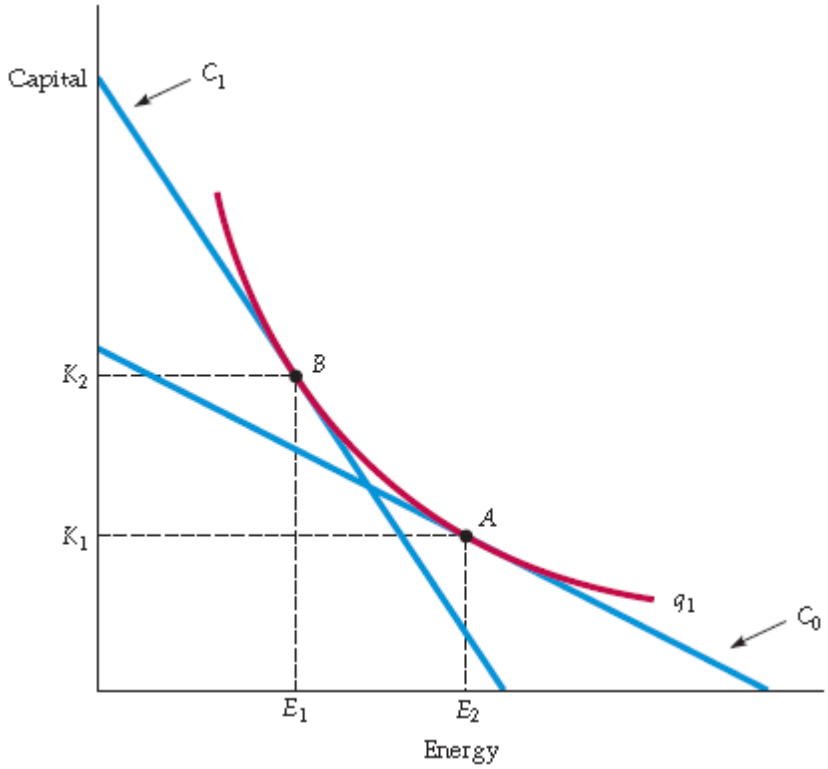
Cost minimization with Varying Output Levels

Expansion path: Curve passing through points of tangency between a firm's isocost lines and its isoquants.



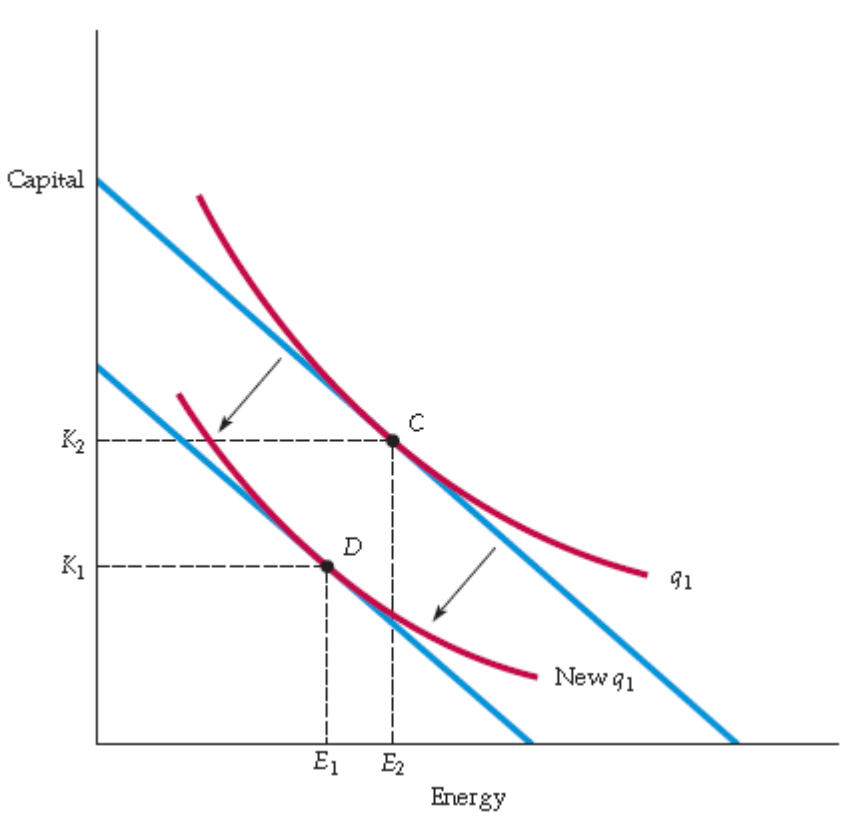
A FIRM'S EXPANSION PATH AND LONG-RUN TOTAL COST CURVE

In (a), the expansion path (from the origin through points *A*, *B*, and *C*) illustrates the lowestcost combinations of labor and capital that can be used to produce each level of output in the long run—i.e., when both inputs to production can be varied. In (b), the corresponding long-run total cost curve (from the origin through points *D*, *E*, and *F*) measures the least cost of producing each level of output.



ENERGY EFFICIENCY THROUGH CAPITAL SUBSTITUTION FOR LABOR

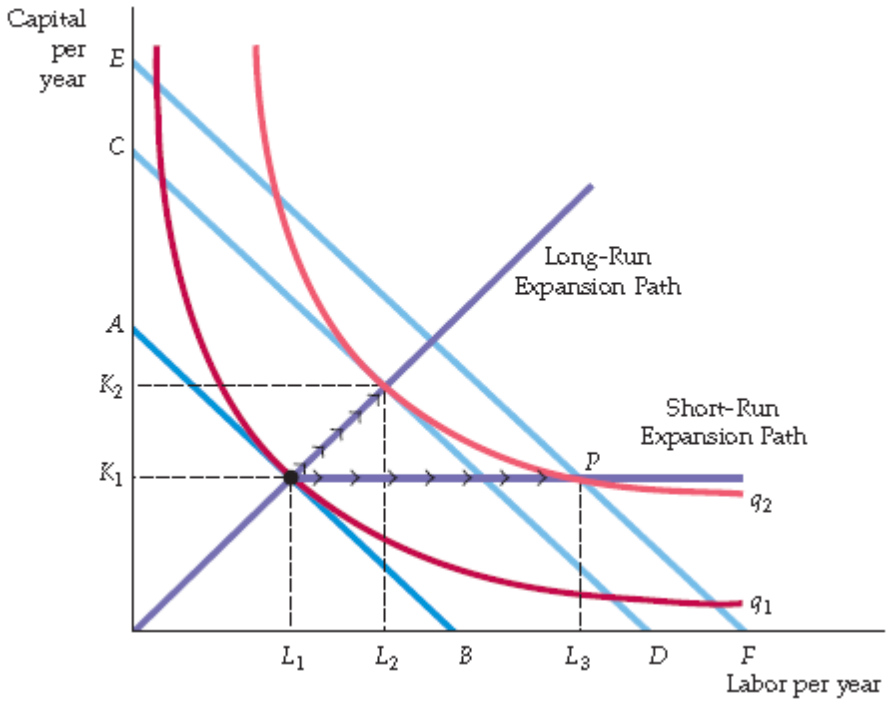
Greater energy efficiency can be achieved if capital is substituted for energy. This is shown as a movement along isoquant q_1 from point *A* to point *B*, with capital increasing from K_1 to K_2 and energy decreasing from E_2 to E_1 in response to a shift in the isocost curve from C_0 to C_1.



ENERGY EFFICIENCY THROUGH TECHNOLOGICAL CHANGE

Technological change implies that the same output can be produced with smaller amounts of inputs. Here the isoquant labeled q_1 shows combinations of energy and capital that will yield output q_1; the tangency with the isocost line at point C occurs with energy and capital combinations E_2 and K_2. Because of technological change the isoquant shifts inward, so the same output q_1 can now be produced with less energy and capital, in this case at point D, with energy and capital combination E_1 and K_1.

Long run versus Short run Cost Curves



THE INFLEXIBILITY OF SHORT-RUN PRODUCTION

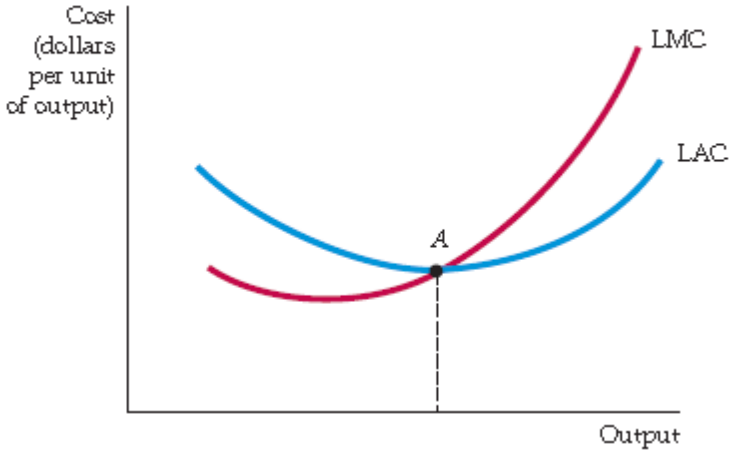
When a firm operates in the short run, its cost of production may not be minimized because of inflexibility in the use of capital inputs. Output is initially at level q_1. In the short run, output q_2 can be produced only by increasing labor from L_1 to L_3 because capital is fixed at K_1. In the long run, the same output can be produced more cheaply by increasing labor from L_1 to L_2 and capital from K_1 to K_2.

Long run average cost

Long run average cost curve (LAC): Curve relating average cost of production to output when all inputs, including capital, are variable.

Short run average cost curve (SAC): Curve relating average cost of production to output when level of capital is fixed.

Long run marginal cost curve (LMC): Curve showing the change in long run toal cost as output is increased incrementally by 1 unit.



LONG-RUN AVERAGE AND MARGINAL COST

When a firm is producing at an output at which the long-run average cost LAC is falling, the long-run marginal cost LMC is less than LAC. Conversely, when LAC is increasing, LMC is greater than LAC. The two curves intersect at *A*, where the LAC curve achieves its minimum.

Economies and Diseconomies of Scale

As output increases, the firm's average cost of producing that output is likely to decline, at least to a point. This can happen for the following reasons:
1. If the firm operates on a larger scale, workers can specialize in the activities at which they are most productive.
2. Scale can provide flexibility. By varying the combination of inputs utilized to produce the firm's output, managers can organize the production process more effectively.
3. The firm may be able to acquire some production inputs at lower cost because it is buying them in large quantities and can therefore negotiate better prices. The mix of inputs might change with the scale of the firm's operation if managers take advantage of lower-cost inputs.

At some point, however, it is likely that the average cost of production will begin to increase with output. There are three reasons for this shift:
1. At least in the short run, factory space and machinery may make it more difficult for workers to do their jobs effectively.
2. Managing a larger firm may become more complex and inefficient as the number of tasks increases.
3. The advantages of buying in bulk may have disappeared once certain quantities are reached. At some point, available supplies of key inputs may be limited, pushing their costs up.

Economies of scale: Situation is which output can be doubled for less than a doubling of cost.

Diseconomies of scale: Situation in which a doubling of output requires more than a doubling of cost.

Increasing returns to scale: Output more than doubles when the quantities of all inputs are doubled.

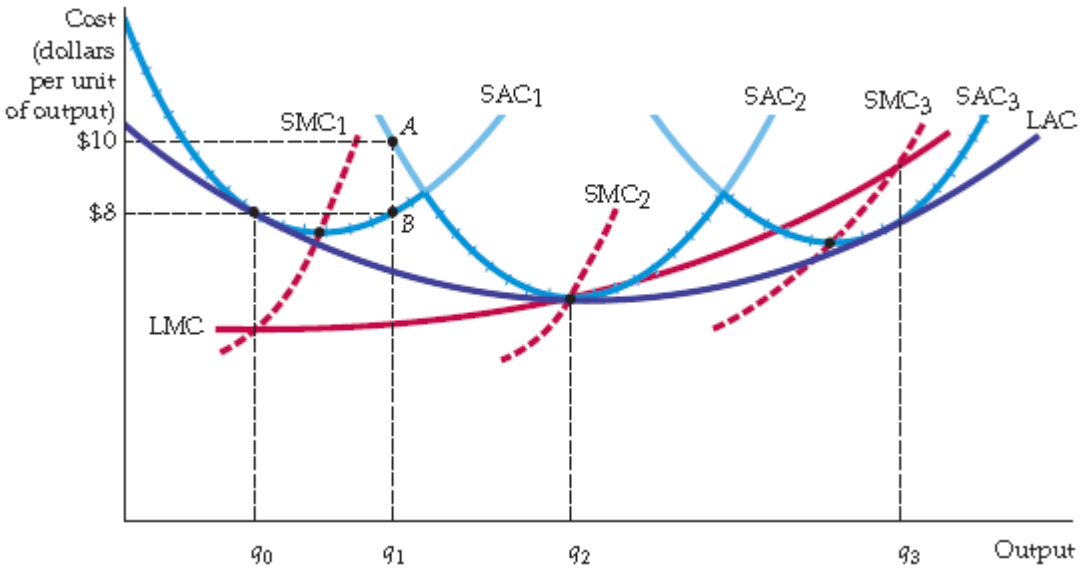
Economies of scale are often measured in terms of a cost-output elasticity, E_C. E_C is the percentage change in the cost of production resulting from a 1-percent increase in output:

$E_C = (\Delta C/C)/(\Delta q/q)$

To see how E_C relates to our traditional measures of cost, rewrite equation as follows:

$E_C = (\Delta C/\Delta q)/(C/q) = MC/AC$

The relationship between short run and long run cost



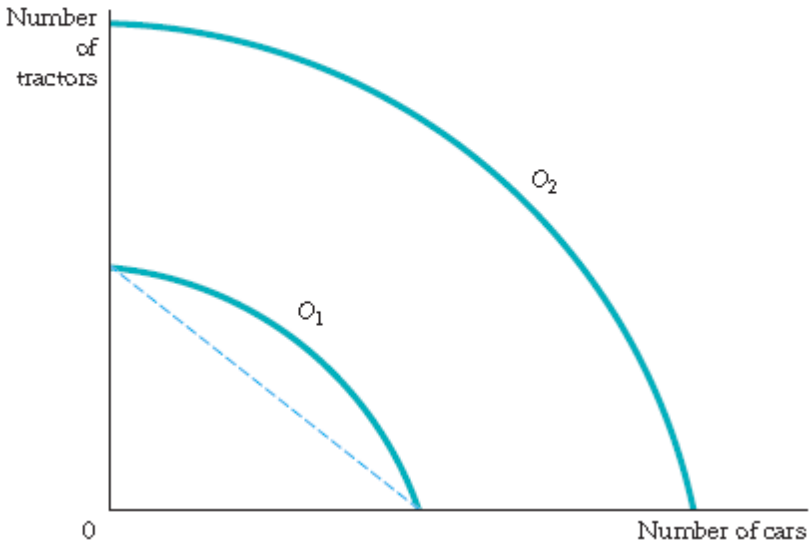
LONG-RUN COST WITH ECONOMIES AND DISECONOMIES OF SCALE

The long-run average cost curve LAC is the envelope of the short-run average cost curves SAC_1, SAC_2, and SAC_3. With economies and diseconomies of scale, the minimum points of the short-run average cost curves do not lie on the long-run average cost curve.

Production Transformation Curves

Production transformation curve: Curve showing the various combinations of two different outputs (products) that can be produced with a given set of inputs.

CH.



PRODUCT TRANSFORMATION CURVE

The product transformation curve describes the different combinations of two outputs that can be produced with a fixed amount of production inputs. The product transformation curves O_1 and O_2 are bowed out (or concave) because there are economies of scope in production.

Economies and Diseconomies of scope

Economies of scope: Situation in which joint output of a single firm is greater than output that could be achieved by two when each produces a single product.

Diseconomies of scope: Situation in which joint output of a single firm is less than could be achieved by separate firms when each produces a single product.

The Degree of Economies of Scope

Degree of economies of scope (SC): Percentage of cost savings resulting when two or more products are produced jointly rather than individually.

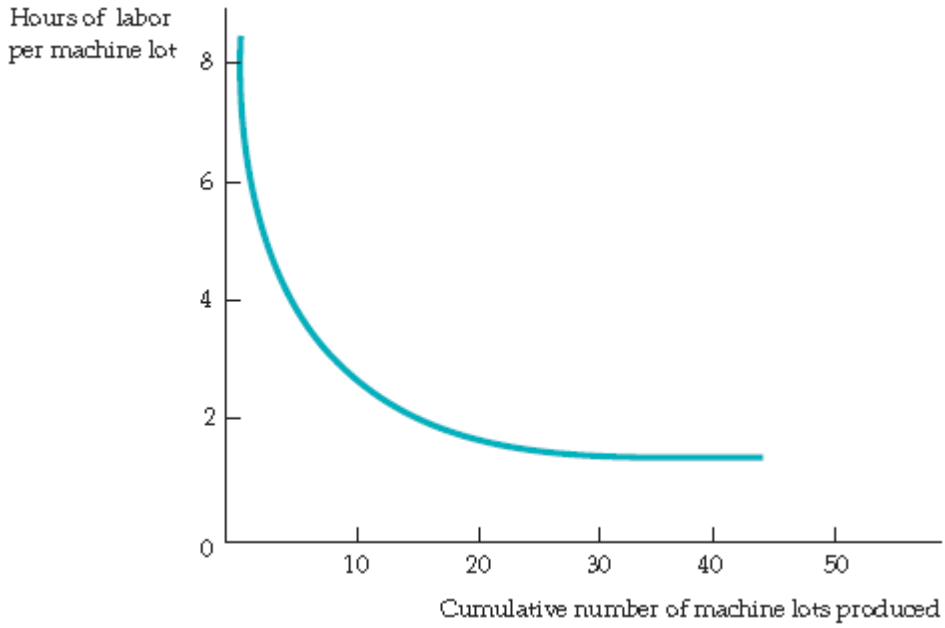
Dynamic changes in Costs – The learning Curve

As management and labour gain experience with production, the firm's marginal and average costs of producing a given level of output fall for four reasons:

1. Workers often take longer to accomplish a given task the first few times they do it. As they become more adept, their speed increases.
2. Managers learn to schedule the production process more effectively, from the flow of materials to the organization of the manufacturing itself.

3. Engineers who are initially cautious in their product designs may gain enough experience to be able to allow for tolerances in design that save costs without increasing defects. Better and more specialized tools and plant organization may also lower cost.
4. Suppliers may learn how to process required materials more effectively ad pass on some of this advantage in the form of lower costs.

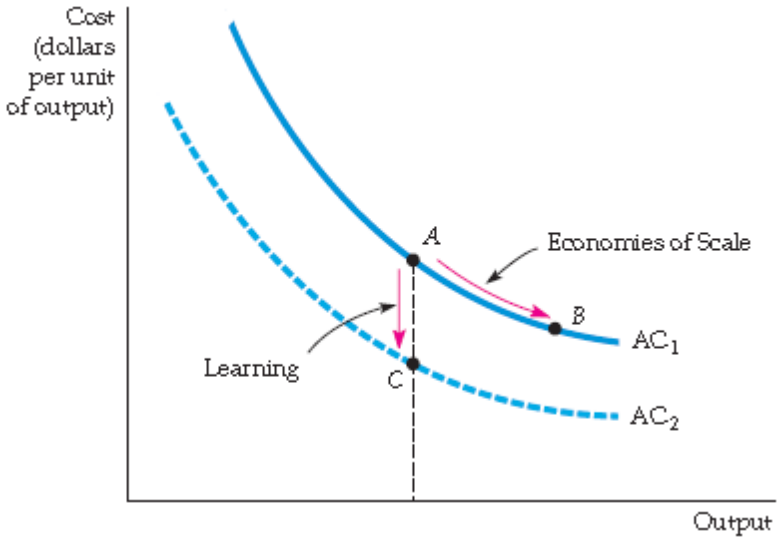
Learning Curve: Graph relating amount of inputs needed by a firm to produce each unit of output to its cumulative output.



THE LEARNING CURVE

A firm's production cost may fall over time as managers and workers become more experienced and more effective at using the available plant and equipment. The learning curve shows the extent to which hours of labor needed per unit of output fall as the cumulative output increases.

Learning versus Economies of Scale

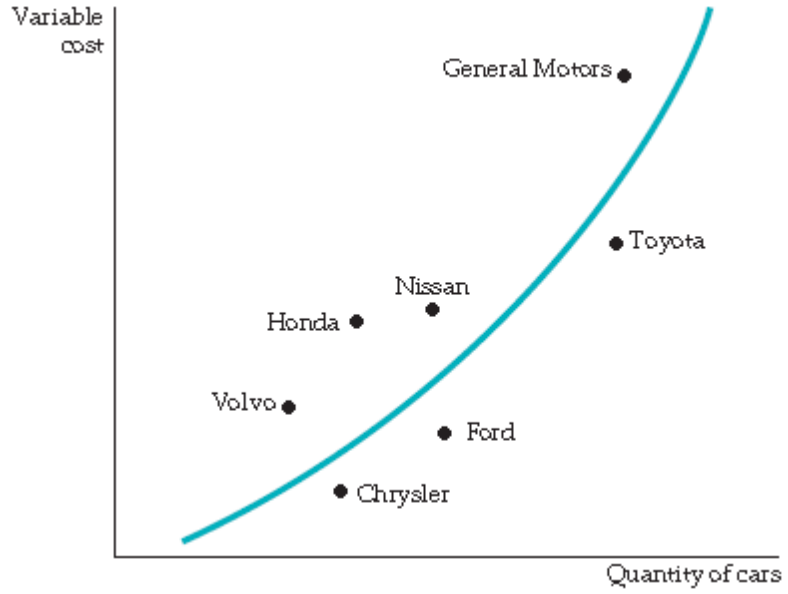


ECONOMIES OF SCALE VERSUS LEARNING

A firm's average cost of production can decline over time because of growth of sales when increasing returns are present (a move from *A* to *B* on curve AC_1), or it can decline because there is a learning curve (a move from *A* on curve AC_1 to *C* on curve AC_2).

Estimating and predicting cost

Cost function: Function relating cost of production to level of output and other variables that the firm can control.

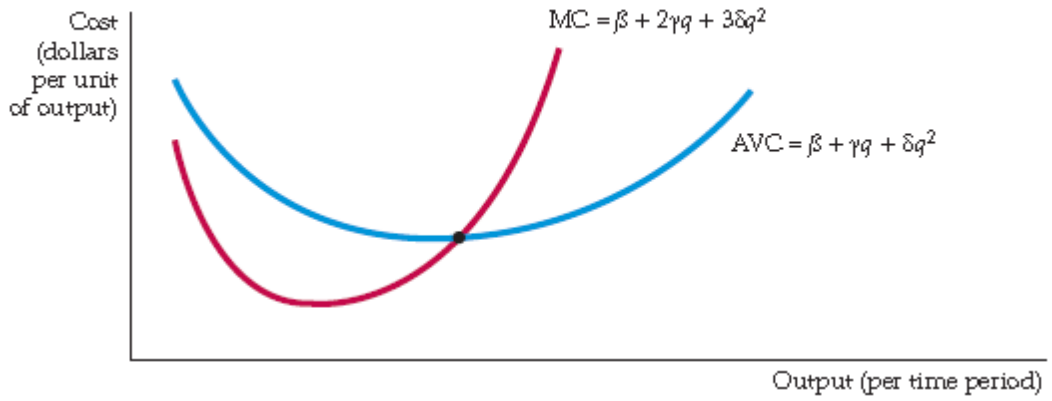


VARIABLE COST CURVE FOR THE AUTOMOBILE INDUSTRY

An empirical estimate of the variable cost curve can be obtained by using data for individual firms in an

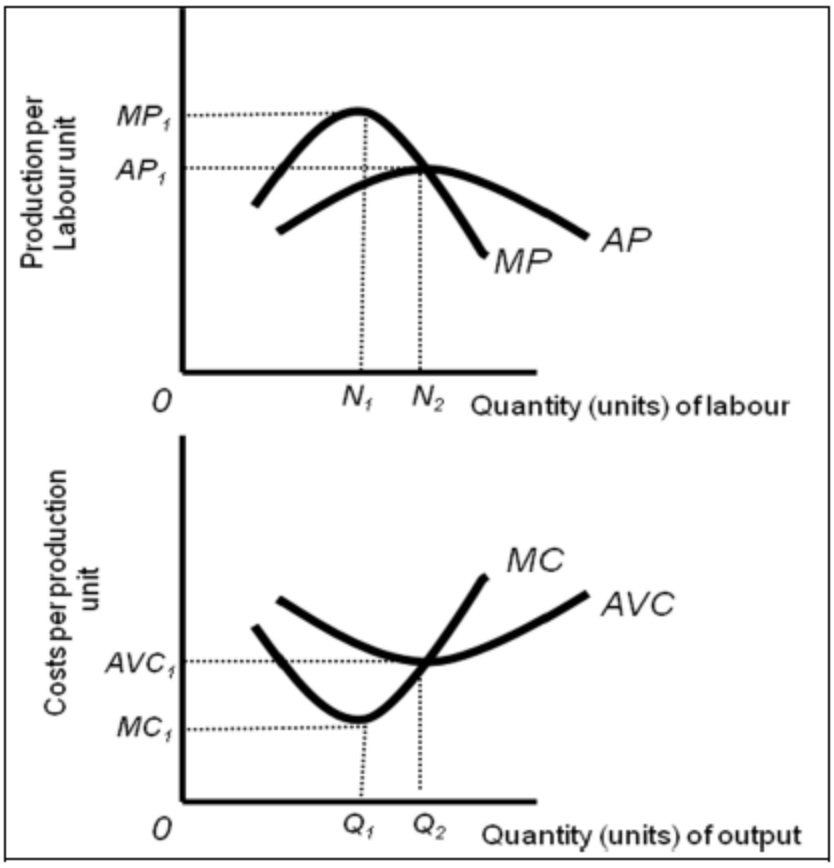
industry. The variable cost curve for automobile production is obtained by determining statistically the curve that best fits the points that relate the output of each firm to the firm's variable cost of production.

Cost functions and the Measurement of Scale Economies



CUBIC COST FUNCTION
A cubic cost function implies that the average and the marginal cost curves are U-shaped.

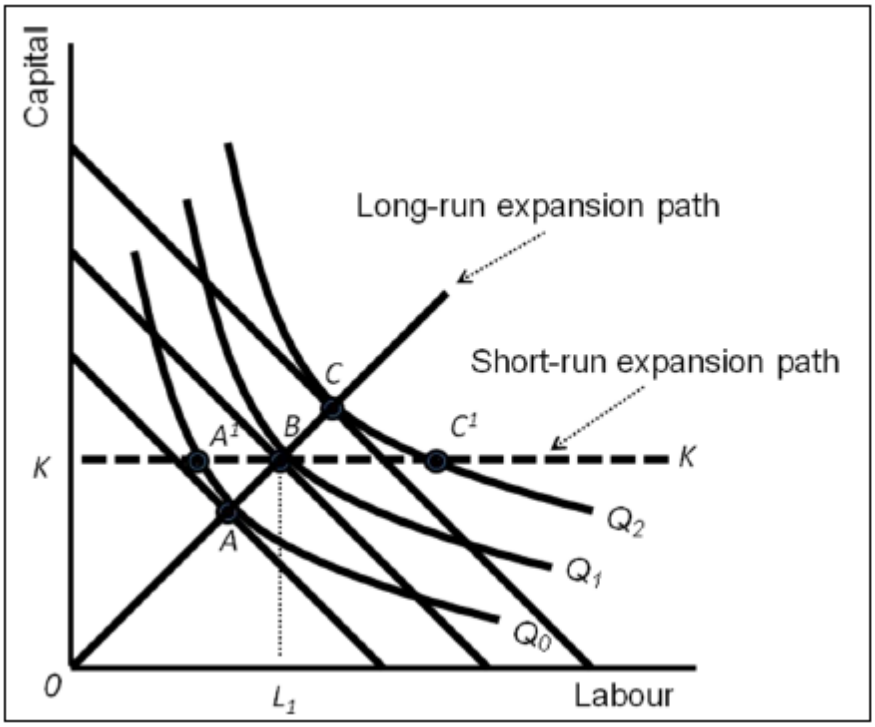
The relationship between production and costs



The characteristics of these short run cost curves

Curve	Characteristic
Fixed cost (*FC*)	*FC* does not vary with output. *FC* = *TC* at zero output.
Variable cost (*VC*)	*VC* is zero when output is zero.
Average fixed cost (*AFC*)	*AFC* decreases as output increases.
Relationship between marginal (*MC*) and average cost curves (*ATC*).	When *MC* < *ATC*, then *ATC* decreases. When *MC* > *ATC*, then *ATC* increases. *ATC* at minimum, then *MC* = *ATC*. Normal profit earned and point of efficiency.
Average total cost (*ATC*), average variable cost (*AVC*) and average fixed cost (*AFC*).	*ATC* = *AVC* + *AFC*. Distance between ATC and *AVC* decreases as AFC decreases and output increases.

The short run expansion path



The long run and short run expansion path summary

Time period	Expansion path	Reasons
Short-run	Horizontal	One input fixed (capital) and one input variable (labour).
Long-run	Sloping upwards from left to right, going through cost-minimising lines.	All inputs are variable.

7.1 (42144)

1. Fixed costs are fixed with respect to changes in output. True or False
2. Mary knows the average total cost and the average variable costs for a given level of output. She cannot determine the total cost, given this information. True or False

Which of the following statements is true regarding the differences between economic and accounting cost?

1. Accounting costs include all implicit and explicit costs.
2. Economic costs include implicit costs only
3. Accountants consider only implicit costs when calculating costs
4. Accounting cost include only explicit costs

Peter purchased 100 shares of IBM stock several years ago for R150.00. per share. The price of these shares has fallen to R55.00 per share. Peter's investment strategy is "buy low, sell high."

Therefore, he will not sell his IBM stock until the price rises above R150.00 per share. If he sells at a price lower than R150 per share he will have “bought high and sold low.” Peter’s decision:

1. Is correct and shows a solid command of the nature of opportunity cost.
2. Is incorrect because the original price paid for the shares is a sunk cost and should have no bearing on whether the shares should be held or sold.
3. Is incorrect because when the price of a stock falls, the law of demand states that he should buy more shares.
4. Is incorrect because it treats the price of the shares as an explicit cost.

In order for a taxicab to be operated in Johannesburg, it must have a medallion on its hood (bonnet). Medallions are expensive, but can be resold, and are therefore an example of

1. A fixed cost
2. A variable cost
3. An implicit cost
4. An opportunity cost
5. A sunk cost

Which of the following statements correctly uses the concept of opportunity cost in decision-making?

1. “Because my secretary’s time has already been paid for, my cost of taking an additional project is lower than it otherwise would be”
2. Since NASA is running under budget this year, the cost of another space shuttle launch is lower than it otherwise would be.”
    a. 1 is true and 2 is false
    b. 1 is false and 2 is true
    c. 1 and 2 are both true
    d. 1 and 2 are both false

Which of the following costs always declines as output increases?

1. Average cost
2. Marginal cost
3. Fixed cost
4. Average fixed cost
5. Average variable cost

7.2 (451)

In a short run production process, the marginal cost is rising and the average variable cost is falling as output is increased. Thus,

1. Average fixed cost is constant
2. Marginal cost is above average variable cost
3. Marginal cost is below average fixed cost
4. Marginal cost is below average variable cost

Which always increase(s) as output increases?

1. Marginal cost only
2. Fixed cost only
3. Total cost
4. Variable cost only
5. Total cost and variable cost

If a factory has a short run capacity constraint (e.g., an auto plant can only produce 800 cars per day at maximum capacity), the marginal cost of production becomes_____

1. Infinite
2. Zero
3. Highly elastic
4. Less than the average variable cost

7.3 (13452)

1. An isocast curve reveals the input combinations that can be purchased with a given outlay of funds. True or False
2. Production budgets and input prices determine the position of isocost curves. True or False

When an isocost curve is just tangent to an isoquant, we know that

1. Output is being produced at minimum cost
2. Output is not being produced at minimum cost
3. The two products are being produced at the least input cost to the firm
4. The two products are being produced at the highest input cost to the firm.

A firm's expansion path is

1. The firm's production function.
2. A curve that makes the marginal product of the last unit of each input equal for each output.
3. A curve that shows the least-cost combination of inputs needed to produce each level of output for given input prices
4. None of the above

At the optimum combination of two inputs,

1. The slopes of the isoquant and isocost curves are equal
2. Cost are minimised for the production of a given output

3. The marginal rate of technical substitution equals the ratio of input prices
4. All of the above
5. 1 and 3 only

A plant uses machinery and waste water to produce steel. The owner of the plant wants to maintain an output of 10,000 tons a day, even though the government has just imposed a R100.00 per 3.79 liters tax on using waste water. The reduction in the amount of waste water that results from the imposition of this tax depends on

1. The amount of waste water used before the tax was imposed
2. The cost to the firm of using waste water before the tax was put in place
3. The rental rate of machinery
4. The marginal product of waste water only
5. The ratio of the marginal product of waste water to the marginal product of machinery

Suppose our firm produces chartered business flights with capital (planes) and labour (pilots) in fixed proportions (i.e. on pilot for each plane) the expansion path for this business will:

1. Increase at a decreasing rate because we will substitute capital for labour as the business grows
2. Follow the 45 degree line from the origin
3. Not be defined
4. Be a vertical line

7.4 (32242)

Consider the following statements when answering this question.

1. A technology with increasing returns to scale will generate a long run average cost curve that has economies of scale.
2. Diminishing returns determines the slope of the short run marginal cost curve, whereas returns to scale determine the slope of the long run marginal cost curve
    a. 1 is true and 2 is false
    b. 1 is false and 2 is true
    c. Both 1 and 2 are true
    d. Both 1 and 2 are false

To model the input decisions for a production system, we plot labour on the horizontal axis and capital on the vertical axis. In the short run, labour is a variable input and capital is fixed. The short run expansion path for this production system is:

1. A vertical line
2. A horizontal line
3. Equal to the 45 degree line from the origin
4. Not defined

Refers to the following statements to answer this question:

1. The long run average cost (LAC) curve is the envelope of the short run average cost (SAC) curves.
2. The long run marginal cost (LMC) curve is the envelope of the short run marginal cost (SMC) curves.

a. 1 and 2 are true
b. 1 is true and 2 is false
c. 2 is true and 1 is false
d. 1 and 2 are false

Skip question 4

Assuming that a firm's production is subject to increasing returns to scale over a broad range of outputs. Long run average costs over this output will tend to

1. Increase
2. Decline
3. Remain constant
4. Fall to a minimum and then rise

7.5 (132)

When a product transformation curve is bowed outward, there are _____ in production.

1. Economies of scope
2. Economies of scale
3. Diseconomies of scope
4. Diseconomies of scale
5. None of the above

Economies of scope refer to

1. Changes in technology
2. The very long run
3. Multiproduct firms
4. Single product firms that utilise multiple plants
5. Short run economies of scale

A frim produces leather handbags and leather shoes. If there are economies of scope, the product transformation curve between handbags and shoes will be

1. A straight line
2. Bowed outward (concave)
3. Bowed inward (convex)
4. A rectangle

Learning unit 8: Profit maximisation and competitive supply

Perfectly competitive markets

Price take: firm that has no influence over market price and thus takes the price as given.

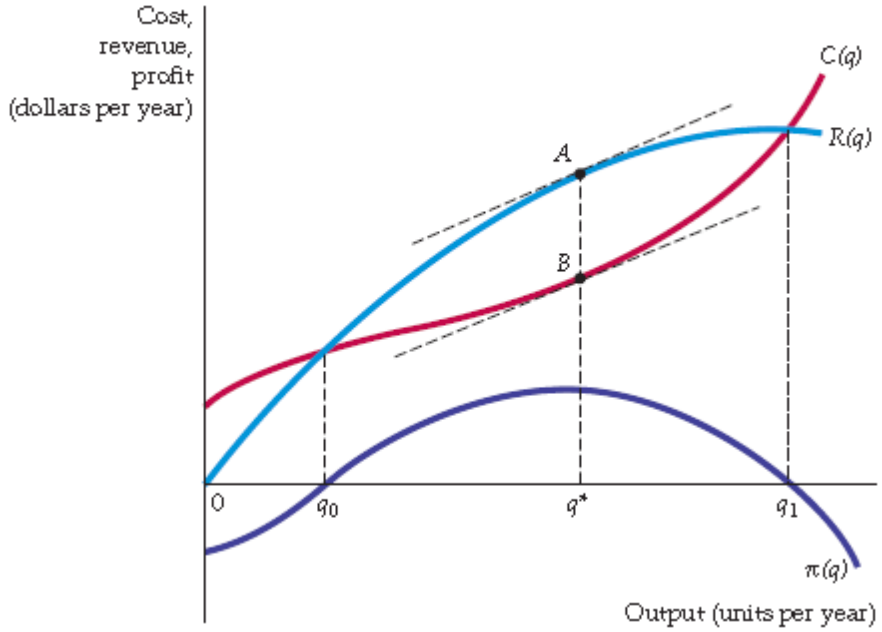
Free entry (or exit): Condition under which there are no special costs that make it difficult for a firm to enter (or exit) an industry.

Condominium: A housing unit that is individually owned but provides access to common facilities that are paid for and controlled jointly by an association of owners.

Marginal Revenue, Marginal Cost and Profit Maximization

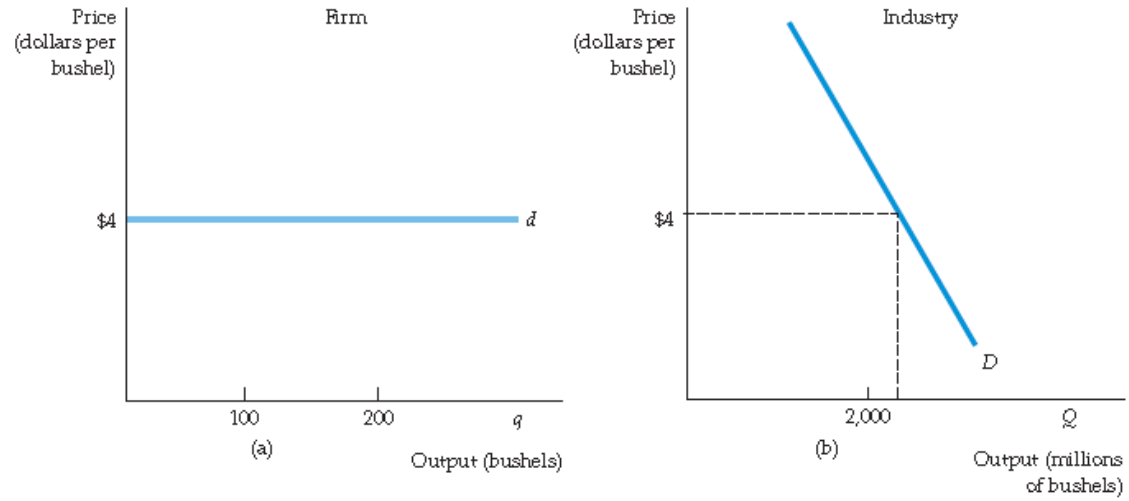
Profit: Difference between total revenue and total cost

Marginal revenue: Change in revenue resulting from a one unit increase in output.



PROFIT MAXIMIZATION IN THE SHORT RUN

A firm chooses output q^*, so that profit, the difference AB between revenue R and cost C, is maximized. At that output, marginal revenue (the slope of the revenue curve) is equal to marginal cost (the slope of the cost curve).



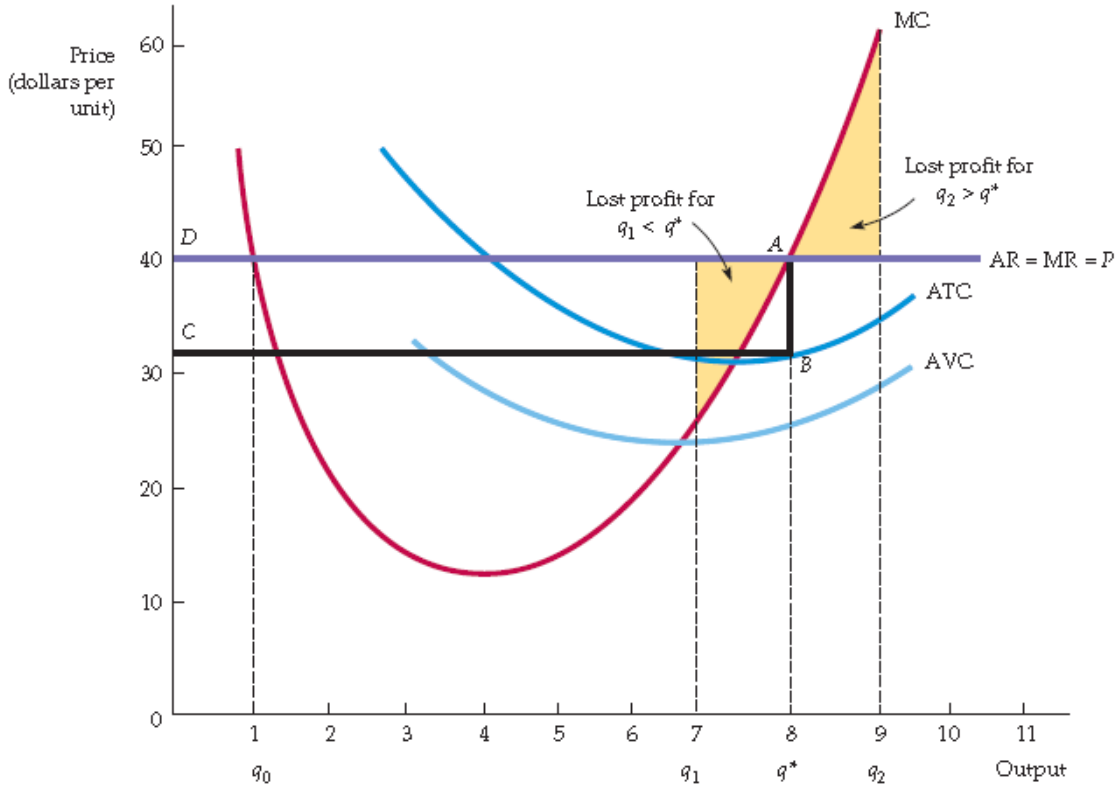
DEMAND CURVE FACED BY A COMPETITIVE FIRM

A competitive firm supplies only a small portion of the total output of all the firms in an industry. Therefore, the firm takes the market price of the product as given, choosing its output on the assumption that the price will be unaffected by the output choice. In (a) the demand curve facing the firm is perfectly elastic, even though the market demand curve in (b) is downward sloping.

Profit Maximization by a competitive firm

Because the demand curve facing a competitive firm is horizontal, so that MR = *P*, the general rule for profit maximization that applies to any firm can be simplified. A perfectly competitive firm should choose its output so that *marginal cost equals price*:

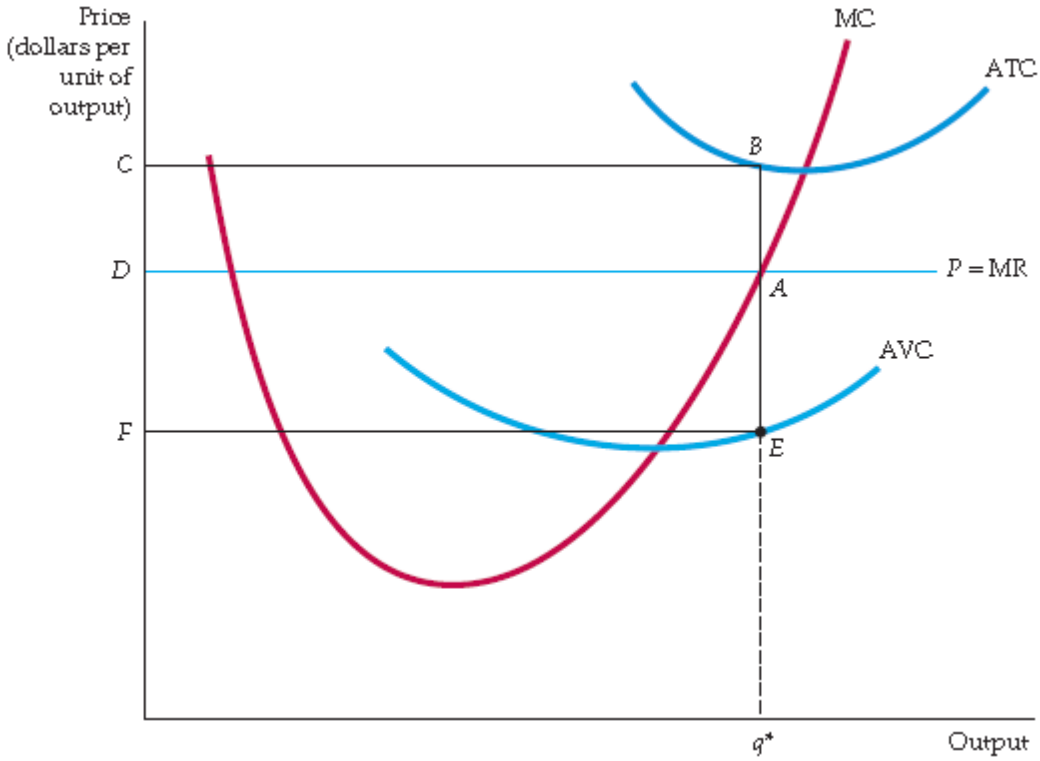
MC(*q*) = MR = *P*



A COMPETITIVE FIRM MAKING A POSITIVE PROFIT

In the short run, the competitive firm maximizes its profit by choosing an output q^* at which its marginal cost MC is equal to the price P (or marginal revenue MR) of its product. The profit of the firm is measured by the rectangle *ABCD.* Any change in output, whether lower at q_1 or higher at q_2, will lead to lower profit.

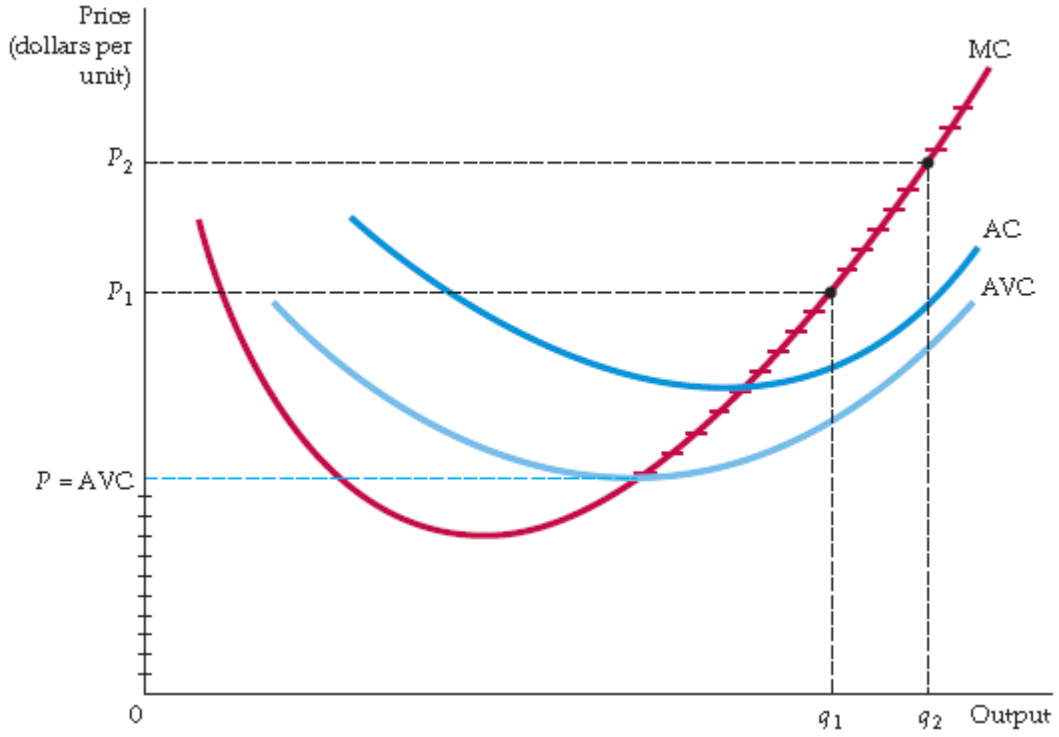
Output rule: If a firm is producing any output, it should produce at the level at which marginal revenue equals marginal cost.



A COMPETITIVE FIRM INCURRING LOSSES

A competitive firm should shut down if price is below AVC. The firm may produce in the short run if price is greater than average variable cost.

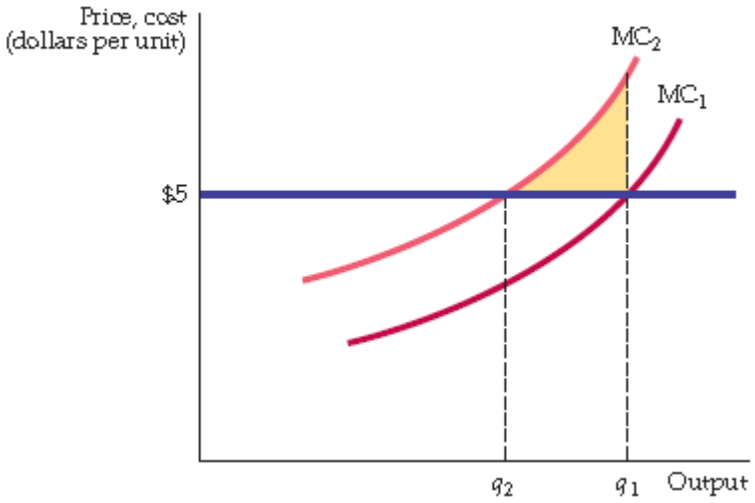
The competitive Firm’s short run supply curve



THE SHORT-RUN SUPPLY CURVE FOR A COMPETITIVE FIRM

In the short run, the firm chooses its output so that marginal cost MC is equal to price as long as the firm covers its average variable cost. The short-run supply curve is given by the crosshatched portion of the marginal cost curve.

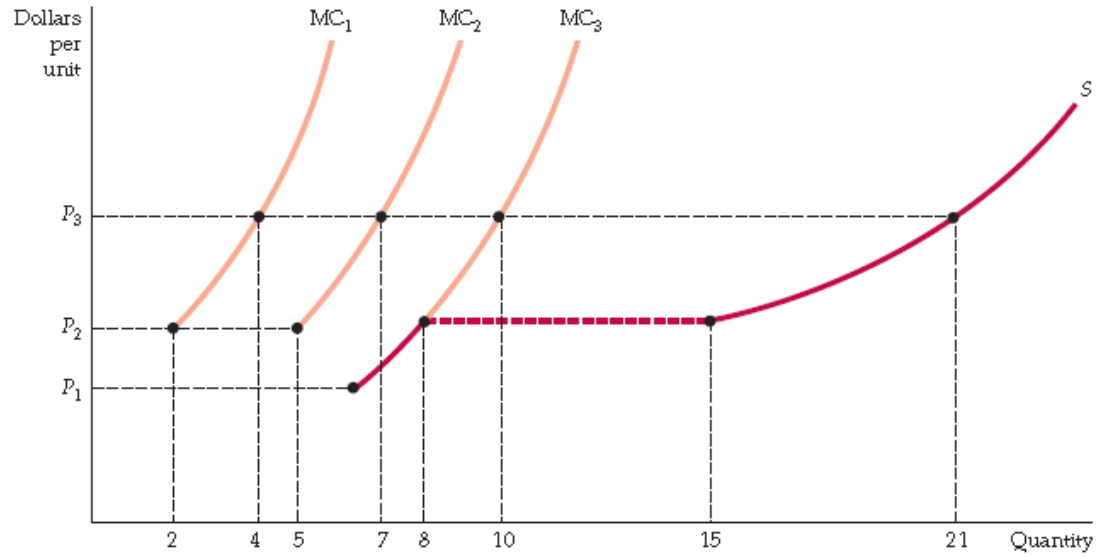
The firm's response to an input price change



THE RESPONSE OF A FIRM TO A CHANGE IN INPUT PRICE

When the marginal cost of production for a firm increases (from MC_1 to MC_2), the level of output that maximizes profit falls (from q_1 to q_2).

The short run market supply curve



INDUSTRY SUPPLY IN THE SHORT RUN

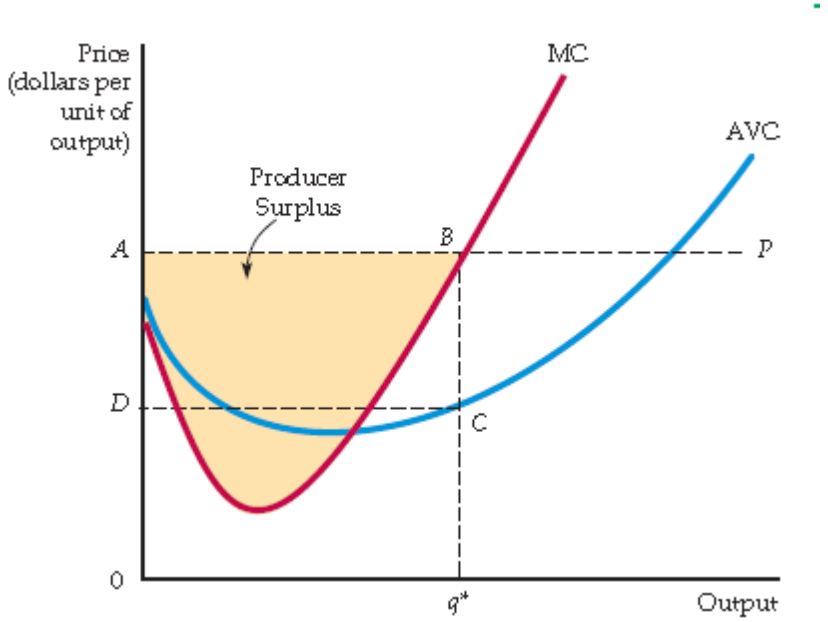
The short-run industry supply curve is the summation of the supply curves of the individual firms. Because the third firm has a lower average variable cost curve than the first two firms, the market supply curve *S* begins at price P_1 and follows the marginal cost curve of the third firm MC_3 until price equals P_2, when there is a kink. For P_2 and all prices above it, the industry quantity supplied is the sum of the quantities supplied by each of the three firms.

The elasticity of supply E_s is the percentage change in quantity supplied Q in response to a 1-percent change in price P:

$E_s = (\_Q/Q)/(\_P/P)$

Producer surplus in the short run

Producer surplus: Sum over all units produced by a firm of differences between the market price of a good and the marginal cost of production.

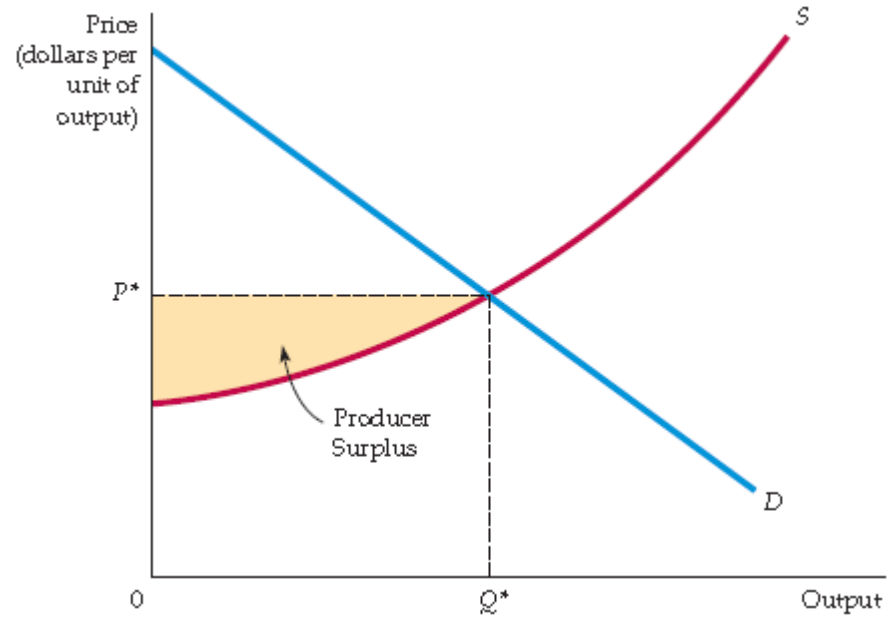


PRODUCER SURPLUS FOR A FIRM

The producer surplus for a firm is measured by the yellow area below the market price and above the marginal cost curve, between outputs 0 and q^*, the profit-maximizing output. Alternatively, it is equal to rectangle *ABCD* because the sum of all marginal costs up to q^* is equal to the variable costs of producing q^*.

PRODUCER SURPLUS VERSUS PROFIT Producer surplus is closely related to profit but is not equal to it. In the short run, producer surplus is equal to revenue minus variable cost, which is *variable profit.* Total profit, on the other hand, is equal to revenue minus *all* costs, both variable and fixed:

Producer surplus = PS = R - VC
Profit = p = R - VC – FC

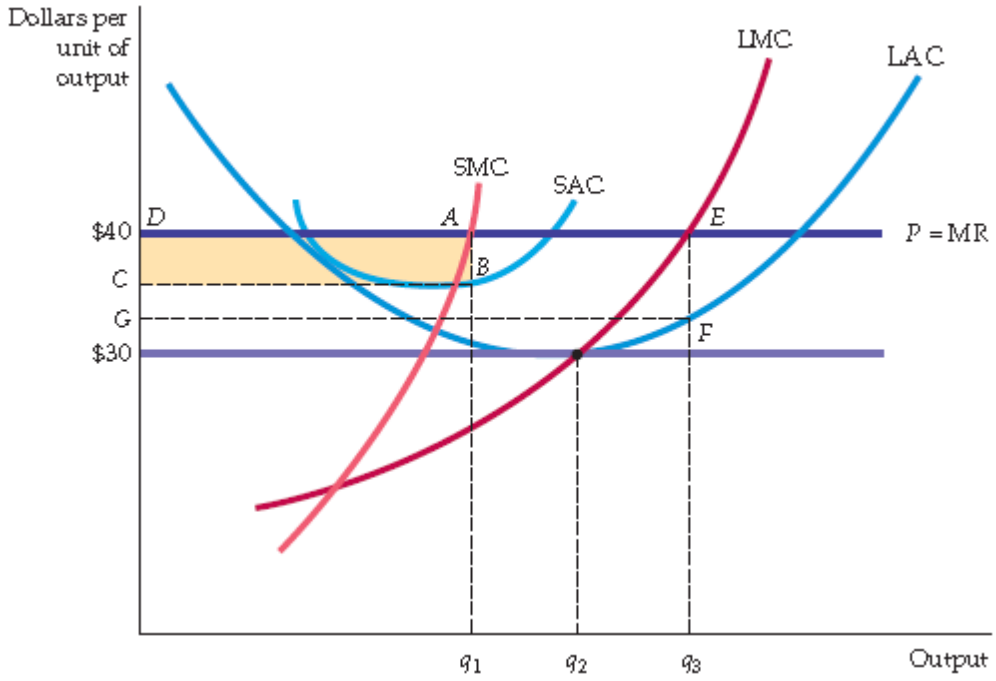


PRODUCER SURPLUS FOR A MARKET

The producer surplus for a market is the area below the market price and above the market supply curve, between 0 and output *Q**.

Choosing output in the long run

Long run profit maximization



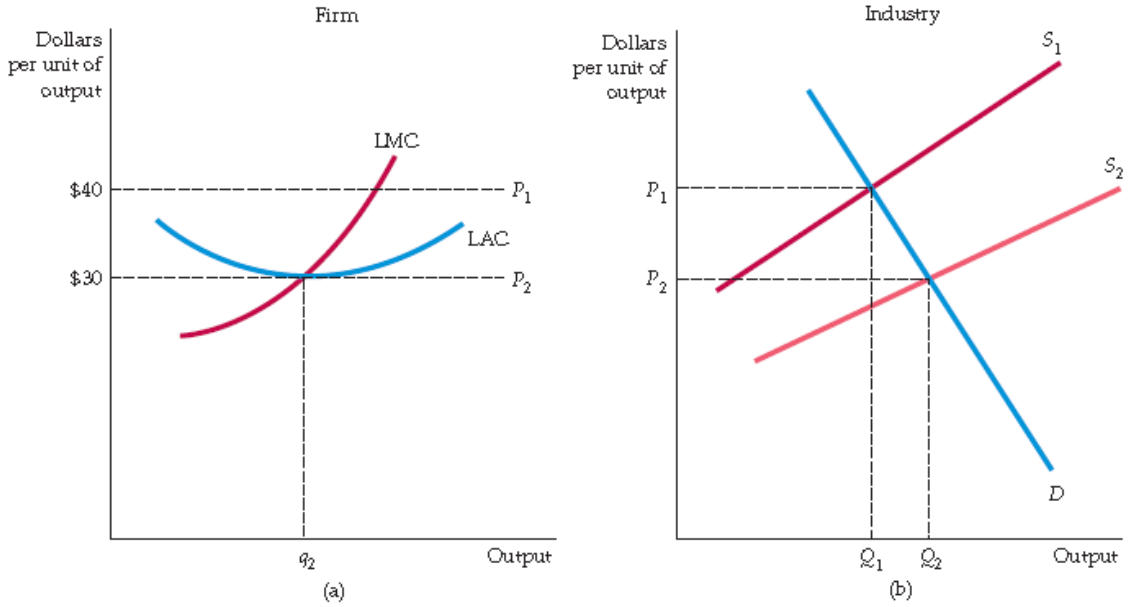
OUTPUT CHOICE IN THE LONG RUN

The firm maximizes its profit by choosing the output at which price equals long-run marginal cost LMC. In the diagram, the firm increases its profit from *ABCD* to *EFGD* by increasing its output in the long run.

Long run competitive equilibrium

Zero economic profit: A firm is earning a normal return on its investment –i.e, it is doing as well as it could be investing its money elsewhere.

In a market with entry and exit, a firm enters when it can earn a positive long run profit and exits when it faces the prospect of a long run loss.



LONG-RUN COMPETITIVE EQUILIBRIUM

Initially the long-run equilibrium price of a product is $40 per unit, shown in (b) as the intersection of demand curve *D* and supply curve S_1. In (a) we see that firms earn positive profits because long-run average cost reaches a minimum of $30 (at q_2). Positive profit encourages entry of new firms and causes a shift to the right in the supply
curve to S_2, as shown in (b). The long-run equilibrium occurs at a price of $30, as shown in (a), where each firm earns zero profit and there is no incentive to enter or exit the industry.

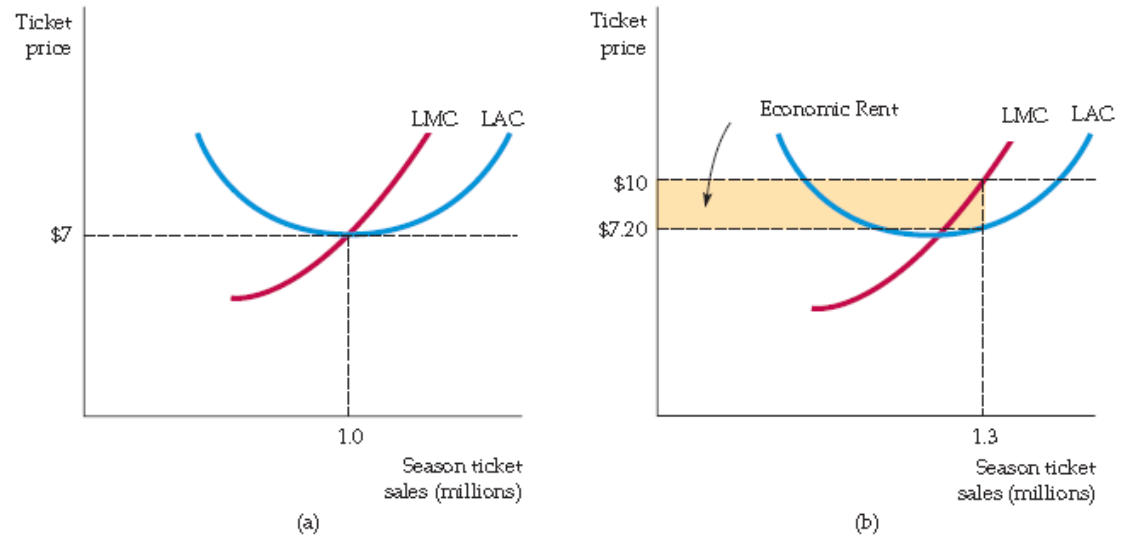
Long-run competitive equilibrium: All firms in an industry are maximizing profit, no firm has an incentive to enter or exit, and price is such that quantity supplied equals quantity demanded.

When a firm earns zero economic profit, it has no incentive to exit the industry. Likewise, other firms have no special incentive to enter. A **long-run competitive equilibrium** occurs when three conditions hold:

1. All firms in the industry are maximizing profit.
2. No firm has an incentive either to enter or exit the industry because all firms are earning zero economic profit.
3. The price of the product is such that the quantity supplied by the industry is equal to the quantity demanded by consumers.

Economic rent

Economic rent: Amount that firms are willing to pay for an input less the minimum amount necessary to obtain it.

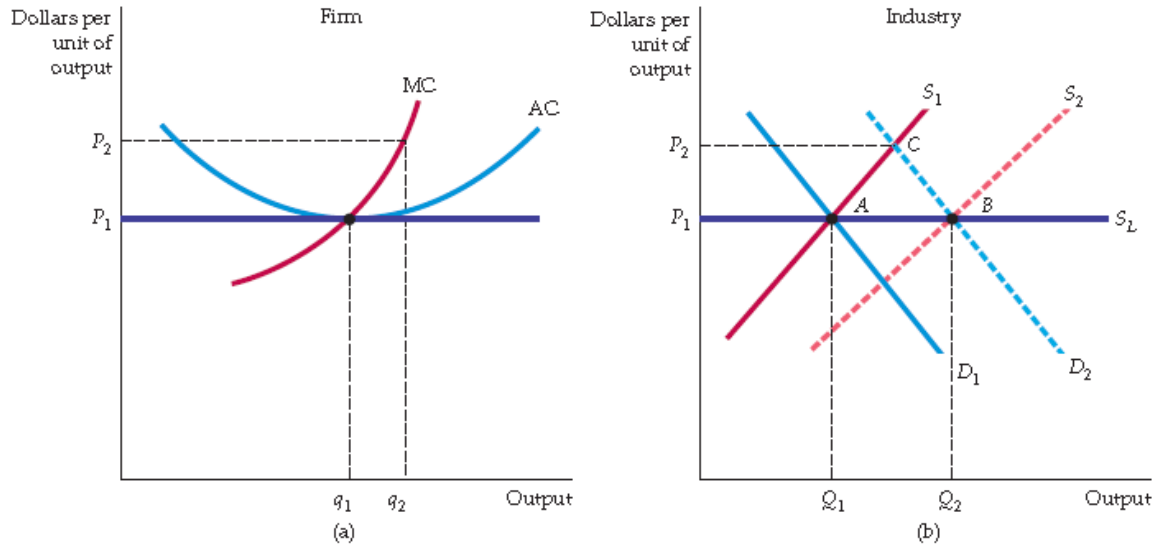


FIRMS EARN ZERO PROFIT IN LONG-RUN EQUILIBRIUM

In long-run equilibrium, all firms earn zero economic profit. In (a), a baseball team in a moderate-sized city sells enough tickets so that price ($7) is equal to marginal and average cost. In (b), the demand is greater, so a $10 price can be charged. The team increases sales to the point at which the average cost of production plus the average economic rent is equal to the ticket price. When the opportunity cost associated with owning the franchise is taken into account, the team earns zero economic profit.

The industry's long run supple curve

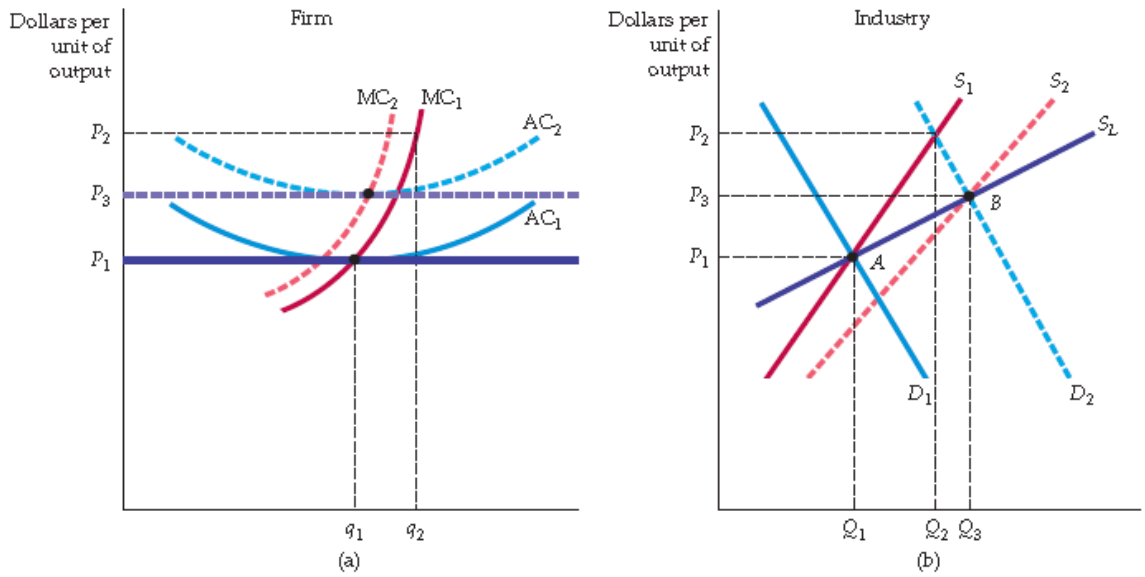
Constant-cost industry: industry whose long-run supply curve is horizontal.



LONG-RUN SUPPLY IN A CONSTANT-COST INDUSTRY

In (b), the long-run supply curve in a constant-cost industry is a horizontal line S_L. When demand increases, initially
causing a price rise (represented by a move from point *A* to point *C*), the firm initially increases its output from q_1 to q_2, as shown in (a). But the entry of new firms causes a shift to the right in industry supply. Because input prices are unaffected by the increased output of the industry, entry occurs until the original price is obtained (at point *B* in (b)).

Increasing-cost industry: Industry whose long run supply curve is upward sloping.

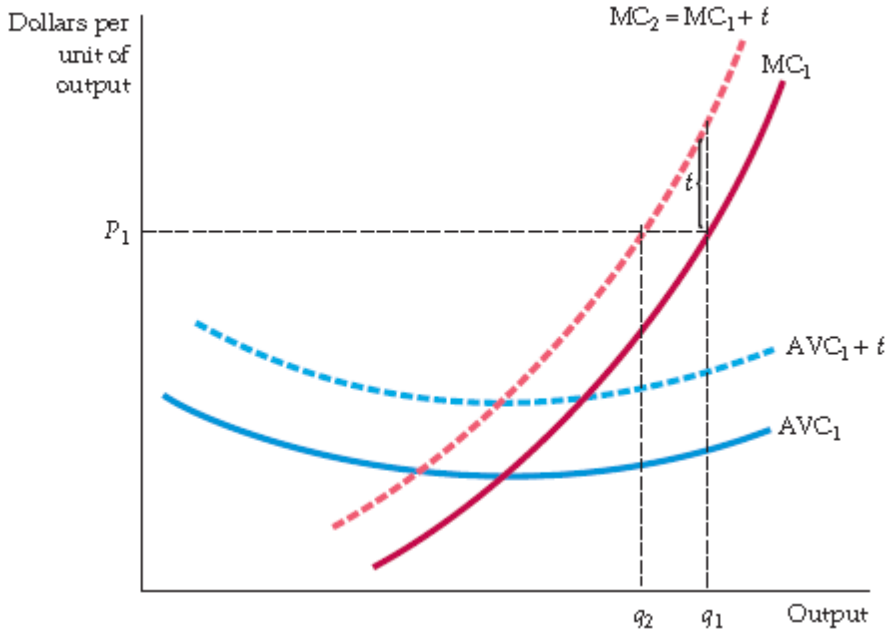


LONG-RUN SUPPLY IN AN INCREASING-COST INDUSTRY

In (b), the long-run supply curve in an increasing-cost industry is an upward-sloping curve S_L. When demand increases, initially causing a price rise, the firms increase their output from q_1 to q_2 in (a). In that case, the entry of new firms causes a shift to the right in supply from S_1 to S_2. Because input prices increase as a result, the new long-run equilibrium occurs at a higher price than the initial equilibrium.

Decreasing-cost industry: Industry whose long-run supply curve is downward sloping.

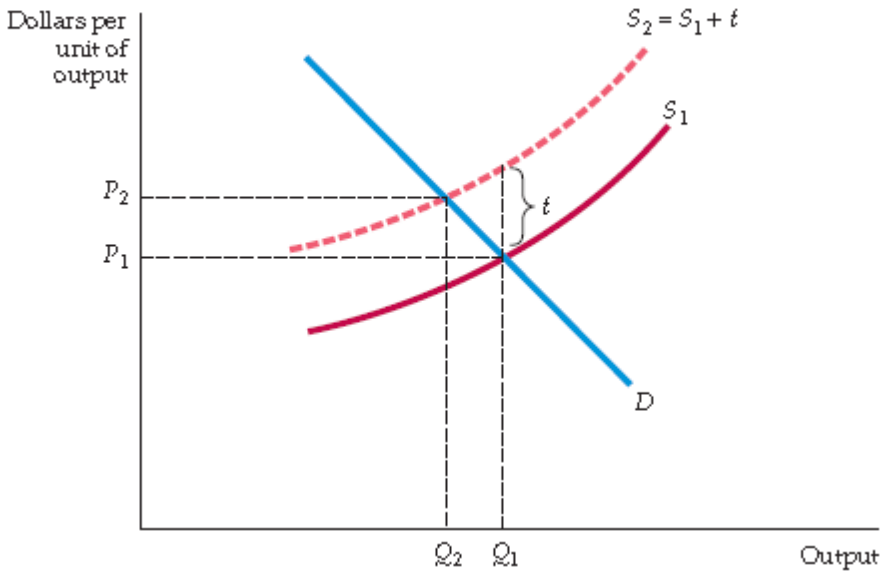
The effects of a TAX



EFFECT OF AN OUTPUT TAX ON A COMPETITIVE FIRM'S OUTPUT

An output tax raises the firm's marginal cost curve by the amount of the tax. The firm will reduce its output to the point at which the marginal cost plus the tax is equal to the price of the product.

Long run Elasticity of supply



EFFECT OF AN OUTPUT TAX ON INDUSTRY OUTPUT

An output tax placed on all firms in a competitive market shifts the supply curve for the industry upward by the amount of the tax. This shift raises the market price of the product and lowers the total output of the industry.

8.1 (55454)

1. Firms often use patent rights as a way to achieve perfect competition. True or false
2. A few sellers may behave if the operate in a perfectly competitive market if the market demand is very elastic. True or False

A price taker is

1. A firm that accepts different prices from different customers
2. A consumer who accepts different prices form different firms

3. A perfectly competitive firm
4. A frim that cannot influence the market price
5. Both 3 and 4

Which of the following is an example of a homogeneous product?

1. Petrol
2. Copper
3. Personal computers
4. Winter parkas
5. Both 1 and 2

Which of the following is a key assumption of a perfectly competitive market?

1. Firms can influence the market price
2. Commodities have few sellers
3. It is difficult for new sellers to enter the market
4. Each seller has a very small share of the market
5. None of the above

Several years ago, Alcoa was effectively the sole seller of aluminium because the firm owned nearly all of the aluminium ore reserves in the world. This market was not perfectly competitive, because this situation violated the:

1. Price taking assumption
2. Homogeneous product assumption
3. Free entry assumption
4. 1 and 2 are correct
5. 1 and 3 are correct

Refer to the following statements to answer this question:

1. Markets that have only a few sellers cannot be highly competitive
2. Market with many seller are always perfectly competitive.
    a. 1 and 2 are true.
    b. 1 is true and 2 is false
    c. 2 is true and 1 is false
    d. 1 and 2 are false

8.2 (13)

If managers do not choose to maximize profit, but to pursue some other goal such as revenue maximisation or growth.

1. They are more likely to become takeover targets of profit maximising firms
2. They are less likely to be replaced by stockholders

3. They are less likely to be replaced by the board of directors
4. They are more likely to have higher profit than if they had pursued that policy explicitly
5. Their companies are more likely to survive in the long run

Owners and managers

1. Must be the same people
2. May be different people with different goals, and in the long run firms that do best are those in which the mangers are allowed to pursue their own independent goals.
3. May be different people with different goals, but in the long run firms that do best are those in which managers pursue the goals of the owners.
4. May be different people with different but exactly complementary goals
5. May be different people with the same goals

8.3 (13413)

1. If current output is less than the profit maximising output, then marginal revenue is greater than marginal cost. True or False
2. Marginal profit is equal to marginal revenue minus marginal cost. True or False
3. At the profit maximising level of output, marginal profit is also maximised. True or False

Revenue is equal to

1. Price times quantity
2. Price times quantity minus total cost
3. Price times quantity minus average cost
4. Price time quantity minus marginal cost
5. Expenditure on production of output

Marginal revenue, graphically, is

1. The slope of a line from the origin to a point on the total revenue curve
2. The slope of a line from the origin to the end of the total revenue curve.
3. The slope of the total revenue curve at a given point
4. The vertical intercept of a line tangent to the total revenue curve at a given point
5. The horizontal intercept of a line tangent to the total revenue curve at a given point.

A firm maximises profit by operating at the level or output where

1. Average revenue equals average cost
2. Average revenue equals average variable cost
3. Total costs are minimised

4. Marginal revenue equals marginal cost
5. Marginal revenue exceeds marginal cost by the greatest amount.

Skip 4

If current output is less that the profit maximising output, then the next unit produced

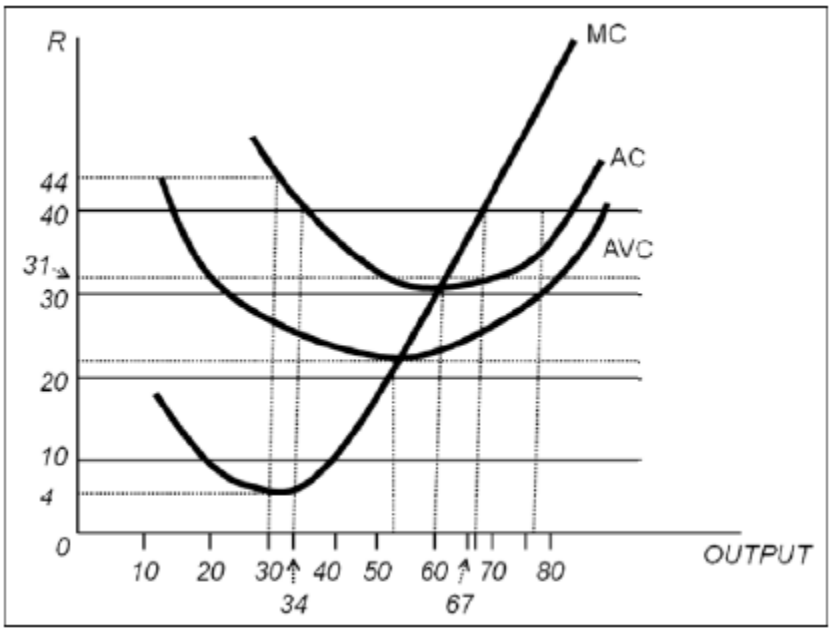
1. Will decrease profit
2. Will increase cost more than it increases revenue
3. Will increase revenue more than it increases cost
4. Will increase revenue without increasing cost
5. May or may not increase profit

(Not a question) Profit and loss positions of the firm

Equilibrium point	Revenue (price) versus costs	Status of operation
Economic profit (only in the short run)	$P = AR > ATC$	Continue
Normal (zero economic) profit (in the long run)	$P = AR = ATC$	Continue
Loss	$P = AR < ATC$, but $P = AR > AVC$	Continue, but part of *FC* not covered
Loss	$P = AR = AVC$	Continue, but *FC* is not covered
Loss	$P = AR < AVC$	Close down, *FC* and *AVC* are not covered

8.4 (42332)

Consider the following figure where a perfectly competitive frim faces a price of R40.00



The profit maximising output is

1. 30
2. 54
3. 60
4. 67
5. 79

At what output does the firm earn zero profit?

1. 0
2. 34 and 79
3. 54
4. 60
5. 67

At 67 units of output, profit is

1. Maximised and zero
2. Maximised and negative
3. Maximised and positive
4. Not maximised, and zero
5. Not maximised, and negative

At the profit maximising level of output, ATC is

1. R26.00
2. R30.00
3. R31.00

4. R40.00
5. R44.00

At the profit maximising level of output, AVC is

1. R22
2. R26
3. R30
4. R32
5. R40

8.5 (31)

The short run supply curve for a competitive firm is

1. Its entire MC curve
2. The upward sloping portion of its MC curve
3. Its MC curve above the minimum point of the AVC curve.
4. Its MC curve above the minimum point of the ATC curve.
5. Its MR curve

Higher input prices result in

1. Upward shifts of MC and reductions in output
2. Upward shifts of MC and increases in output
3. Downward shifts of MC and reductions in output
4. Downward shifts of MC and increases in output
5. Increased demand for the good the input is used for

8.6 (324)

Producer surplus in a perfectly competitive industry

1. The difference between profit at the profit maximising output and profit at the profit minimising output
2. The difference between revenue and total cost
3. The difference between revenue and variable cost
4. The difference between revenue and fixed cost
5. The same thing as revenue

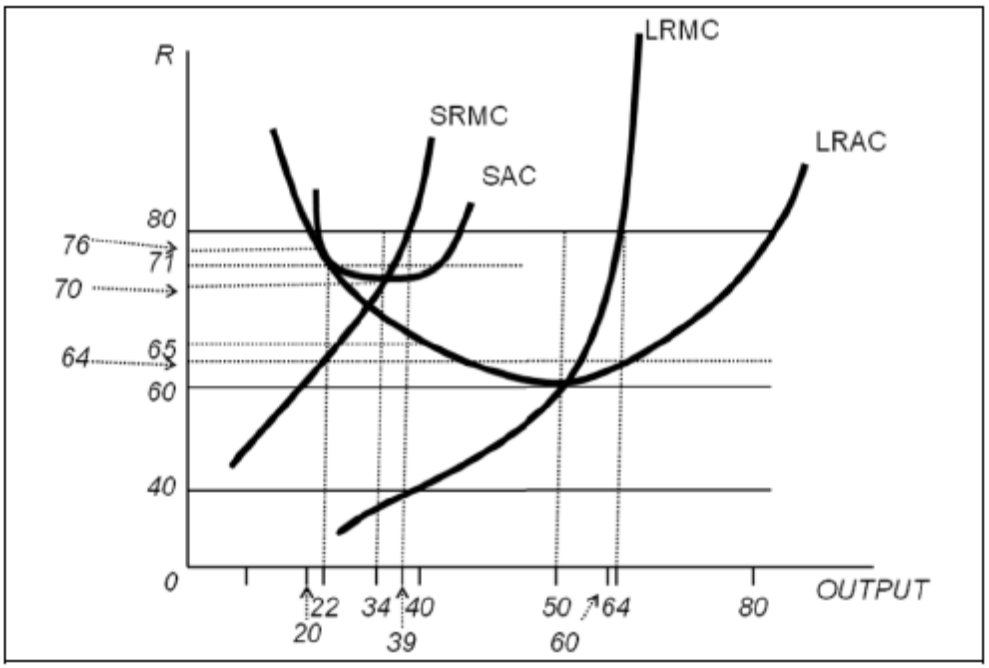
The shutdown decision can be restated in terms of producer surplus by saying that a firm should produce in the short run as long as

1. Revenue exceeds producer surplus
2. Producer surplus is positive
3. Producer surplus exceeds fixed cost
4. Producer surplus exceeds variable cost
5. Profit and producer surplus are equal

A firm's producer surplus equals its economic profit when

1. Average variable costs are minimised
2. Average fixed costs are minimised
3. Marginal costs equal marginal revenue
4. Fixed costs are zero
5. Total revenues equal total variable costs

8.7 (3355441)



At P = $80, the profit maximising output in the short run is.

1. 22
2. 34
3. 39
4. 50
5. 64

At P = R80, how much is profit in the short run?

1. 88
2. 306
3. 351
4. 1000
5. 1024

If the firm expects R800 to be the long run price, how many units of output will it plan to produce in the long run?

1. 22
2. 34
3. 38
4. 50
5. 64

How much profit will the firm earn if the price stays at R80?

1. 0
2. 306
3. 312
4. 1000
5. 1023

As the firm makes its long run adjustment, which if the following statements must be true?

1. It takes advantage of increasing returns to scale
2. It suffers from decreasing returns to scale
3. It takes advantage of increasing marginal product
4. It takes advantage of economies of scale
5. It takes advantage of diseconomies of scale

As the competitive industry, not just the firm in question, move towards long run equilibrium, the firm will be forced to operate at what level of output?

1. 22
2. 34
3. 38
4. 50
5. 64

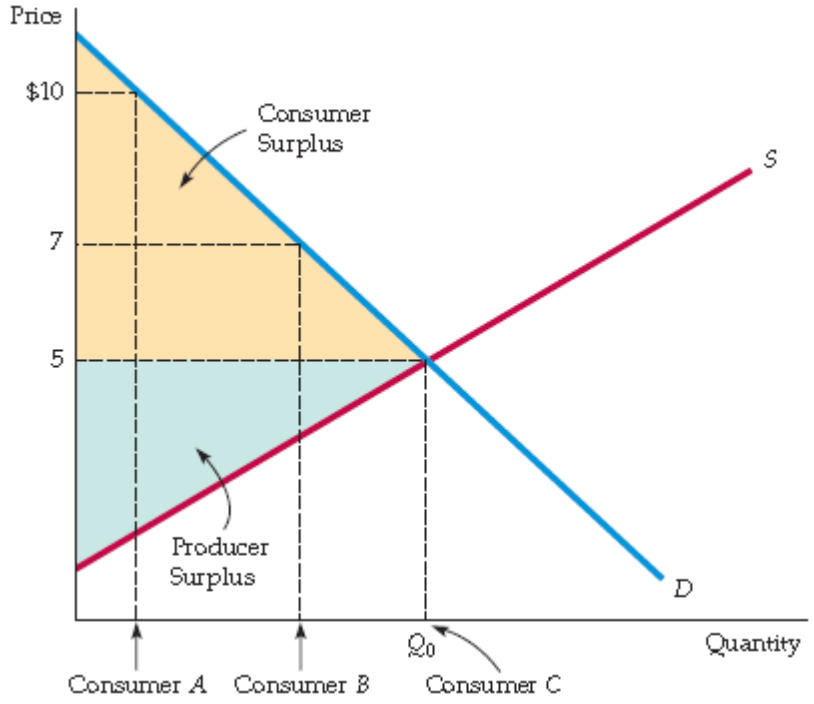
As the competitive industry, not just the firm in question, moves towards long run equilibrium, what will the price be?

1. 60
2. 64
3. 70
4. 71
5. 80

Learning unit 9: The analysis of competitive markets

Evaluating the Gains and Losses from Government Policies – Consumer and Producer Surplus

Review of Consumer and producer Surplus



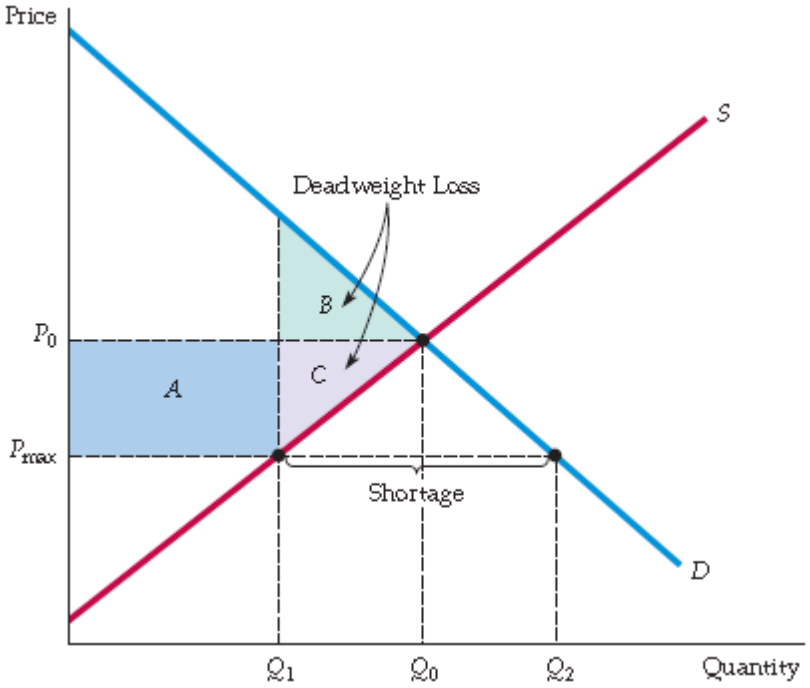
CONSUMER AND PRODUCER SURPLUS

Consumer *A* would pay $10 for a good whose market price is $5 and therefore enjoys a benefit of $5. Consumer *B* enjoys a benefit of $2, and Consumer *C*, who values the good at exactly the market price, enjoys no benefit. Consumer surplus, which measures the total benefit to all consumers, is the yellow-shaded area between the demand curve and the market price. Producer surplus measures the total profits of producers, plus rents to factor inputs. It is the green-shaded area between the

supply curve and the market price. Together, consumer and producer surplus measure the welfare benefit of a competitive market.

Application of Consumer and Producer Surplus

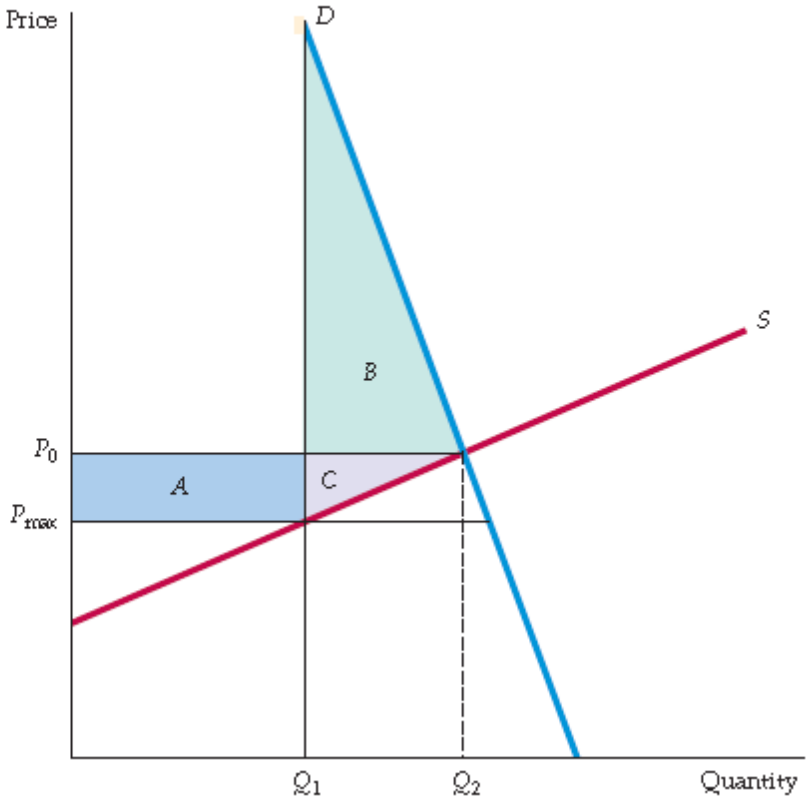
Welfare effects: Gains and losses to consumers and producers.



CHANGE IN CONSUMER AND PRODUCER SURPLUS FROM PRICE CONTROLS

The price of a good has been regulated to be no higher than P_{max}, which is below the marketclearing price P_0. The gain to consumers is the difference between rectangle *A* and triangle *B.* The loss to producers is the sum of rectangle *A* and triangle *C.* Triangles *B* and *C* together measure the deadweight loss from price controls.

Dead weight loss: Net loss of total (consumer plus producer) surplus.



EFFECT OF PRICE CONTROLS WHEN DEMAND IS INELASTIC

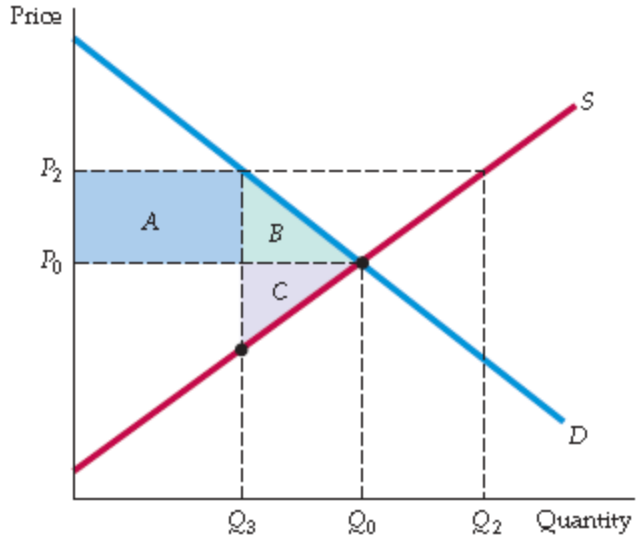
If demand is sufficiently inelastic, triangle *B* can be larger than rectangle *A.* In this case, consumers suffer a net loss from price controls.

The efficiency of a Competitive Market

Economic efficiency: Maximization of an aggregate consumer and producer surplus.

Market failure: Situation in which an unregulated competitive market is inefficient because prices fail to provide proper signals to consumers and producers.

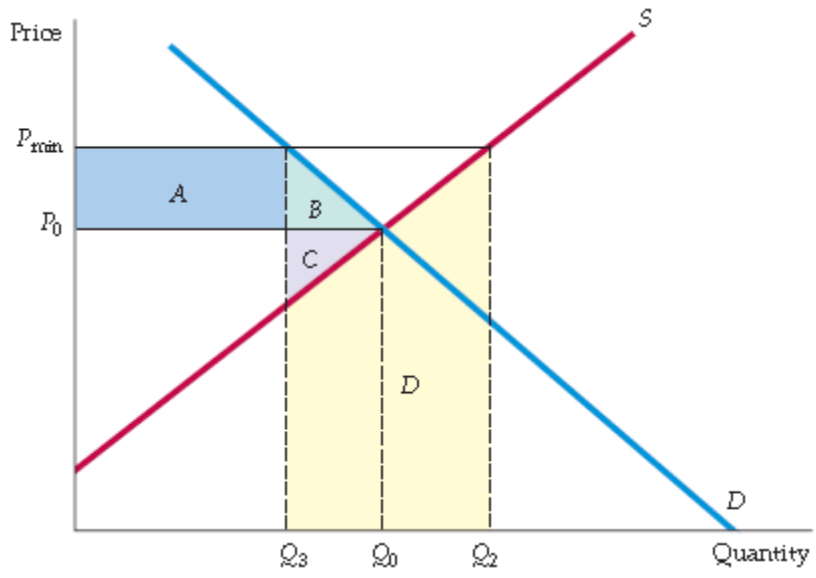
Externality: Action taken by either a producer or a consumer which affects other producers or consumers but is not accounted for by the market price.



WELFARE LOSS WHEN PRICE IS HELD ABOVE MARKET-CLEARING LEVEL

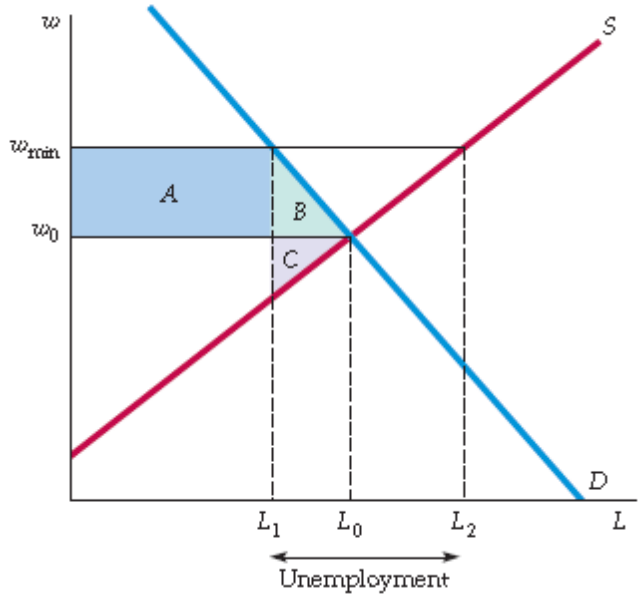
When price is regulated to be no lower than P_2, only Q_3 will be demanded. If Q_3 is produced, the deadweight loss is given by triangles *B* and *C.* At price P_2, producers would like to produce more than Q_3. If they do, the deadweight loss will be even larger.

Minimum prices



PRICE MINIMUM

Price is regulated to be no lower than P_{min}. Producers would like to supply Q_2, but consumers will buy only Q_3. If producers indeed produce Q_2, the amount $Q_2 - Q_3$ will go unsold and the change in producer surplus will be $A - C - D$. In this case, producers as a group may be worse off.

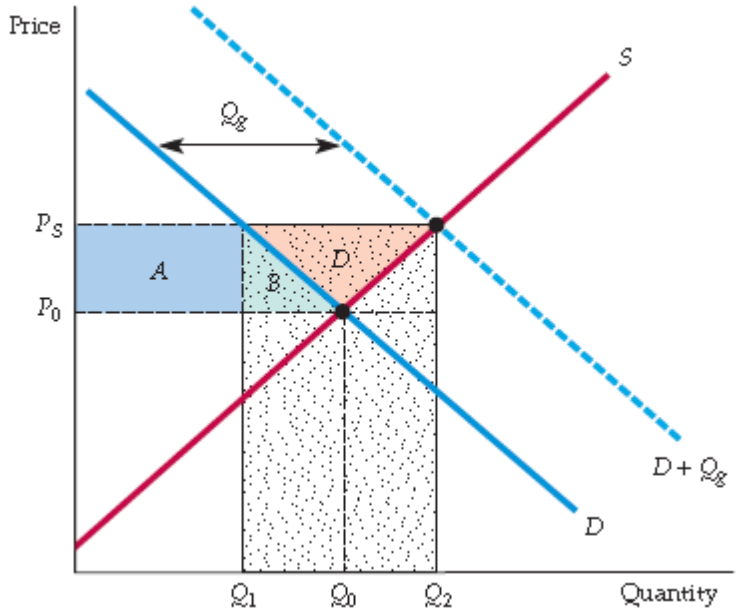


THE MINIMUM WAGE

Although the market-clearing wage is w_0, firms are not allowed to pay less than w_{min}. This results in unemployment of an amount $L_2 - L_1$ and a deadweight loss given by triangles *B* and *C.*

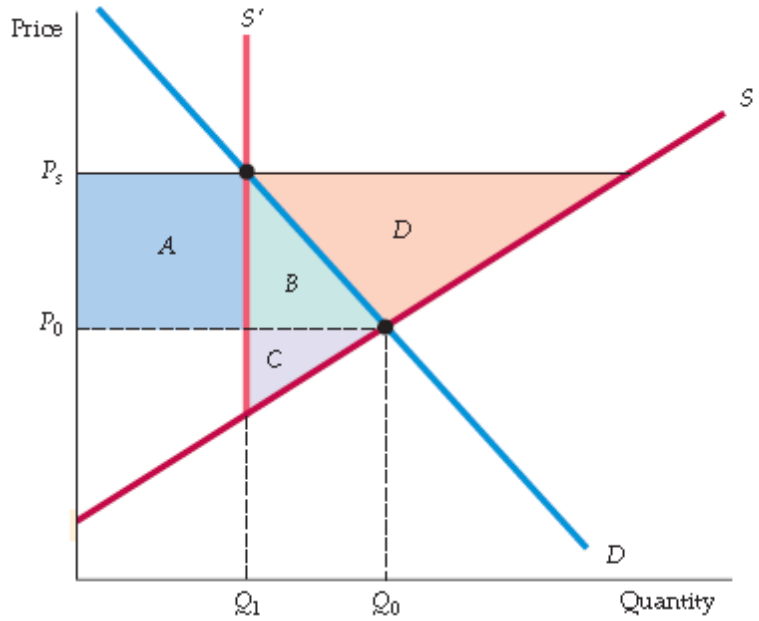
Price supports and Production Quotas

Price support: Price set by government above free market level and maintained by governmental purchases of excess supply.



PRICE SUPPORTS

To maintain a price P_s above the market-clearing price P_0, the government buys a quantity Q_g. The gain to producers is *A* _ *B* _ *D*. The loss to consumers is *A* _ *B*. The cost to the government is the speckled rectangle, the area of which is $P_s(Q_2 - Q_1)$.



SUPPLY RESTRICTIONS

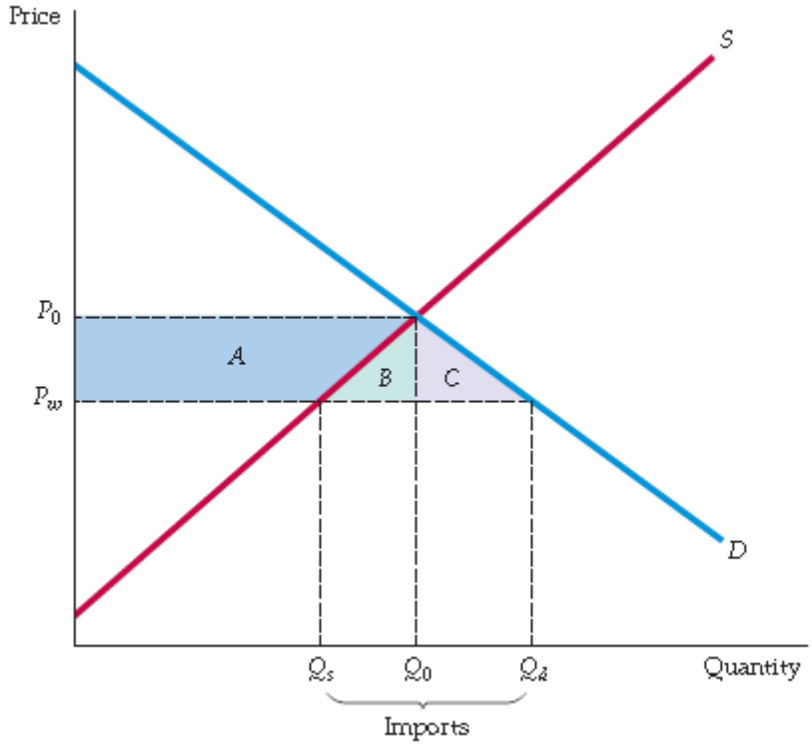
To maintain a price P_s above the market-clearing price P_0, the government can restrict supply to Q_1, either by imposing production quotas (as with taxicab medallions) or by giving producers a financial incentive to reduce output (as with acreage limitations in agriculture).

For an incentive to work, it must be at least as large as $B \_ C \_ D$, which would be the additional profit earned by planting, given the higher price P_S. The cost to the government is therefore at least $B \_ C \_ D$.

Import quotas and tariffs

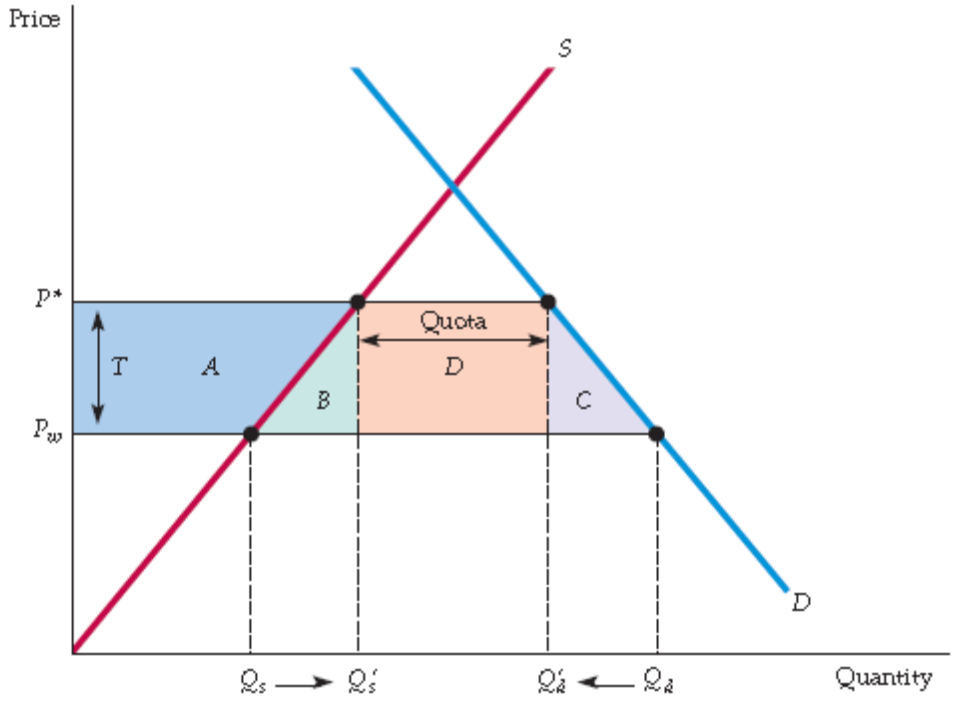
Import quota: Limit on the quantity of a good that can be imported.

Tariff: Tax on an imported good.



IMPORT TARIFF OR QUOTA THAT ELIMINATES IMPORTS

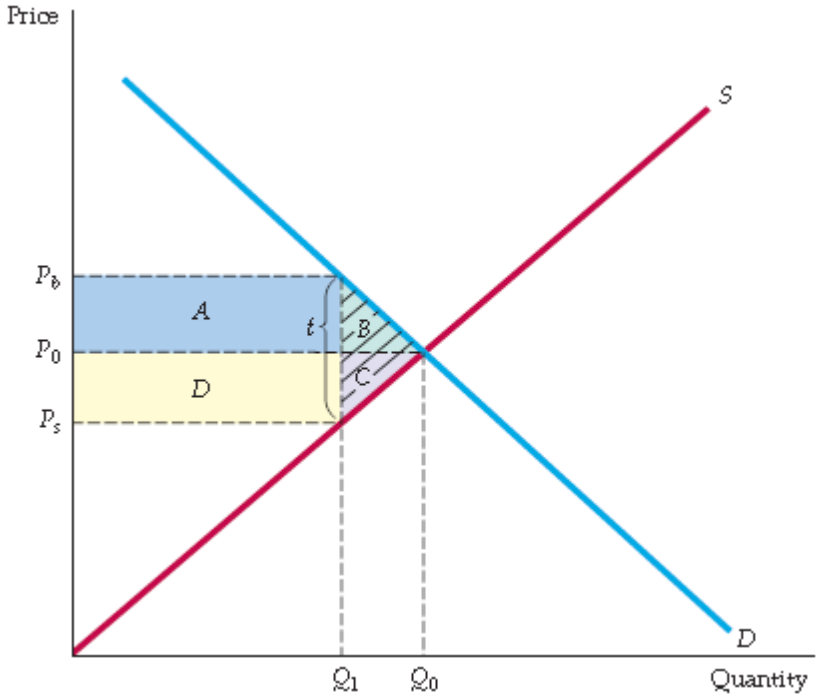
In a free market, the domestic price equals the world price P_w. A total Q_d is consumed, of which Q_s is supplied domestically and the rest imported. When imports are eliminated, the price is increased to P_0. The gain to producers is trapezoid A. The loss to consumers is $A + B + C$, so the deadweight loss is $B + C$.



IMPORT TARIFF OR QUOTA (GENERAL CASE)
When imports are reduced, the domestic price is increased from P_w to P^*. This can be achieved by a quota, or by a tariff $T = P^* - P_w$. Trapezoid *A* is again the gain to domestic producers. The loss to consumers is *A* + *B* + *C* + *D*. If a tariff is used, the government gains *D*, the revenue from the tariff, so the net domestic loss is *B* + *C*. If a quota is used instead, rectangle *D* becomes part of the profits of foreign producers, and the net domestic loss is *B* + *C* + *D*.

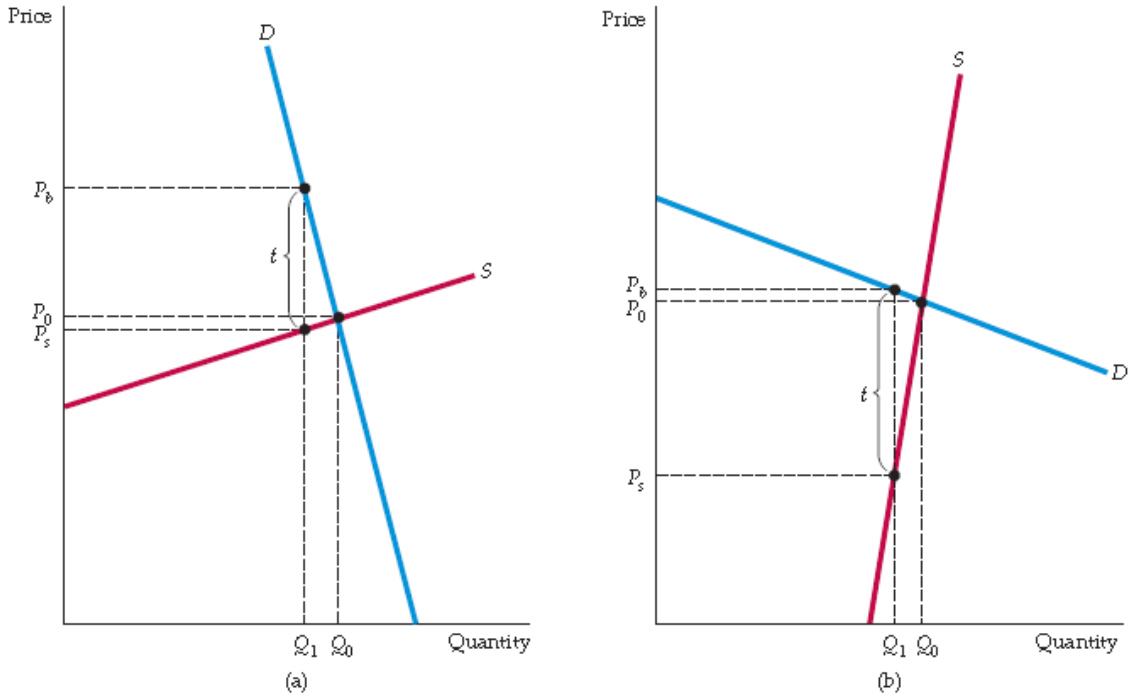
The impact of a tax or subsidy

Specific tax: Tax of a certain amount of money per unit sold.



INCIDENCE OF A TAX

P_b is the price (including the tax) paid by buyers.
P_s is the price that sellers receive, less the tax.
Here the burden of the tax is split evenly between buyers and sellers. Buyers lose *A* + *B*, sellers lose *D* + *C*, and the government earns *A* + *D* in revenue. The deadweight loss is *B* + *C.*

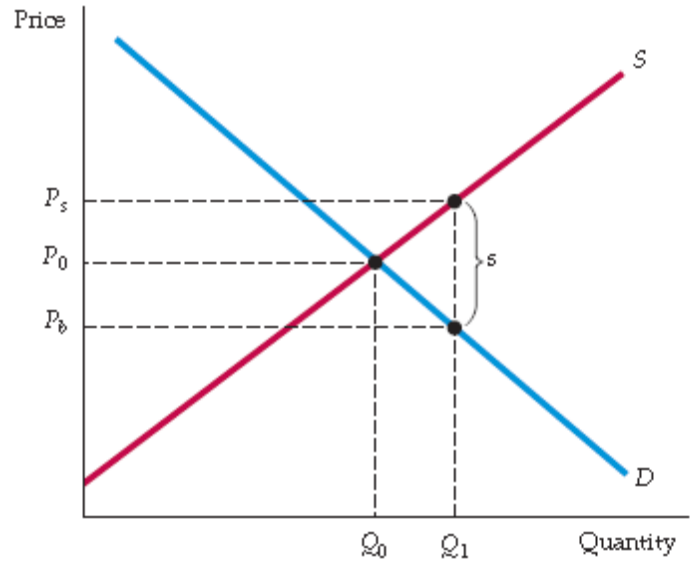


IMPACT OF A TAX DEPENDS ON ELASTICITIES OF SUPPLY AND DEMAND

(a) If demand is very inelastic relative to supply, the burden of the tax falls mostly on buyers.
(b) If demand is very elastic relative to supply, it falls mostly on sellers.

The effects of a subsidy

Subsidy: Payment reducing the buyer's price below the seller's price; i.e, a negative tax.



SUBSIDY

A subsidy can be thought of as a negative tax. Like a tax,
the benefit of a subsidy is split between buyers and sellers,
depending on the relative elasticities of supply and demand.

Learning unit 10: Market power: monopoly and monopsony

Monopoly: Market with only one seller.

Monopsony: Market with only one buyer.

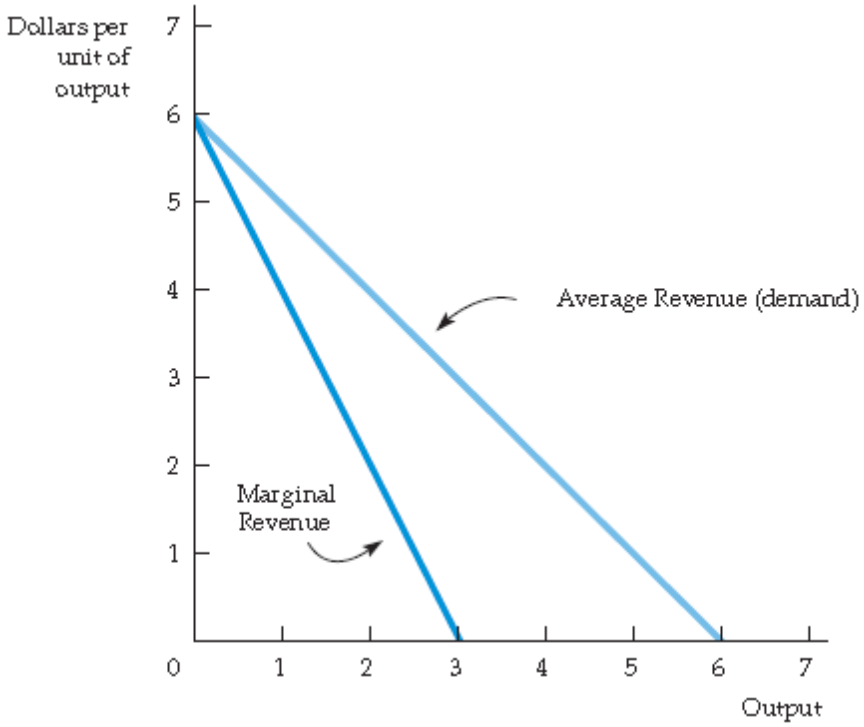
Market power: Ability of a seller or buyer to affect the price of a good.

Monopoly

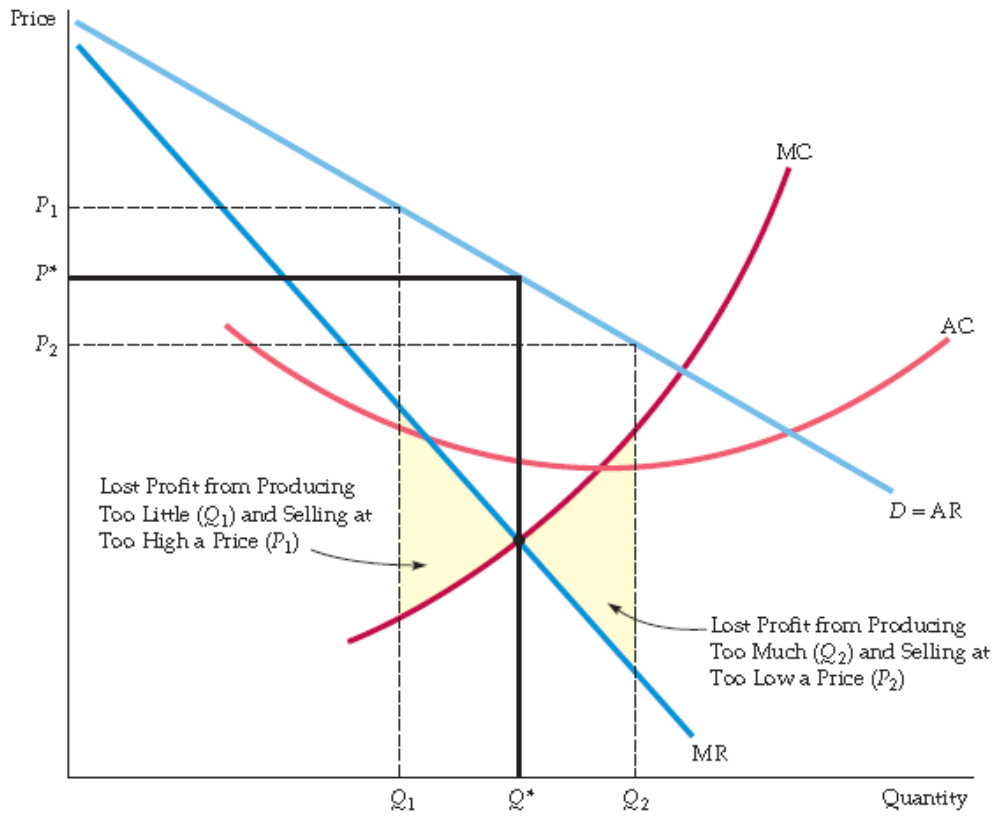
Average revenue and marginal revenue

Marginal revenue: Change in revenue resulting from a one unit increase in output.

The Monopolist's Output Decision

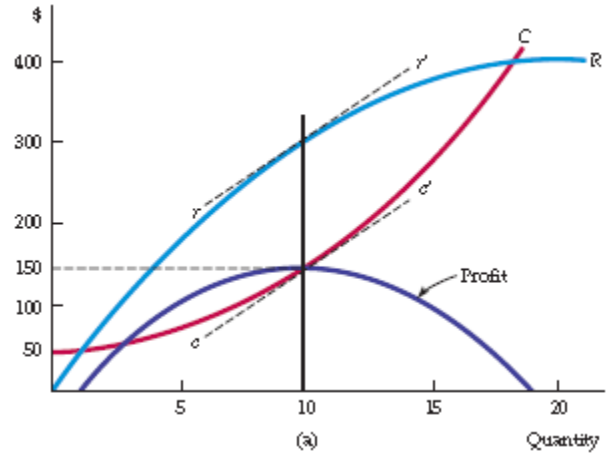


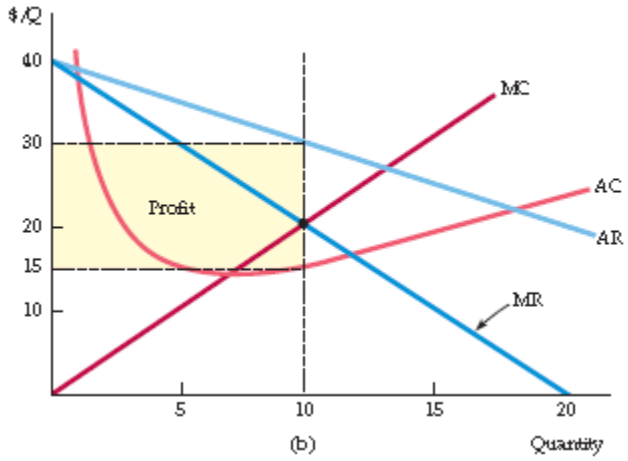
AVERAGE AND MARGINAL REVENUE
Average and marginal revenue are shown for the demand curve $P = 6 - Q$.



PROFIT IS MAXIMIZED WHEN MARGINAL REVENUE EQUALS MARGINAL COST

Q^* is the output level at which MR = MC. If the firm produces a smaller output—say, Q_1—it sacrifices some profit because the extra revenue that could be earned from producing and selling the units between Q_1 and Q^* exceeds the cost of producing them. Similarly, expanding output from Q^* to Q_2 would reduce profit because the additional cost would exceed the additional revenue.





EXAMPLE OF PROFIT MAXIMIZATION

Part (a) shows total revenue *R*, total cost *C*, and profit, the difference between the two. Part (b) shows average and marginal revenue and average and marginal cost. Marginal revenue is the slope of the total revenue curve, and marginal cost is the slope of the total cost curve. The profitmaximizing output is *Q** _ 10, the point where marginal revenue equals marginal cost. At this output level, the slope of the profit curve is zero, and the slopes of the total revenue and total cost curves are equal. The profit per unit is $15, the difference between average revenue and average cost. Because 10 units are produced, total profit is $150.

A rule of thumb for pricing

We know that price and output should be chosen so that marginal revenue equals marginal cost, but how can the manager of a firm find the correct price and output level in practice? Most managers have only limited knowledge of the average and marginal revenue curves that their firms face. Similarly, they might know the firm's marginal cost only over a limited output range. We therefore want to translate the condition that marginal revenue should equal marginal cost into a rule of thumb that can be more easily applied in practice.

To do this, we first write the expression for marginal revenue:

Note that the extra revenue from an incremental unit of quantity, _1*PQ*2>_*Q*, has two components:
1. Producing one extra unit and selling it at price *P* brings in revenue (1)(*P*) _ *P.*
2. But because the firm faces a downward-sloping demand curve, producing and selling this extra unit also results in a small drop in price _*P*>_*Q* which reduces the revenue from all units sold (i.e., a change in revenue *Q*[_*P*>_*Q*]).
Thus,

$$\mathrm{MR} = P + Q\frac{\Delta P}{\Delta Q} = P + P\left(\frac{Q}{P}\right)\left(\frac{\Delta P}{\Delta Q}\right)$$

We obtained the expression on the right by taking the term *Q*1_*P*>_*Q*2 and multiplying and dividing it by *P.* Recall that the elasticity of demand is defined as E_d = 1*P*>*Q*2 1_*Q*>_*P*2. Thus 1*Q*>*P*2 1_*P*>_*Q*2 is the reciprocal of the elasticity of demand, 1/E_d, measured at the profit-maximizing output, and

$$\mathrm{MR} = P + P(1/E_d)$$

Now, because the firm's objective is to maximize profit, we can set marginal revenue equal to marginal cost:

$$P + P(1/E_d) = \mathrm{MC}$$

which can be rearranged to give us

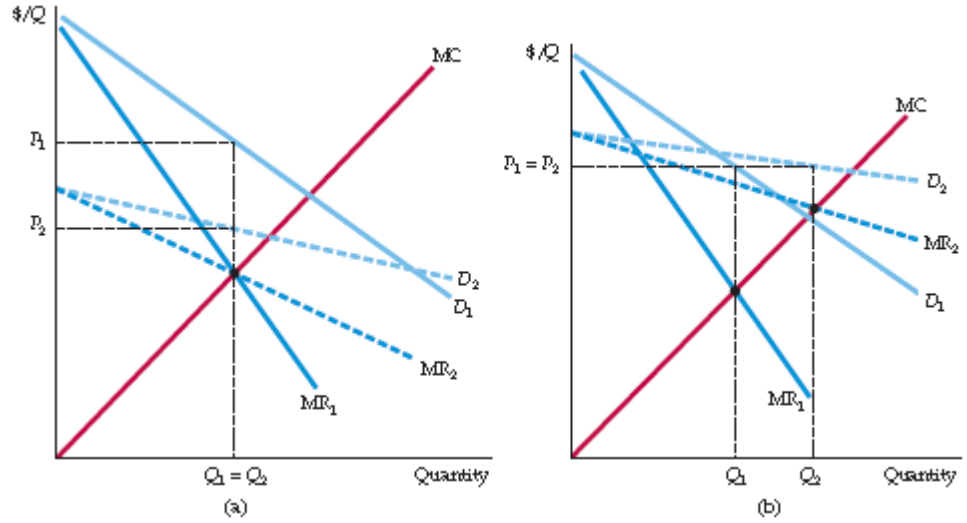
$$\frac{P - \mathrm{MC}}{P} = \frac{1}{E_d}$$

This relationship provides a rule of thumb for pricing. The left-hand side, (*P* - MC)/*P*, is the markup over marginal cost as a percentage of price. The relationship says that this markup should equal minus the inverse of the elasticity of demand.[4] (This figure will be a *positive* number because the elasticity of demand is negative) .

Equivalently, we can rearrange this equation to express price directly as a markup over marginal cost.

$$P = \frac{\mathrm{MC}}{1 + (1/E_d)}$$

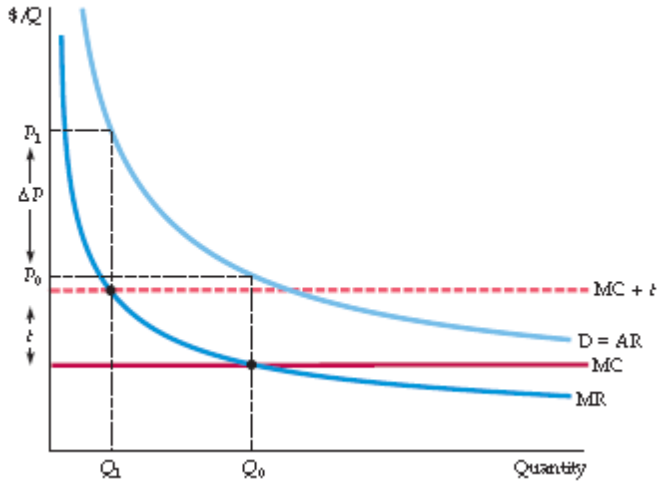
Shifts in demand



SHIFTS IN DEMAND

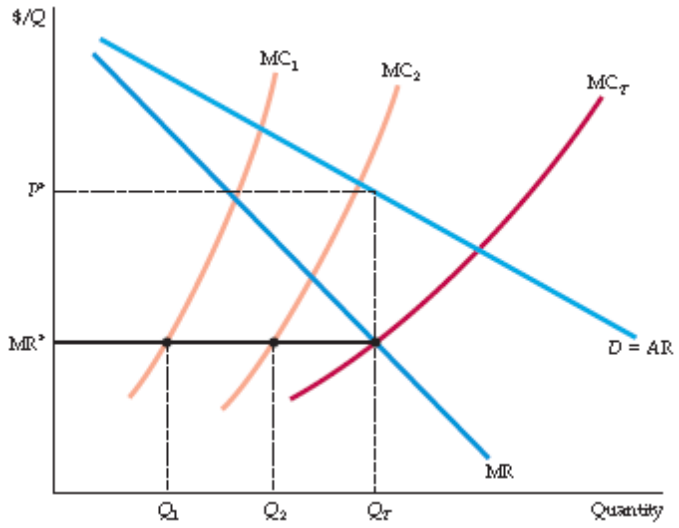
Shifting the demand curve shows that a monopolistic market has no supply curve—i.e., there is no one-to-one relationship between price and quantity produced. In (a), the demand curve D_1 shifts to new demand curve D_2. But the new marginal revenue curve MR_2 intersects marginal cost at the same point as the old marginal revenue curve MR_1. The profit-maximizing output therefore remains the same, although price falls from P_1 to P_2. In (b), the new marginal revenue curve MR_2 intersects marginal cost at a higher output level Q_2. But because demand is now more elastic, price remains the same.

The effect of a tax



EFFECT OF EXCISE TAX ON MONOPOLIST

With a tax t per unit, the firm's effective marginal cost is increased by the amount t to MC + t. In this example, the increase in price ΔP is larger than the tax t.



PRODUCTION WITH TWO PLANTS

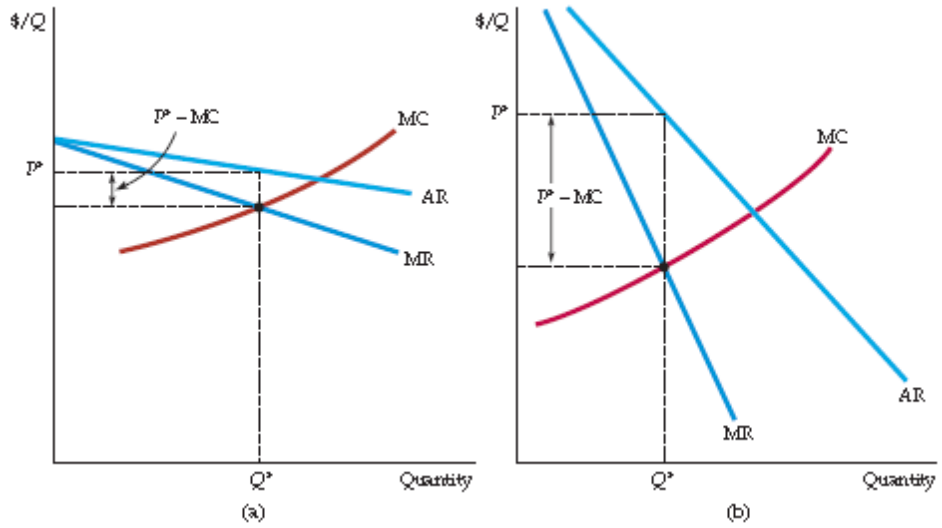
A firm with two plants maximizes profits by choosing output levels Q_1 and Q_2 so that marginal revenue MR (which depends on *total* output) equals marginal costs for each plant, MC_1 and MC_2.

Measuring Monopoly Power

Larner Index of Monopoly Power: Measure of monopoly power calculated as excess of price over marginal cost as a fraction of price.

The Rule of Thumb for Pricing

$$P = \frac{MC}{1 + (1/E_d)}$$



ELASTICITY OF DEMAND AND PRICE MARKUP

The markup $(P - MC)/P$ is equal to minus the inverse of the elasticity of demand facing the firm. If the firm's demand is elastic, as in (a), the markup is small and the firm has little monopoly power. The opposite is true if demand is relatively inelastic, as in (b).

Sources of monopoly power

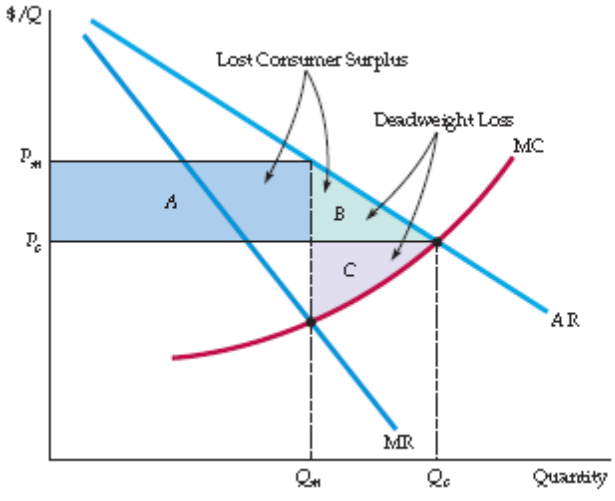
Three factors determine a firm's elasticity of demand

1. The elasticity of market demand. Because the firm's own demand will be at least as elastic as market demand, the elasticity of market demand limits the potential for monopoly power.
2. The number of firms in the market. If there are many firms, it is unlikely that any one frim will be able to affect price significantly.
3. The interaction among firms. Even if only two or three firms are in the rivalry among them in aggressive, with each firm trying to capture as much of the market as it can.

The number of firms

Barrier to entry: condition that impedes entry by new competitors.

The Social costs of Monopoly Power

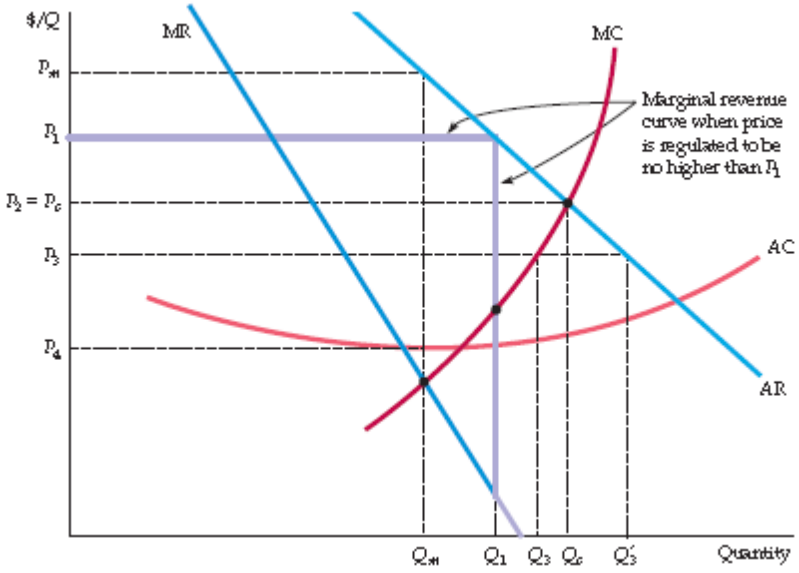


DEADWEIGHT LOSS FROM MONOPOLY POWER
The shaded rectangle and triangles show changes in consumer and producer surplus when moving from competitive price and quantity, P_c and Q_c, to a monopolist's price and quantity, P_m and Q_m. Because of the higher price, consumers lose $A + B$ and producer gains $A - C$. The deadweight loss is $B + C$.

Rent Seeking

Rent seeking: Spending money in socially unproductive efforts to acquire, maintain, or exercise monopoly.

Price regulation

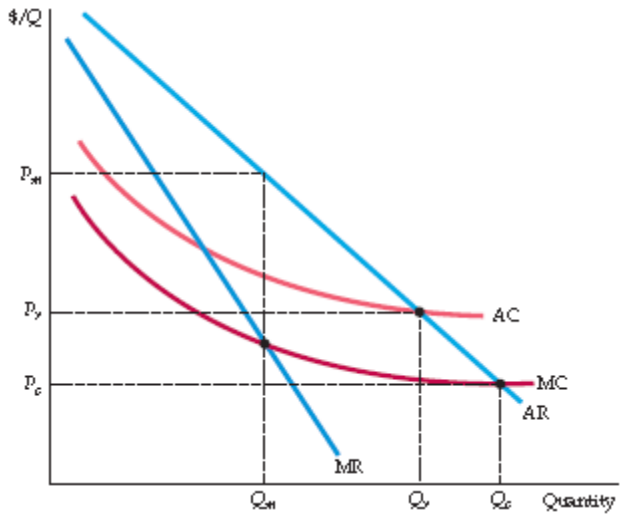


PRICE REGULATION

If left alone, a monopolist produces Q_m and charges P_m. When the government imposes a price ceiling of P_1 the firm's average and marginal revenue are constant and equal to P_1 for output levels up to Q_1. For larger output levels, the original average and marginal revenue curves apply. The new marginal revenue curve is, therefore, the dark purple line, which intersects the marginal cost curve at Q_1. When price is lowered to P_c, at the point where marginal cost intersects average revenue, output increases to its maximum Q_c. This is the output that would be produced by a competitive industry. Lowering price further, to P_3, reduces output to Q_3 and causes a shortage, $Q_3 = - Q_3$.

Natural Monopoly

Natural monopoly: Firm that can produce the entire output of the market at a cost lower than what it would be if there were several firms.



REGULATING THE PRICE OF A NATURAL MONOPOLY

A firm is a natural monopoly because it has economies of scale (declining average and marginal costs) over its entire output range. If price were regulated to be P_c the firm would lose money and go out of business. Setting the price at P_r yields the largest possible output consistent with the firm's remaining in business; excess profit is zero.

Regulation in Practice

Rate-of-return regulation: Maximum price allowed by a regulatory agency is based on the (expected) rate of return that a firm will earn.

Monopsony

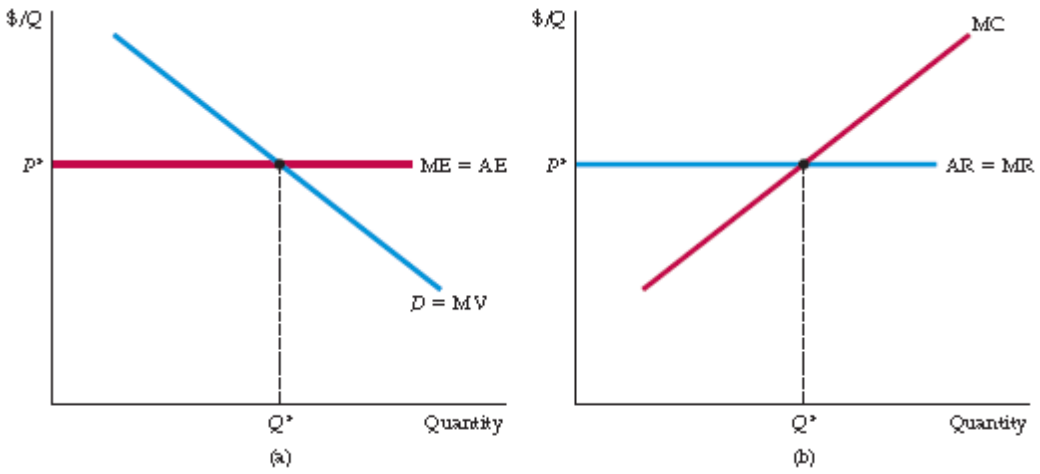
Oligopsony: Market with only a few buyers

Monopsony power: Buyer's ability to affect the price of a good

Marginal value: Additional benefit derived from purchasing one more unit of a good.

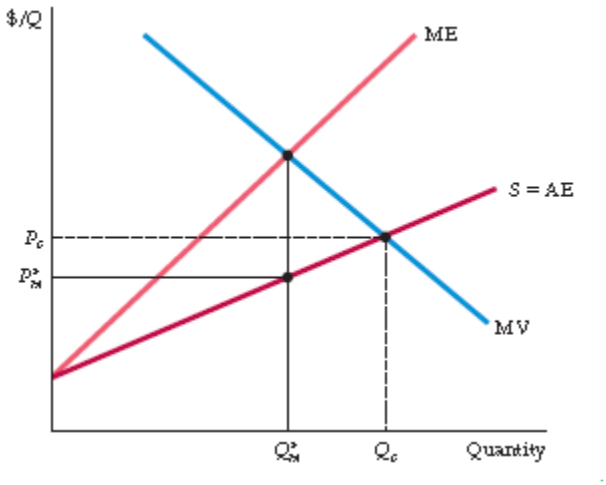
Marginal expenditure: Additional cost of buying one more unit of a good.

Average expenditure: Price paid per unit of a good.



COMPETITIVE BUYER COMPARED TO COMPETITIVE SELLER

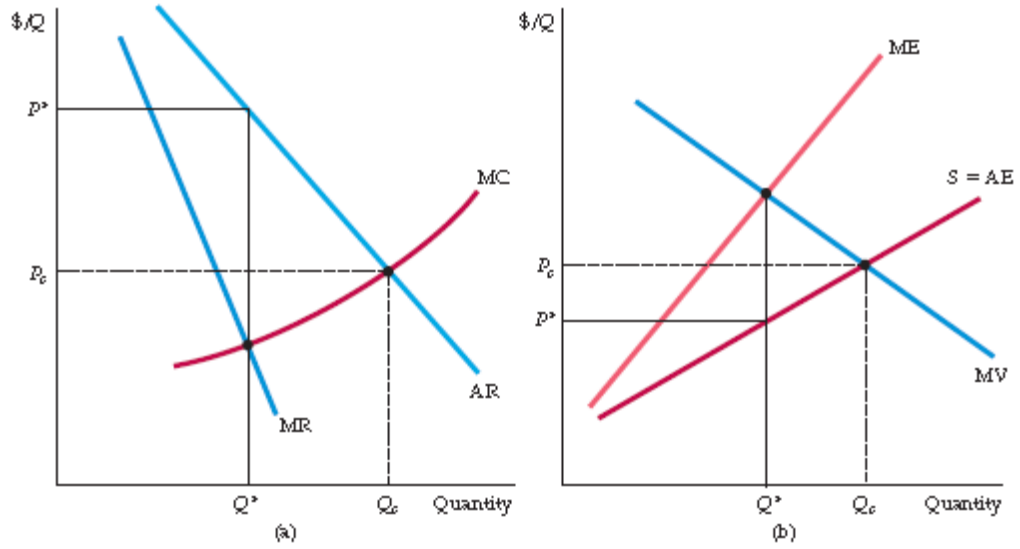
In (a), the competitive buyer takes market price P^* as given. Therefore, marginal expenditure and average expenditure are constant and equal; quantity purchased is found by equating price to marginal value (demand). In (b), the competitive seller also takes price as given. Marginal revenue and average revenue are constant and equal; quantity sold is found by equating price to marginal cost.



MONOPSONIST BUYER

The market supply curve is monopsonist's average expenditure curve AE. Because average expenditure is rising, marginal expenditure lies above it. The monopsonist purchases quantity Q_m*, where marginal expenditure and marginal value (demand) intersect. The price paid per unit P_m* is then found from the average expenditure (supply) curve. In a competitive market, price and quantity, P_c and Q_c, are both higher. They are found at the point where average expenditure (supply) and marginal value (demand) intersect.

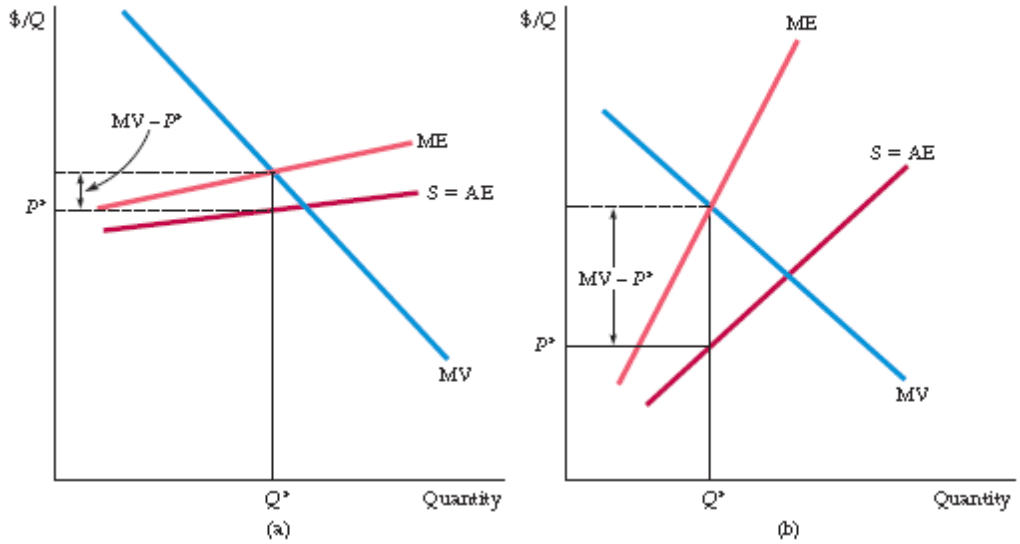
Monopsony power



MONOPOLY AND MONOPSONY

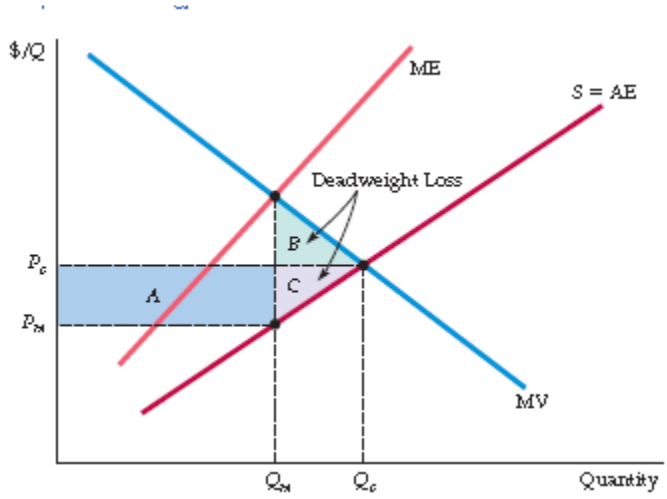
These diagrams show the close analogy between monopoly and monopsony. (a) The monopolist produces where marginal revenue intersects marginal cost. Average revenue exceeds marginal revenue, so that price exceeds marginal cost. (b) The monopsonist purchases up to the point where marginal expenditure intersects marginal value. Marginal expenditure exceeds average expenditure, so that marginal value exceeds price.

Sources of Monopsony Power



MONOPSONY POWER: ELASTIC VERSUS INELASTIC SUPPLY

Monopsony power depends on the elasticity of supply. When supply is elastic, as in (a), marginal expenditure and average expenditure do not differ by much, so price is close to what it would be in a competitive market. The opposite is true when supply is inelastic, as in (b).



DEADWEIGHT LOSS FROM MONOPSONY POWER

The shaded rectangle and triangles show changes in buyer and seller surplus when moving from competitive price and quantity, P_c and Q_c, to the monopsonist's price and quantity, P_m and Q_m. Because both price and quantity are lower, there is an increase in buyer (consumer) surplus given by $A - B$. Producer surplus falls by $A + C$, so there is a deadweight loss given by triangles B and C.

Bilateral Monopoly

Bilateral monopoly: Market with only one seller and one buyer.

Limiting Market Power: The Antitrust Laws

Antitrust laws: Rules and regulations prohibiting actions that restrain, or are likely to restrain, competition.

Parallel conduct: Form of implicit collusion in which one firm consistently follows actions of another.

Predatory pricing: Practice of pricing to drive current competitors out of business and to discourage new entrants in a market so that a firm can enjoy higher future profits.

Enforcement of the Antitrust Laws

The antitrust laws are enforced in three ways:

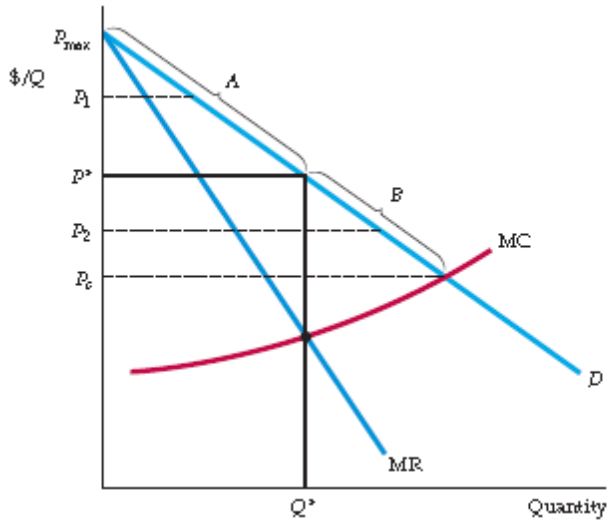
1. Through the Antitrust Division of the Department of Justice. As an arm of the executive branch, its enforcement policies closely reflect the view of the administration in power. Responding to an external complaint or an internal study, the department can institute a criminal proceeding, bring a civil suit, or both. The result of a criminal action can be fines for the corporation and fines or jail sentences for individuals. For example, individuals who conspire to fix prices or rig bids can be charged with a felony and, if found guilty, may be sentenced to jail—something to remember if you are planning to parlay your knowledge of microeconomics into a successful business career! Losing a civil action forces a corporation to cease its anticompetitive practices and often to pay damages.

2. Through the administrative procedures of the Federal Trade Commission. Again, action can result from an external complaint or from the FTC's own initiative. Should the FTC decide that action is required, it can either request a voluntary understanding to comply with the law or seek a formal commission order requiring compliance.

3. Through private proceedings. Individuals or companies can sue for *treble (three-fold) damages* inflicted on their businesses or property. The prospect of treble damages can be a strong deterrent to would-be violators. Individuals or companies can also ask the courts for injunctions to force wrongdoers to cease anticompetitive actions.

Learning unit 11: Pricing with market power

Capturing Consumer Surplus



CAPTURING CONSUMER SURPLUS

If a firm can charge only one price for all its customers, that price will be *P** and the quantity produced will be *Q**. Ideally, the firm would like to charge a higher price to consumers willing to pay more than *P**, thereby capturing some of the consumer surplus under region *A* of the demand curve. The firm would also like to sell to consumers willing to pay prices lower than *P**, but only if doing so does not entail lowering the price to other consumers. In that way, the firm could also capture some of the surplus under region *B* of the demand curve.

Price discrimination: Practice of charging different prices to different consumers for similar goods.

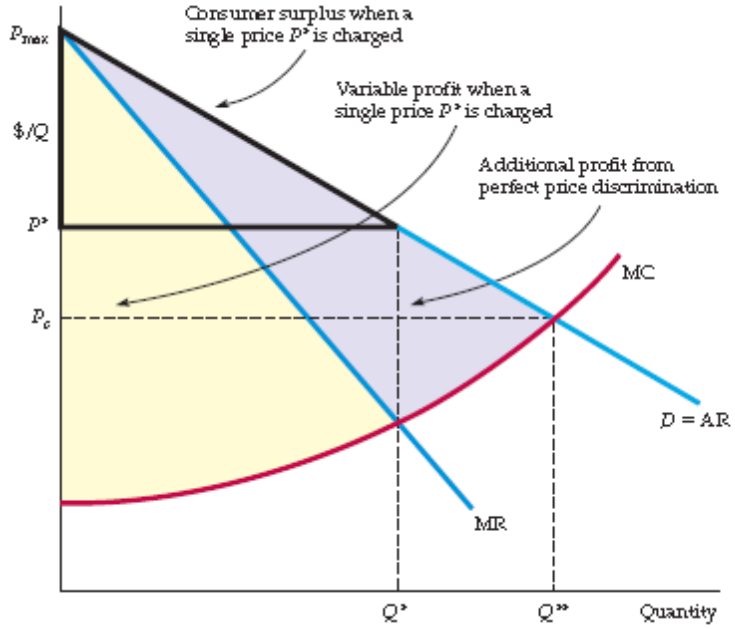
Price discrimination

First-degree Price Discrimination

Reservation price: Maximum price that a customer is willing to pay for a good.

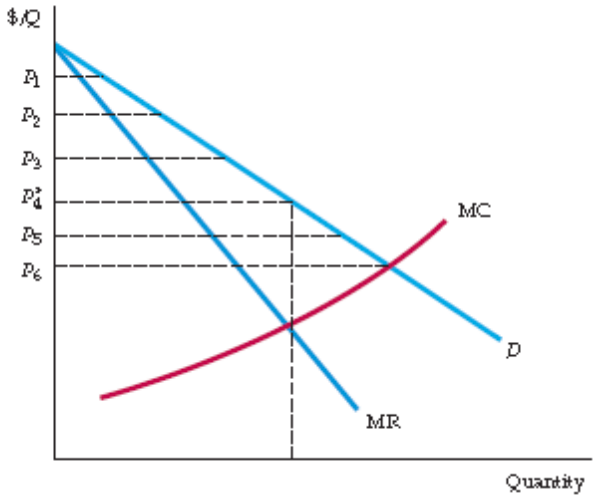
First-degree price discrimination: Practice of charging each customer her reservation price.

Variable profit: Sum of profits on each incremental unit produced by a firm; i.e., profit ignoring fixed costs.



ADDITIONAL PROFIT FROM PERFECT FIRST-DEGREE PRICE DISCRIMINATION

Because the firm charges each consumer her reservation price, it is profitable to expand output to *Q***. When only a single price, *P**, is charged, the firm's variable profit is the area between the marginal revenue and marginal cost curves. With perfect price discrimination, this profit expands to the area between the demand curve and the marginal cost curve.



FIRST-DEGREE PRICE DISCRIMINATION IN PRACTICE

Firms usually don't know the reservation price of every consumer, but sometimes reservation prices can be roughly identified. Here, six different prices are charged. The firm earns higher profits, but some consumers may also benefit. With a single price P_4*, there are fewer consumers. The consumers who now pay P_5 or P_6 enjoy a surplus.

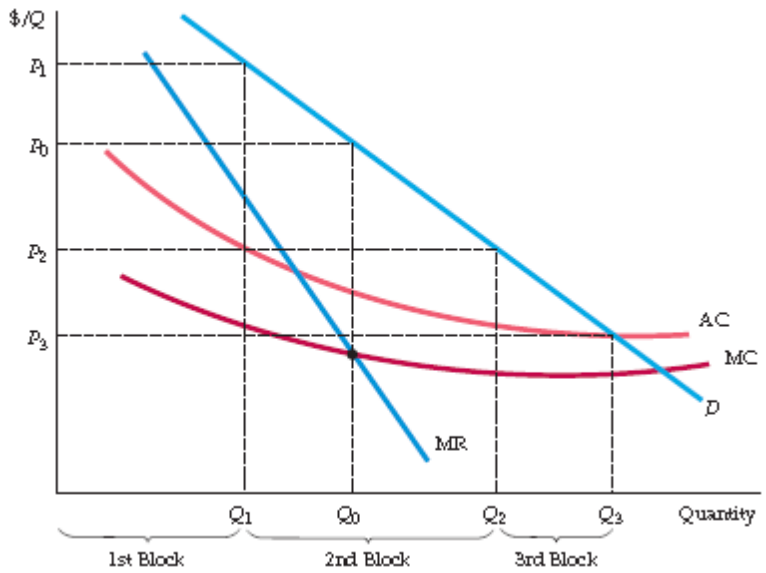
Second-degree price Discrimination

Second-degree price discrimination: Practice of charging different prices per unit for different quantities of the same good or service.

Block pricing: Practice of charging different prices for different quantities or "blocks" of a good

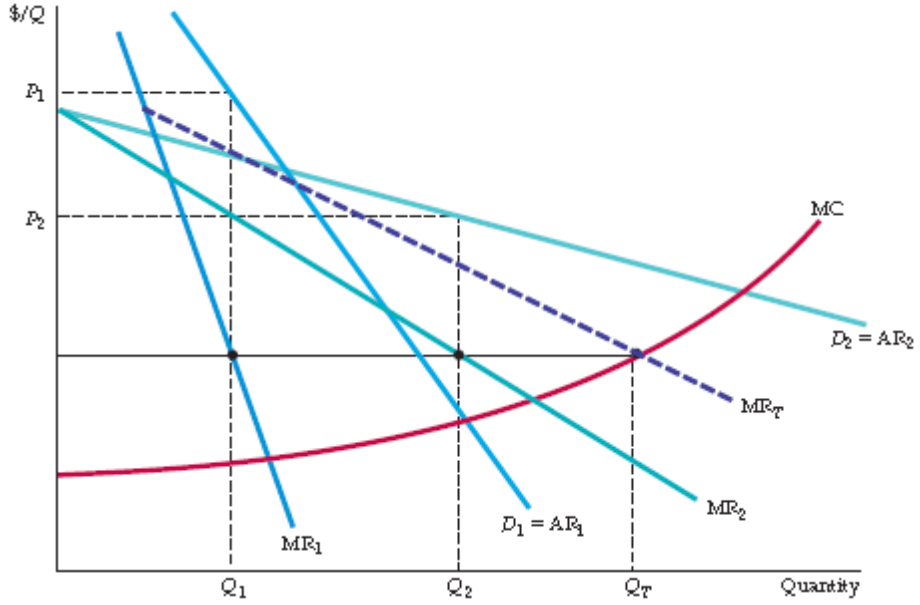
Third-degree Price Discrimination

Third-degree price discrimination: Practice of dividing consumers into two or more groups with separate demand curves and charging different prices to each group



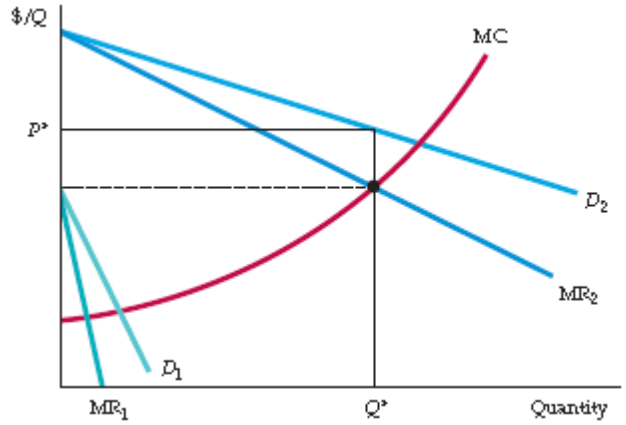
SECOND-DEGREE PRICE DISCRIMINATION

Different prices are charged for different quantities, or "blocks," of the same good. Here, there are three blocks, with corresponding prices P_1, P_2, and P_3. There are also economies of scale, and average and marginal costs are declining. Second-degree price discrimination can then make consumers better off by expanding output and lowering cost.



THIRD-DEGREE PRICE DISCRIMINATION

Consumers are divided into two groups, with separate demand curves for each group. The optimal prices and quantities are such that the marginal revenue from each group is the same and equal to marginal cost. Here group 1, with demand curve D_1, is charged P_1, and group 2, with the more elastic demand curve D_2, is charged the lower price P_2. Marginal cost depends on the total quantity produced Q_T. Note that Q_1 and Q_2 are chosen so that $MR_1 = MR_2 = MC$.



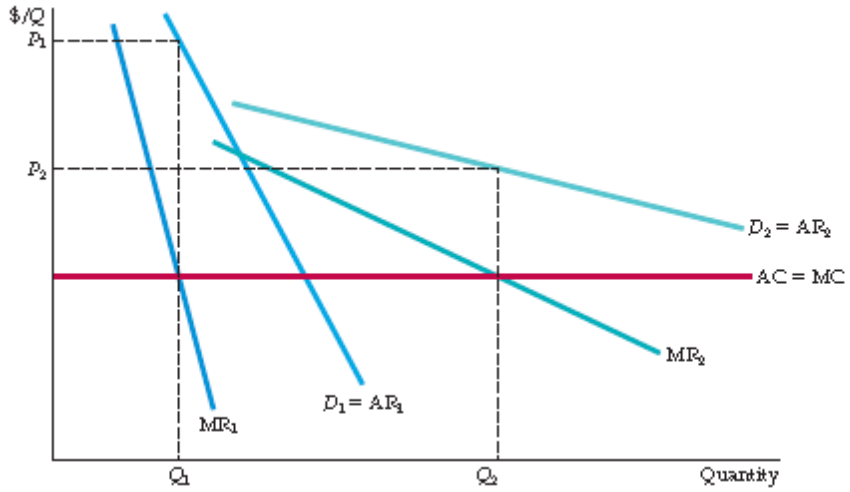
NO SALES TO SMALLER MARKET

Even if third-degree price discrimination is feasible, it may not pay to sell to both groups of consumers if marginal cost is rising. Here the first group of consumers, with demand D_1, are not willing to pay much for the product. It is unprofitable to sell to them because the price would have to be too low to compensate for the resulting increase in marginal cost.

Intertemporal Price Discrimination and Peak-Lead Pricing

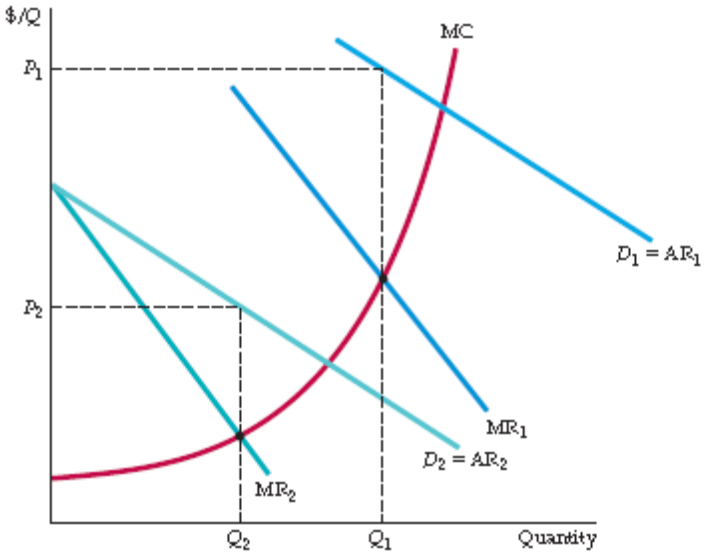
Intertemporal price discrimination: Practice of separating consumers with different demand functions into different groups by charging different prices at different points in time.

Peak-load pricing: Practice of charging higher prices during peak periods when capacity constraints cause marginal costs to be high.



INTERTEMPORAL PRICE DISCRIMINATION

Consumers are divided into groups by changing the price over time. Initially, the price is high. The firm captures surplus from consumers who have a high demand for the good and who are unwilling to wait to buy it. Later the price is reduced to appeal to the mass market.

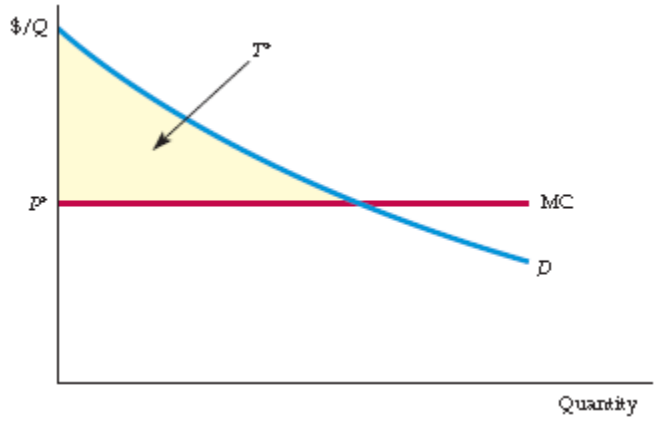


PEAK-LOAD PRICING

Demands for some goods and services increase sharply during particular times of the day or year. Charging a higher price P_1 during the peak periods is more profitable for the firm than charging a single price at all times. It is also more efficient because marginal cost is higher during peak periods.

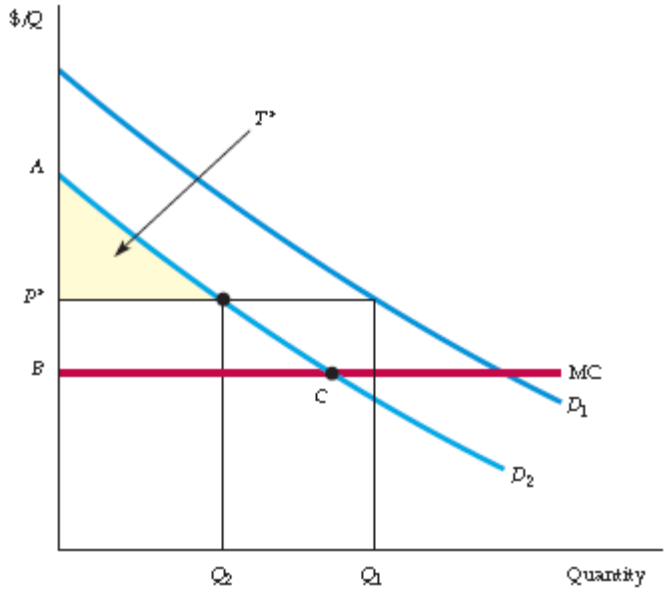
The Two-Part Tariff

Two-part tariff: Form of pricing in which consumers are charged both an entry and a usage fee.



TWO-PART TARIFF WITH A SINGLE CONSUMER

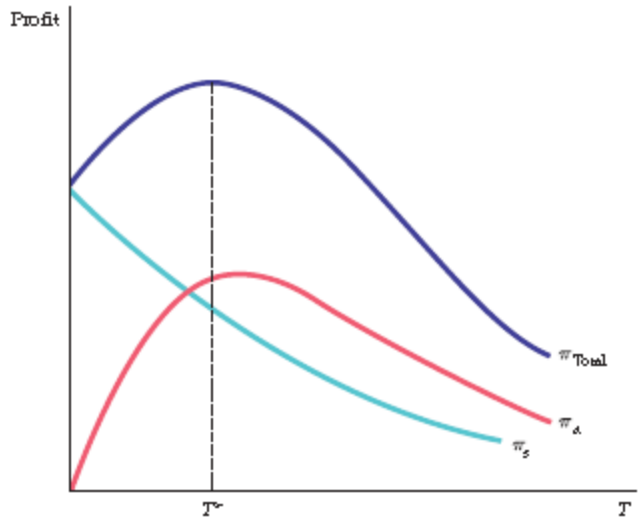
The consumer has demand curve *D.* The firm maximizes profit by setting usage fee *P* equal to marginal cost and entry fee *T** equal to the entire surplus of the consumer.



TWO-PART TARIFF WITH TWO CONSUMERS

The profit-maximizing usage fee *P** will exceed marginal cost. The entry fee *T** is equal to the surplus of the consumer with the smaller demand.
The resulting profit is $2T^* + (P^* - \text{MC})(Q_1 + Q_2)$.

Note that this profit is larger than twice the area of triangle *ABC.*



TWO-PART TARIFF WITH MANY DIFFERENT CONSUMERS

Total profit p is the sum of the profit from the entry fee p_a and the profit from sales p_S. Both p_a and p_S depend on *T*, the entry fee. Therefore

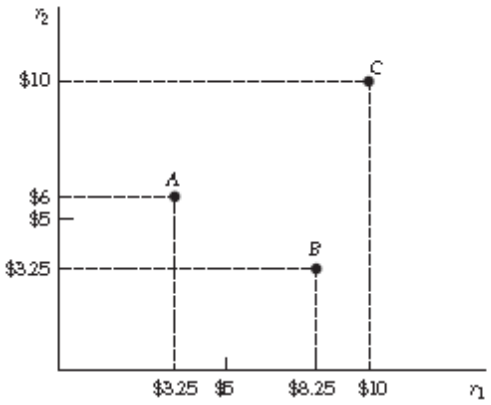
$$\pi = \pi_a + \pi_s = n(T)T + (P - MC)Q(n)$$

where *n* is the number of entrants, which depends on the entry fee *T*, and *Q* is the rate of sales, which is greater the larger is *n.* Here *T** is the profit-maximizing entry fee, given *P.* To calculate optimum values for *P* and *T*, we can start with a number for *P*, find the optimum *T*, and then estimate the resulting profit. *P* is then changed and the corresponding *T* recalculated, along with the new profit level.

Bundling

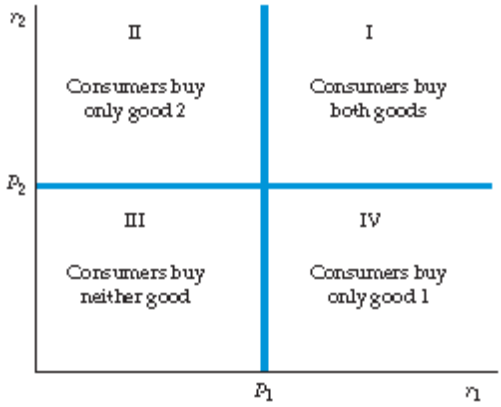
Bundling: Practice of selling two or more products as a package.

Relative Valuations



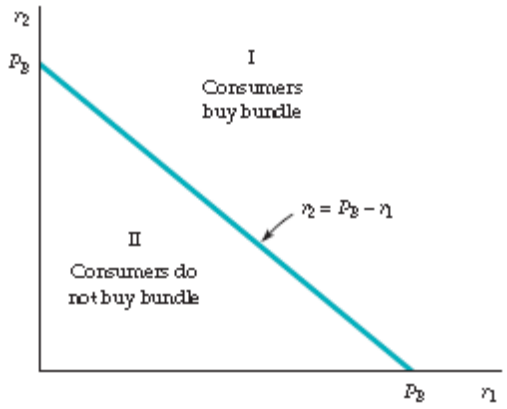
RESERVATION PRICES

Reservation prices r_1 and r_2 for two goods are shown for three consumers, labeled *A, B*, and *C.* Consumer *A* is willing to pay up to $3.25 for good 1 and up to $6 for good 2.



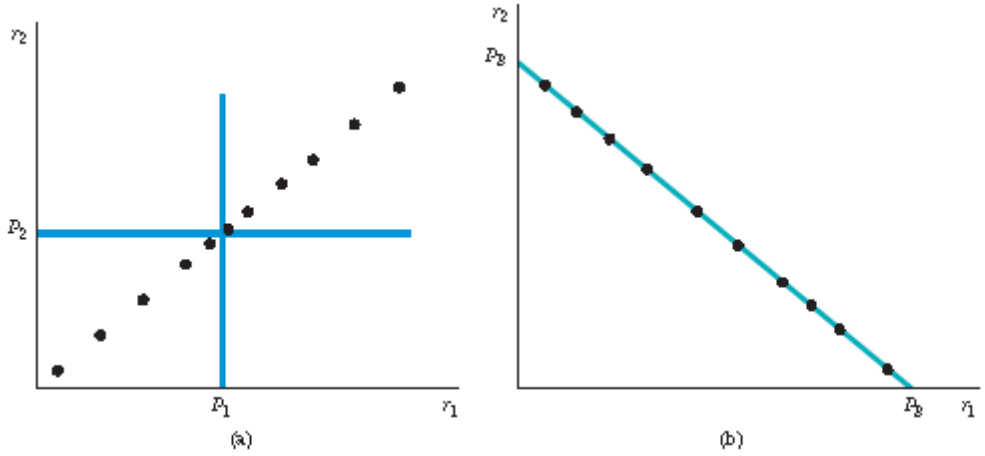
CONSUMPTION DECISIONS WHEN PRODUCTS ARE SOLD SEPARATELY

The reservation prices of consumers in region I exceed the prices P_1 and P_2 for the two goods, so these consumers buy both goods. Consumers in regions II and IV buy only one of the goods, and consumers in region III buy neither good.



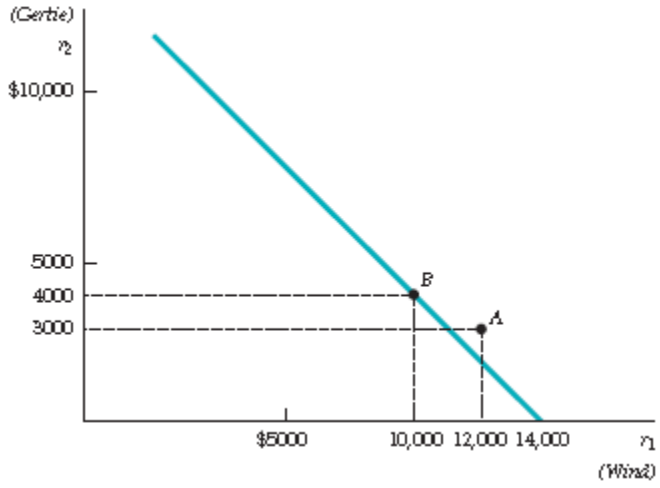
CONSUMPTION DECISIONS WHEN PRODUCTS ARE BUNDLED

Consumers compare the *sum* of their reservation prices $r_1 + r_2$, with the price of the bundle P_B. They buy the bundle only if $r_1 + r_2$ is at least as large as P_B.



RESERVATION PRICES

In (a), because demands are perfectly positively correlated, the firm does not gain by bundling: It would earn the same profit by selling the goods separately. In (b), demands are perfectly negatively correlated. Bundling is the ideal strategy—all the consumer surplus can be extracted.



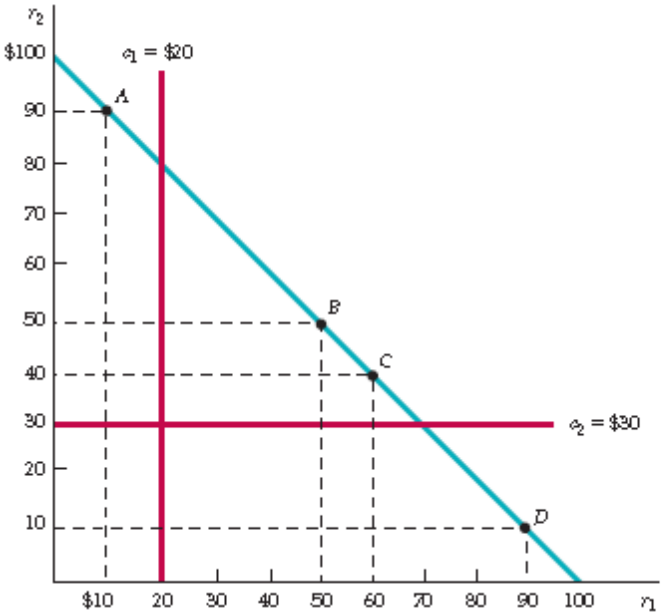
MOVIE EXAMPLE

Consumers *A* and *B* are two movie theaters. The diagram shows their reservation prices for the films *Gone with the Wind* and *Getting Gertie's Garter.* Because the demands are negatively correlated, bundling pays.

Mixed Bundling

Mixed bundling: Selling two or more goods both as a package and individually.

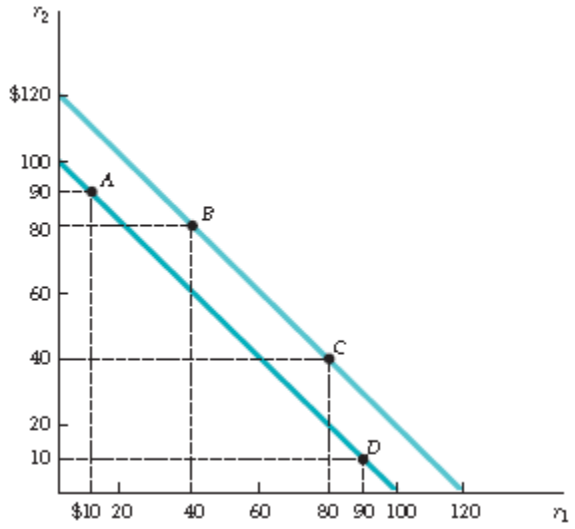
Pure bundling: Selling products only as a package.



MIXED VERSUS PURE BUNDLING

With positive marginal costs,

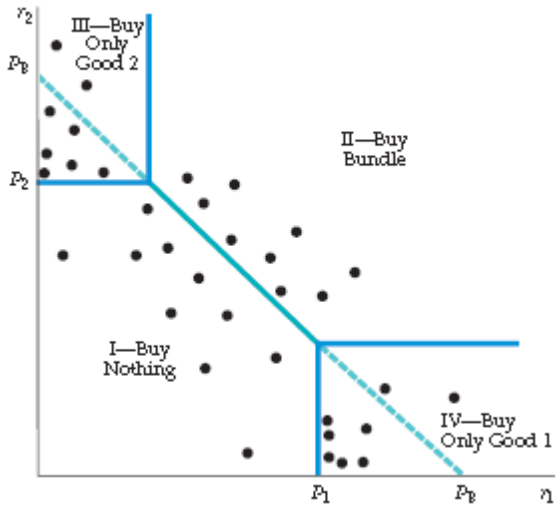
mixed bundling may be more profitable than pure bundling. Consumer *A* has a reservation price for good 1 that is below marginal cost c_1, and consumer *D* has a reservation price for good 2 that is below marginal cost c_2. With mixed bundling, consumer *A* is induced to buy only good 2, and consumer *D* is induced to buy only good 1, thus reducing the firm's cost.



MIXED BUNDLING WITH ZERO MARGINAL COSTS

If marginal costs are zero, and if consumers' demands are not perfectly negatively correlated, mixed bundling is still more profitable than pure bundling. In this example, consumers *B* and *C* are willing to pay $20 more for the bundle than are consumers *A* and *D.* With pure bundling, the price of the bundle is $100. With mixed bundling, the price of the bundle can be increased to $120 and consumers *A* and *D* can still be charged $90 for a single good.

Bundling in Practice



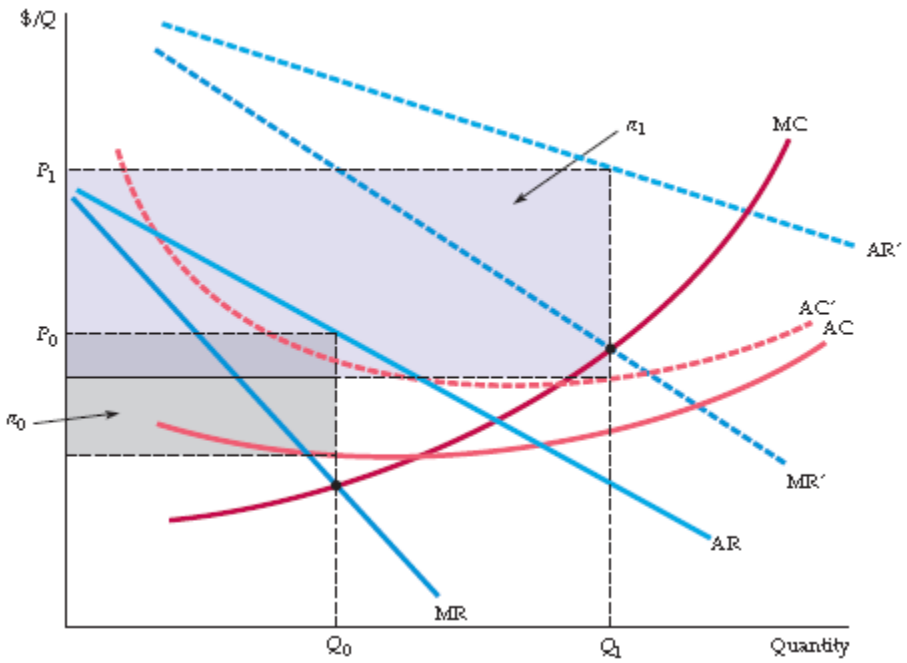
MIXED BUNDLING IN PRACTICE

The dots in this figure are estimates of reservation prices for a representative sample of consumers. A company could first choose a price for the bundle, P_B, such that a diagonal line connecting these prices passes roughly midway through the dots. The company could then try individual prices P_1 and P_2. Given P_1, P_2, and P_B, profits can be calculated for this sample of consumers. Managers can then raise or lower P_1, P_2, and P_B and see whether the new pricing leads to higher profits. This procedure is repeated until total profit is roughly maximized.

Tying

Tying: Practice of requiring a customer to purchase one good in order to purchase another.

Advertising



EFFECTS OF ADVERTISING

AR and MR are average and marginal revenue when the firm doesn't advertise, and AC and MC are average and marginal cost. The firm produces Q_0 and receives a price P_0. Its total profit p_0 is given by the gray-shaded rectangle. If the firm advertises, its average and marginal revenue curves shift to the right. Average cost rises (to AC_) but marginal cost remains the same. The firm now produces Q_1 (where MR_ = MC), and receives a price P_1. Its total profit, p_1, is now larger.

The rule of thumb for advertising

Advertising-to-sales ratio: Ration of a firm's advertising expenditure to sales.

Advertising elasticity of demand: Percentage change in quantity demanded resulting from a 1 percent increase in advertising expenditures.

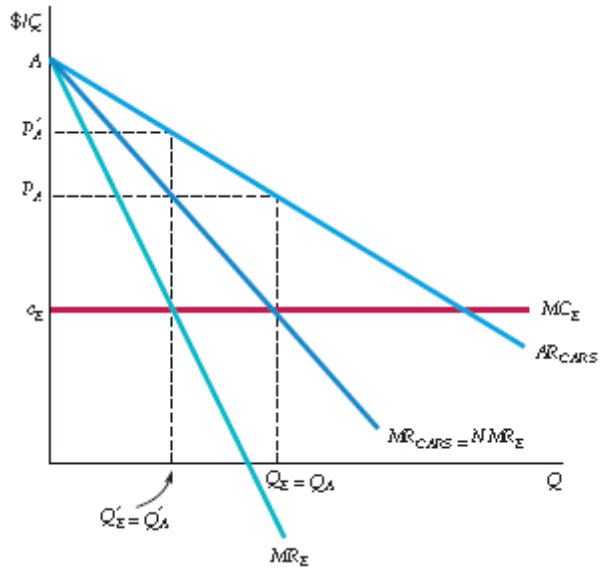
The vertically integrated firm

Horizontal integration: Organizational form in which several plants produce the same or related products for a firm.

Vertical integration: Organizational form in which a firm contains several divisions, with some producing parts and components that others use to produce finished products.

Transfer prices: Internal prices at which parts and components from upstream divisions are "sold" to downstream divisions with a firm.

Double marginalization: when each firm in a vertical chain mark up its price above its marginal cost, thereby increasing the price of the final product.



EXAMPLE OF DOUBLE MARGINALIZATION

For the automobile company, the marginal revenue curve for cars is the demand curve for engines (the net marginal revenue for engines). Corresponding to that demand curve is the engine company's marginal revenue curve, MR_E. If the engine company and automobile company are separate entities, the engine company will produce a quantity of engines Q_E at the point where its marginal revenue curve intersects its marginal cost curve. The automobile maker will buy those engines and produce an equal number of cars. Hence, the price of cars will be P'_A. But if the firms merge, the integrated company will have the demand curve AR_{CARS} and marginal revenue curve MR_{CARS}. It produces a number of engines and equal number of cars at the point where MR_{CARS} equals the marginal cost of producing cars, which is MC_E. Thus more engines and cars are produced, and the price of cars is lower.

Quantity forcing: Use of a sales quota of other incentives to make downstream firms sell as much as possible.

Learning unit 12: Monopolistic competition and oligopoly

Monopolistic competition

Market type	Type of product	Examples of products[52]	Consumer behaviour	Nature of demand curve	Entry and exit	Profit	Number of firms
Monopolistic competition	Differentiated, but substitutable	Toothpaste	Perspective of differentiation. Can easily substitute products	Fairly elastic	Free	Short-run: economic profit Long-run: zero profit	Many

Monopolistic competition: Market in which firms can enter freely, each producing its own brand or version of a differentiated product.

Oligopoly: Market in which only a few firms compete with one another, and entry by new firms is impeded.

Market type	Type of product	Examples of products	Consumer behaviour	Nature of demand curve	Entry and exit	Profit	Number of firms
Oligopoly	May or may not be differ-rentiated	Automobiles Steel	Follow advertising	Depend on nature of market structure	Barriers to entry: natural factors; scale economies; patents; access to technology; name recognition	Substantial profits	Few

Cartel: Market in which some or all firms explicitly collude, coordinating prices and output levels to maximize joint profits.

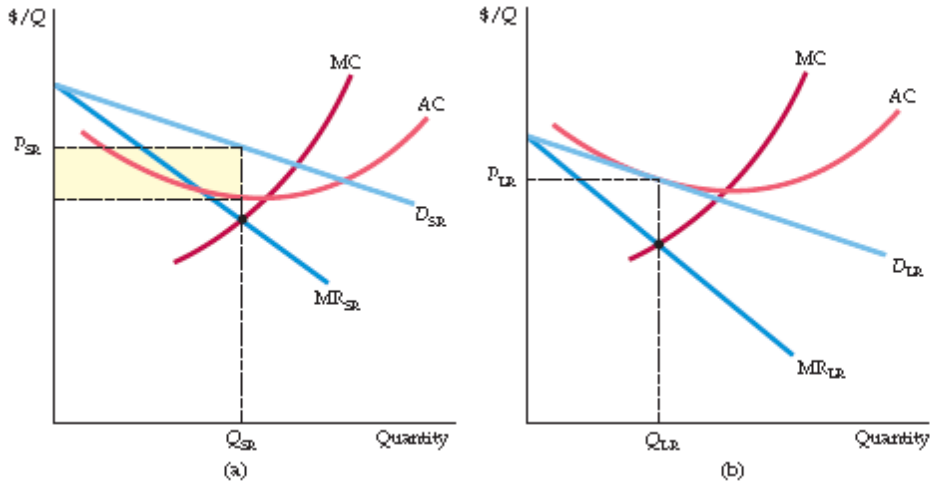
A specific characteristic of cartels is that they are based upon an explicit agreement to cooperate in setting prices and output levels.

The makings of Monopolistic Competition

A monopolistically competitive market has two key characteristics:

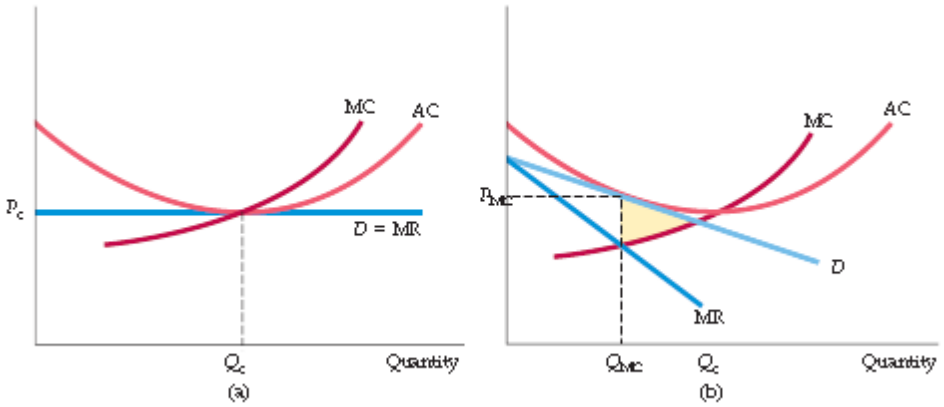
1. Firms compete by selling differentiated products that are highly substitutable for one another but not perfect substitutes. In other words, the cross-price elasticities of demand are large but not infinite.
2. There is free entry and exit: it is relatively easy for new firms to enter the market with their own brands and for existing firms to leave if their products become unprofitable.

Equilibrium in the short run and the long run



A MONOPOLISTICALLY COMPETITIVE FIRM IN THE SHORT AND LONG RUN

Because the firm is the only producer of its brand, it faces a downward-sloping demand curve. Price exceeds marginal cost and the firm has monopoly power. In the short run, described in part (a), price also exceeds average cost, and the firm earns profits shown by the yellow-shaded rectangle. In the long run, these profits attract new firms with competing brands. The firm's market share falls, and its demand curve shifts downward. In long-run equilibrium, described in part (b), price equals average cost, so the firm earns zero profit even though it has monopoly power.



COMPARISON OF MONOPOLISTICALLY COMPETITIVE EQUILIBRIUM AND PERFECTLY COMPETITIVE EQUILIBRIUM

Under perfect competition, as in (a), price equals marginal cost, but under monopolistic competition, price exceeds marginal cost. Thus there is a deadweight loss, as shown by the yellow-shaded area in (b). In both types of markets, entry occurs until profits are driven to zero. Under perfect competition, the demand curve facing the firm is horizontal, so the zero-profit point occurs at the point of minimum average cost. Under monopolistic competition the demand curve is downward-sloping, so the zero-profit point is to the left of the point of minimum average cost. In evaluating monopolistic competition, these inefficiencies must be balanced against the gains to consumers from product diversity.

Oligopoly

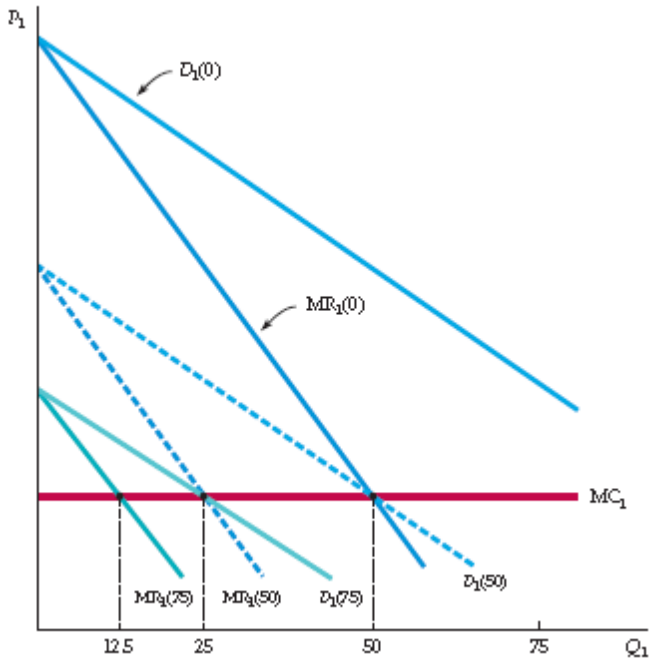
Equilibrium in an Oligopolistic Market

Nash equilibrium: Set of strategies or actions in which each firm does the best it can given its competitors' action (Each firm is doing the best it can given what its competitors are doing)

Duopoly: Market in which two firms compete with each other

The Cournot Model

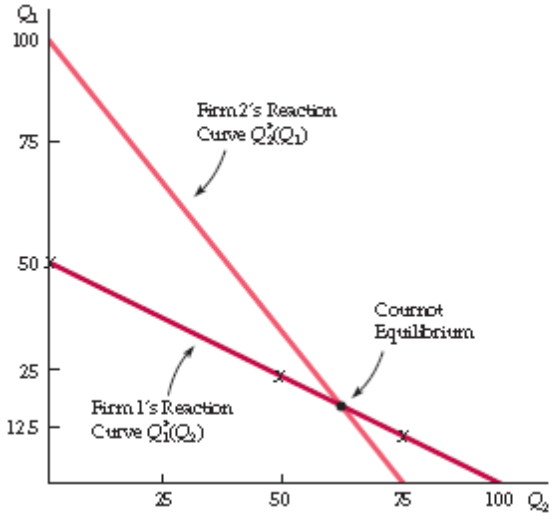
Cournot Model: Oligopoly model in which firms produce a homogeneous good, each firm treats the output of its competitors as fixed, and all firms decide simultaneously how much to produce.



FIRM 1'S OUTPUT DECISION

Firm 1's profit-maximizing output depends on how much it thinks that Firm 2 will produce. If it thinks Firm 2 will produce nothing, its demand curve, labeled $D_1(0)$, is the market demand curve. The corresponding marginal revenue curve, labeled $MR_1(0)$, intersects Firm 1's marginal cost curve MC_1 at an output of 50 units. If Firm 1 thinks that Firm 2 will produce 50 units, its demand curve, $D_1(50)$, is shifted to the left by this amount. Profit maximization now implies an output of 25 units. Finally, if Firm 1 thinks that Firm 2 will produce 75 units, Firm 1 will produce only 12.5 units.

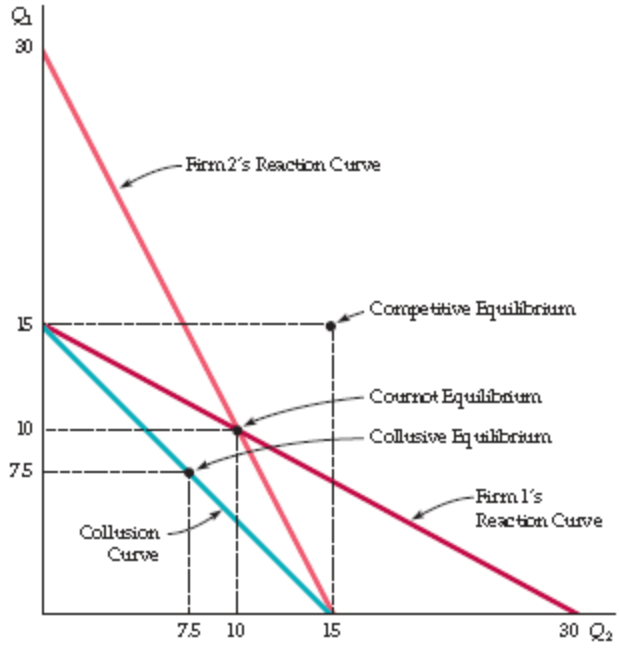
Reaction curve: Relationship between firm's profit maximizing output and the amount it thinks its competitors will produce.



REACTION CURVES AND COURNOT EQUILIBRIUM

Firm 1's reaction curve shows how much it will produce as a function of how much it thinks Firm 2 will produce. (The xs at $Q_2 = 0$, 50, and 75 correspond to the examples shown in Figure 12.3.) Firm 2's reaction curve shows its output as a function of how much it thinks Firm 1 will produce. In Cournot equilibrium, each firm correctly assumes the amount that its competitor will produce and thereby maximizes its own profits. Therefore, neither firm will move from this equilibrium.

Cournot equilibrium: Equilibrium in the Cournot Model in which each firm correctly assumes how much its competitors will produce and sets its own production level accordingly.



DUOPOLY EXAMPLE

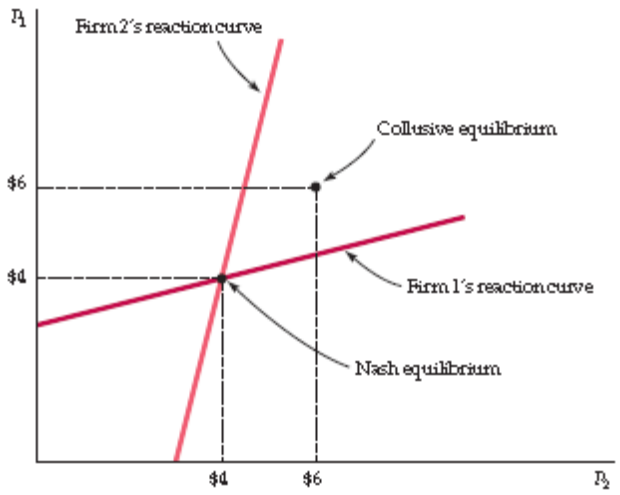
The demand curve is $P = 30 - Q$, and both firms have zero marginal cost. In Cournot equilibrium, each firm produces 10. The collusion curve shows combinations of Q_1 and Q_2 that maximize *total* profits. If the firms collude and share profits equally, each will produce 7.5. Also shown is the competitive equilibrium, in which price equals marginal cost and profit is zero.

First Mover Advantage – The Stackelberg Model

Stackelberg model: Oligopoly model in which one firm sets its output before other firms do.

Price competition

Bertrand Model: Oligopoly model in which firms produce a homogeneous good, each firm treats the price as its competitors as fixed, and all firms decide simultaneously what price to change.



NASH EQUILIBRIUM IN PRICES

Here two firms sell a differentiated product, and each firm's demand depends both on its own price and on its competitor's price. The two firms choose their prices at the same time, each taking its competitor's price as given. Firm 1's reaction curve gives its profit-maximizing price as a function of the price that Firm 2 sets, and similarly for Firm 2. The Nash equilibrium is at the intersection of the two reaction curves: When each firm charges a price of $4, it is doing the best it can given its competitor's price and has no incentive to change price. Also shown is the collusive equilibrium: If the firms cooperatively set price, they will choose $6.

Competition versus Collusion: The Prisoners' Dilemma

Noncooperative game: Game in which negotiation and enforcement of binding contracts are not possible.

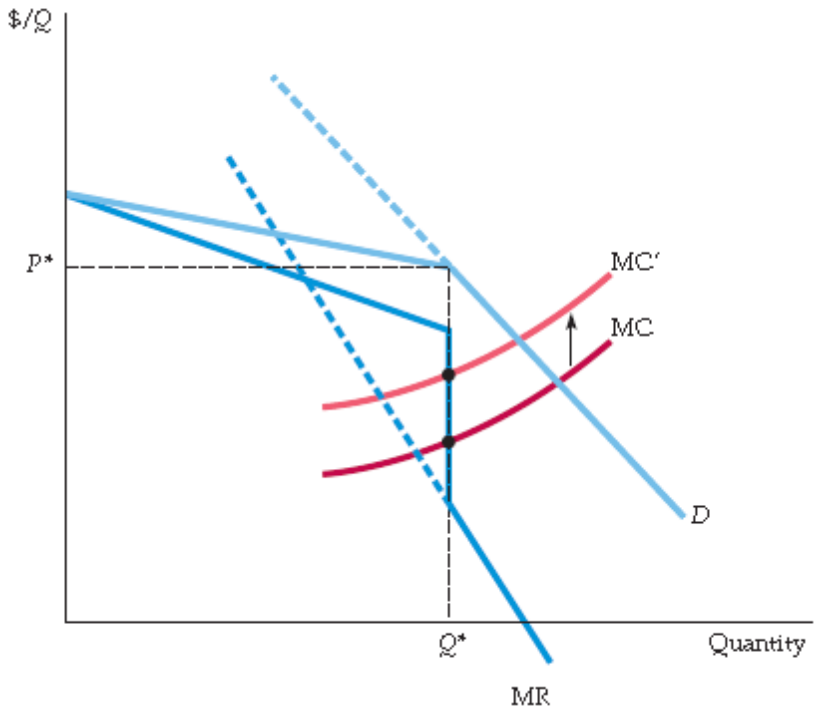
Payoff Matrix: Table showing profit (or payoff) to each firm given its decision and the decision of its competitor

Prisoners' dilemma: Game theory example in which two prisoners must decide separately whether to confesses, he will receive a lighter sentence and his accomplice will receive a heavier one, but if neither confesses, sentences will be lighter than if both confess.

Implications of the Prisoners' Dilemma for Oligopolistic Pricing

Price rigidity: Characteristic of oligopolistic markets by which firms are reluctant to change prices even if costs or demands.

Kinked demand curve model: Oligopoly model in which each firm faces a demand curve kinked at the currently prevailing price: at higher prices demand is very elastic, whereas at lower prices it is inelastic.



THE KINKED DEMAND CURVE

Each firm believes that if it raises its price above the current price *P**, none of its competitors will follow suit, so it will lose most of its sales. Each firm also believes that if it lowers price, everyone will follow suit, and its sales will increase only to the extent that market demand increases. As a result, the firm's demand curve *D* is kinked at price *P**, and its marginal revenue curve MR is discontinuous at that point. If marginal cost increases from MC to MC', the firm will still produce the same output level *Q** and charge the same price *P**.

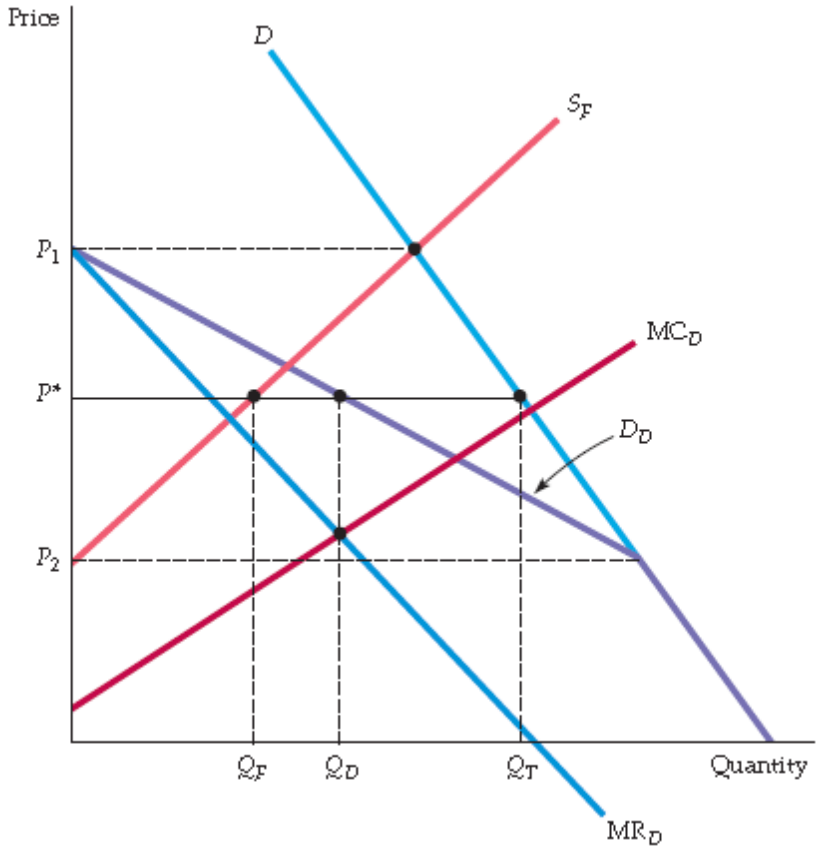
Price Signalling and Price leadership

Price signalling: Form of implicit collusion in which a firm announces a price increase in the hope that other firms will follow suit.

Price leadership: Pattern of pricing in which one firm regularly announces price changes that other firms then match.

The Dominant Firm Model

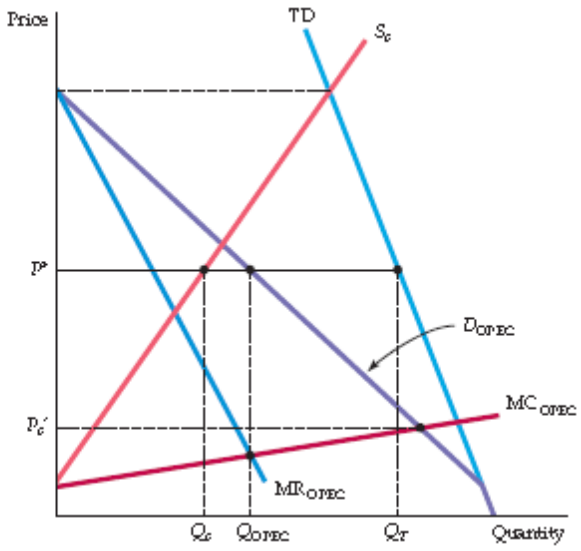
Dominant firm: Firm with a large share of total sales that set price to maximize profits, taking into account the supply response of smaller firms.



PRICE SETTING BY A DOMINANT FIRM

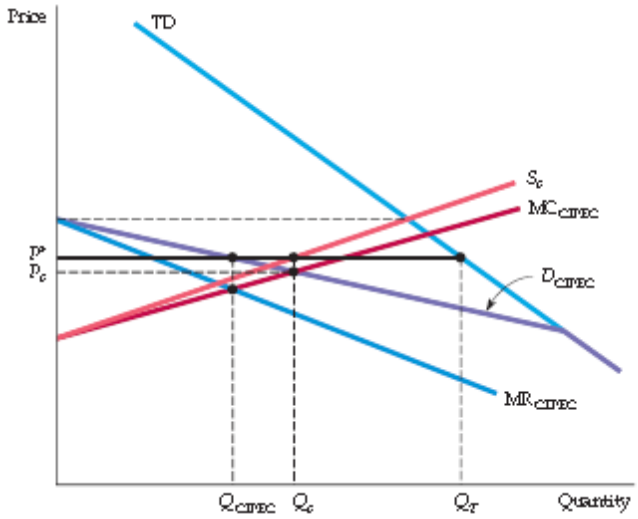
The dominant firm sets price, and the other firms sell all they want at that price. The dominant firm's demand curve, D_D, is the difference between market demand D and the supply of fringe firms S_F. The dominant firm produces a quantity Q_D at the point where its marginal revenue MR_D is equal to its marginal cost MC_D. The corresponding price is P^*. At this price, fringe firms sell Q_F, so that total sales equal Q_T.

Analysis of Cartel Pricing



THE OPEC OIL CARTEL

TD is the total world demand curve for oil, and S_c is the competitive (non-OPEC) supply curve. OPEC's demand D_{OPEC} is the difference between the two. Because both total demand and competitive supply are inelastic, OPEC's demand is inelastic. OPEC's profit-maximizing quantity Q_{OPEC} is found at the intersection of its marginal revenue and marginal cost curves; at this quantity, OPEC charges price P^*. If OPEC producers had not cartelized, price would be P_c, where OPEC's demand and marginal cost curves intersect.



THE CIPEC COPPER CARTEL

TD is the total demand for copper and S_c is the competitive (non-CIPEC) supply. CIPEC's demand D_{CIPEC} is the difference between the two.

Both total demand and competitive supply are relatively elastic, so CIPEC's demand curve is elastic, and CIPEC has very little monopoly power. Note that CIPEC's optimal price P^* is close to the competitive price P_c.

12.1 (33311)

1. A monopolistically competitive firm in long run equilibrium will make zero economic profit. True or False
2. Firms in both perfect and monopolistic competition face a downward sloping demand curve. True or False

For which of the following market structures is it assumed that there are barriers to entry?

1. Perfect competition
2. Monopolistic competition
3. Monopoly
4. All of the above
5. 2 and 3 only

Refer to the following statement about monopolistic competition to answer this question.

1. In the long run, the price of the good will equal the minimum of the average cost.
2. In the short run, firms may earn a profit.
    a. 1 and 2 are true
    b. 1 is true and 2 is false
    c. 1 is false and 2 is true
    d. 1 and 2 are false

A market with few entry barriers and with many firms that sell differentiated products is

1. Purely competitive
2. A monopoly
3. Monopolistically competitive
4. Oligopolistic

The most important factor in determining the long run profit potential in monopolistic competition is

1. Free entry and exit
2. The elasticity of the market demand curve
3. The elasticity of the firm's demand curve
4. The reaction of rival firms to a change in price

Monopolistically competitive firms have monopoly power because they

1. Face downward sloping demand curves
2. Are great in number
3. Have freedom of entry

4. Are free to advertise

12.2 (24141)

1. A reaction curve shows how much a firm will produce as a function of how much it thinks its competitors will produce. True or False.
2. The market structure in which there is interdependence among firms is perfect competition. True or False.
3. In comparing the Cournot equilibrium with competitive equilibrium, profit is higher, and output level is lower in the competitive equilibrium. True of False

The market structure in which strategic considerations are most important is

1. Monopolistic competition
2. Oligopoly
3. Pure competition
4. Pure monopoly]

In the Cournot duopoly model, each firm assumes that

1. Rivals will match price cuts but will not march price increases.
2. Rivals will match all reasonable price changes
3. The price of its rival is fixed
4. The output level of its rival is fixed.

A situation in which each firm selects its best action, given what it rivals are doing is called a

1. Nash equilibrium
2. Cooperative equilibrium
3. Stackelberg equilibrium
4. Zero sum game

Which of the following can be regarded as a barrier to enrty?

1. Scale economies
2. Patents
3. Strategic actions by incumbent firms
4. All of the above

In the _____, each firm treats the output of its competitor as fixed and then decided how much to produce

1. Cournot model
2. Model of monopolistic competition
3. Stackelberg model

4. Kinked demand model
5. None of the above

12.3 (5422)

Which one of the following statements is a common criticism of the original Bertrand duopoly model?

1. Firms never choose optimal prices as strategic variables
2. Firms would more naturally choose quantities if goods are homogeneous
3. The assumption that market share is split evenly between the firms is unrealistic.
4. 1 and 2 are correct
5. 2 and 3 are correct

Is there a first mover advantage in the Bertrand duopoly model with homogeneous products?

1. Yes, first movers always hold the advantage over other firms
2. Yes, first movers may have an advantage, but it depends on the model assumptions.
3. No, first movers cannot choose a profit maximising quantity because the second mover can always produce a bit less and earn higher profits
4. No, the second mover would be able to set a slightly lower price and capture the full market share.

Collusion can earn higher prices and higher profits under the Bertrand model, but why is this unlikely outcome in practice?

1. Firms prefer to remain independent of other firms so that their pricing plans can be more flexible over time.
2. The collusive firms have an incentive to gain market share at the expense of the other firms by cutting prices
3. The federal antitrust authorities have an easier time catching firms that collude on price rather than quantity.
4. None of the above.

Which oligopoly model(s) has/have the same results as the competitive model?

1. Cournot
2. Bertrand
3. Stackelberg
4. Both Cournot and Stackelberg

12.4 (24)

The prisoner's dilemma is a particular type of game in which negotiation and enforcement of binding contracts are not possible, and such games are known as:

1. Cooperative games
2. Noncooperative games
3. Collusive games
4. Cournot games

Two firms operating in the same market must choose between a collude price and a cheat price. Firm A's profits is listed before the comma, B's outcome after the comma. If each firm tries to choose a price that is best for it, regardless of the other firm's price, which of the following statements is/are correct?

		Firm B	
		Cheat Price	Collude Price
Firm A	Cheat Price	18, 18	30, 6
	Collude Price	6, 30	24, 24

1. Firm A should charge a collude price, frim B should charge a cheat price
2. Firm A should charge a cheat price, firm B should charge a collude price
3. Both firms should charge a collude price
4. Both firms should charge a cheat price

12.5 (41131)

1. Under the kinked demand curve model, an increase in marginal cost will lead to a decrease in output level and no change in price. True of False
2. The demand curve facing the dominant firm equals market demand minus fringe firm's supply curve. True or False

The oligopoly model that predicts that oligopoly prices will tend to be very rigid is the _____ model

1. Cournot
2. Stackelberg
3. Dominant firm
4. Kinked demand

In the kinked demand curve model, if one firm reduces its price

1. Other firms will also reduce their price
2. Other firms will compete on a non-price basis
3. Other firms will raise their price
4. Both a and b are correct

5. Both 2 and 3 are correct

Suppose that three oligopolistic firms are currently charging R12 for their product. The three firms are about the same size. Firm A decides to raise its price to R18, and announces to the press that it is doing so because higher prices are needed to restore economic vitality to the industry. Firms B and C go along with firm A and raise their prices as well. This is an example of

1. Price leadership
2. Collusion
3. The dominant firm model
4. The stackelberg model
5. None of the above

A market structure in which there is one large firm that has a major share of the market and many smaller firms supplying the remainder of the market is called:

1. The Stackelberg model
2. The kinked demand curve model
3. The dominant firm model
4. The Cournot model
5. The Bertrand model

In the dominant firm model, the smaller fringe firms behave like:

1. Competitive firms
2. Cournot firms
3. Stackelberg firms
4. Bertrand firms
5. Monopolists

12.6

Which of the following is NOT conducive to the successful operation of a cartel?

1. Market demand for the good is relatively inelastic
2. The cartel supplies all of the world's output of a good
3. Cartel members have substantial cost advantages over non-member producers
4. The supply of non-member producers is very price elastic

This market situation is much like a pure monopoly except that its member firm's tend to cheat on agreed upon price and output strategies. What is it?

1. Duopoly
2. Cartel
3. Market sharing monopoly
4. Natural monopoly

ECS 2601 Memorandum to May 2014

Examination 1a. Consider the following baskets of goods:

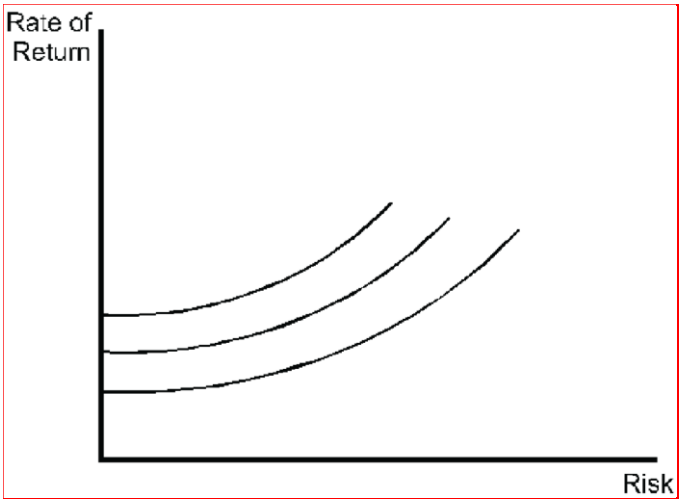
	FOOD	CLOTHING
A	8	3
B	4	5
C	5	8

If preferences satisfy all requirements, is A preferred to B or B to A? Explain your answer. (3 marks)

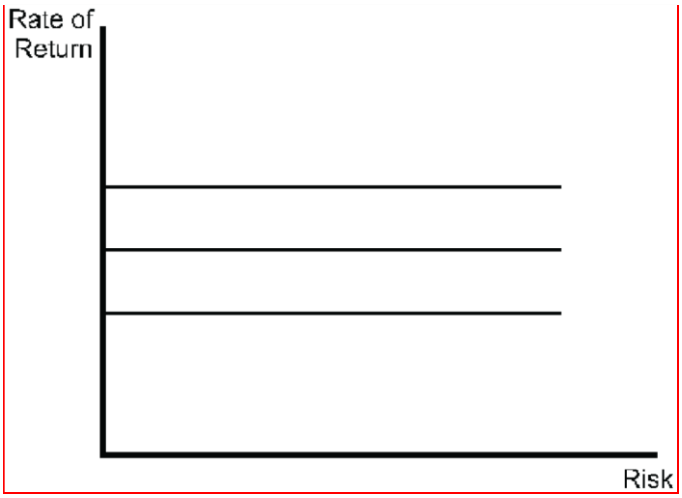
A has more food than B.
While B has more clothing than A.
A and B cannot be compared without additional information.

1b. In the field of financial management it has been observed that there is a trade-off between the rate of return that one earns on investments and the amount of risk that one must bear to earn that return.

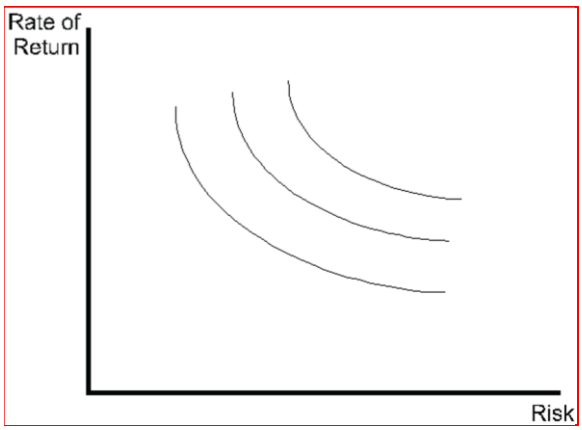
(i). Draw a set of indifference curves between risk and return for a person that is risk averse (a person that does not like risk). (2 marks)



(ii). Draw a set of indifference curves for a person that is risk neutral (a person that does notcare about risk one way or the other). (2 marks)

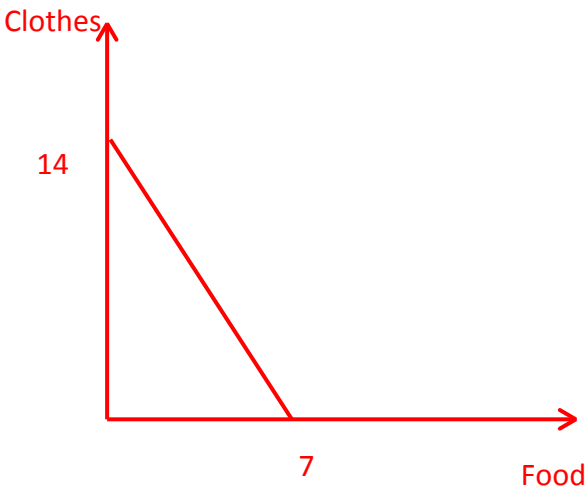


(iii). Draw a set of indifference curves for a person that likes risk. (2 marks)

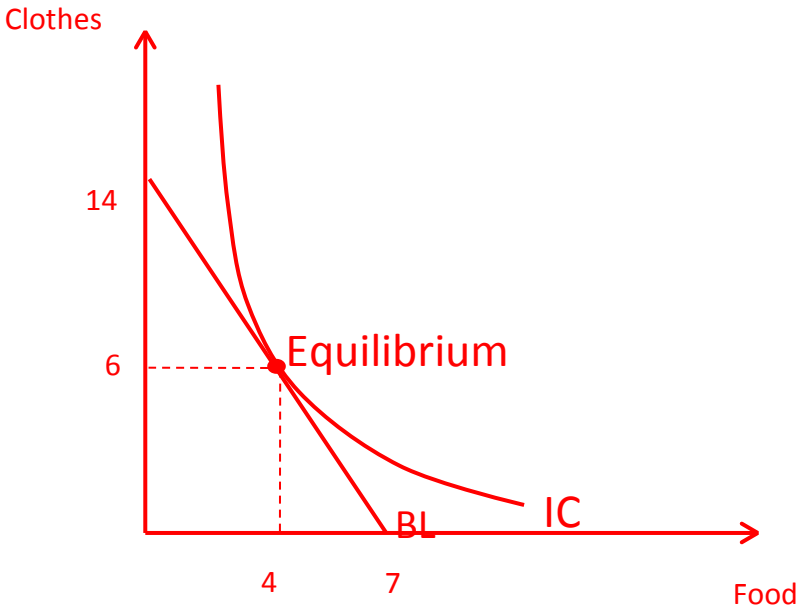


(1c) Lindiwe has a budget of R140. The price of food is R20 and the price of clothes is R10. She maximises her utility by buying 4 units of food and 6 units of clothes.

(i) Draw a budget line, with food on the horizontal axis. (2 marks)



(ii) Suppose an indifference map exists, show her equilibrium point on the diagram above. (2 marks)

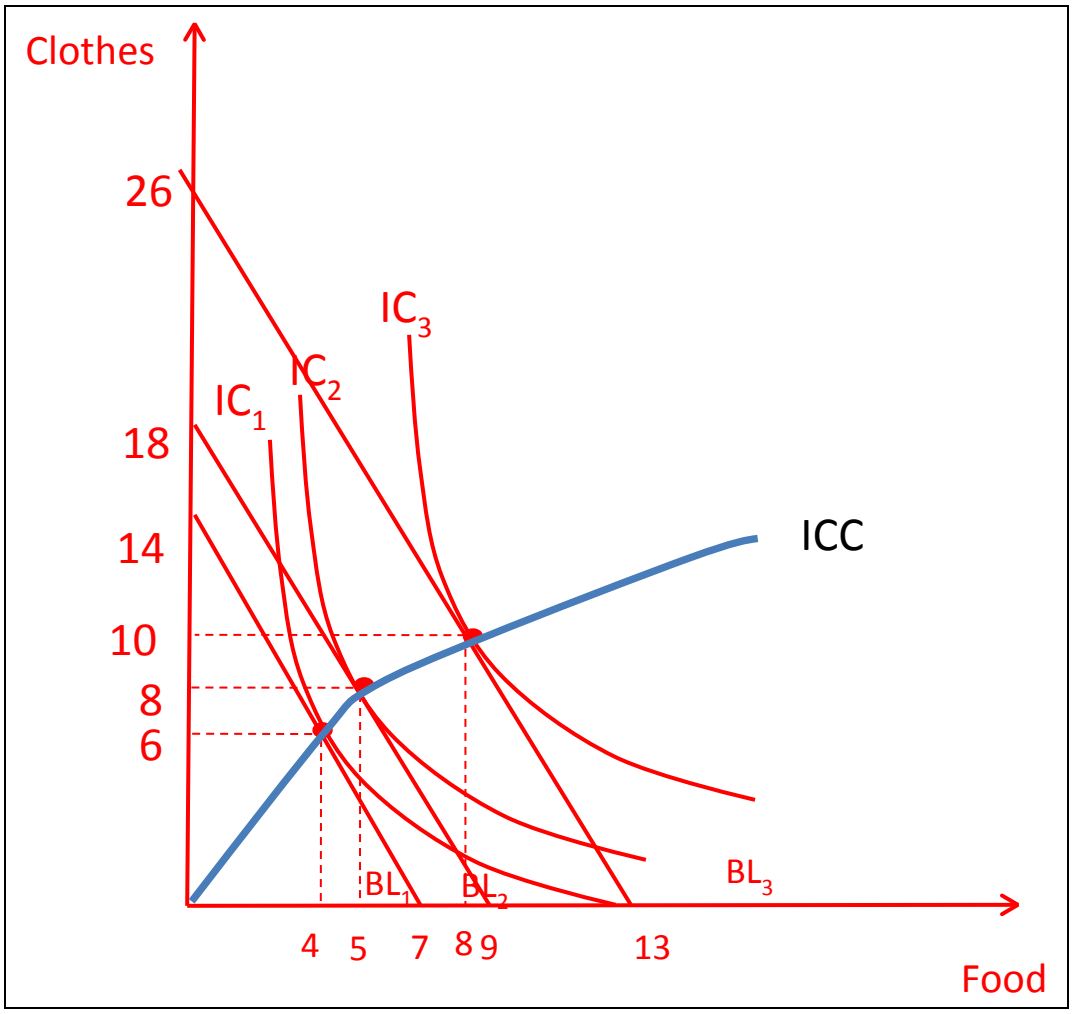


(iii) Which condition must be satisfied to gain equilibrium? (2 marks)

MRS = Pf / Pc
Or The slope of the IC = the slope of the budget line
Or The IC tangents to the budget line
Or $MU_f / MU_c = P_f / P_c$

(iv) When the income of Lindiwe increases to R180, she then maximise her utility by buying 5 units of food and 8 units of clothes. When the income increases to R260, she buys 8 units of food and 10 units of clothes. From the information given in (i) and (iii), draw an indifference curve

map for Lindiwa indicating all equilibrium positions and also derive her income consumption curve. (5 marks)



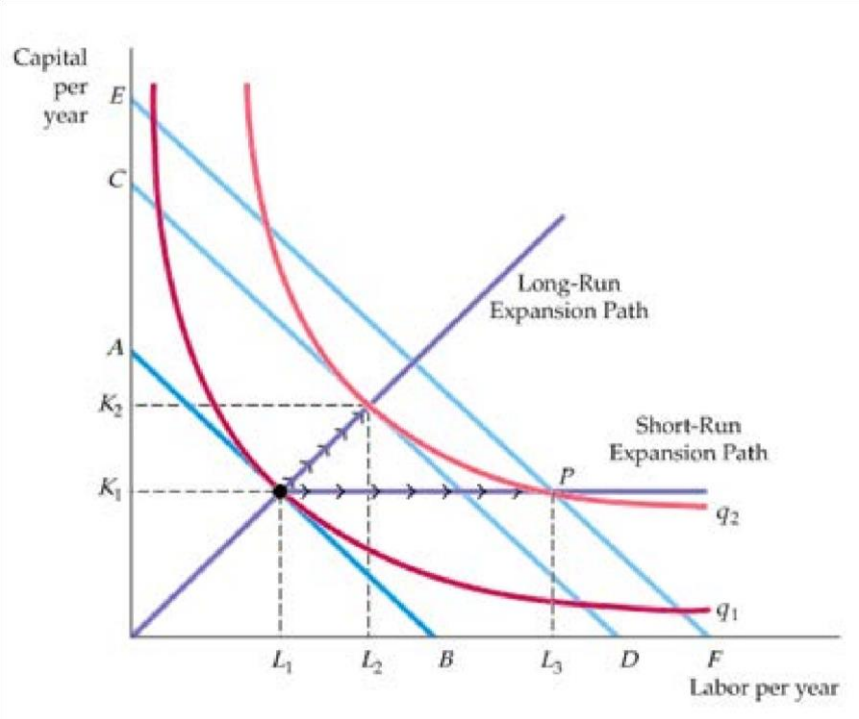
2a. For a producer that uses 6 units of labour at a wage rate of R20 000 per year and R400 000 worth of capital, work out the producer's total cost of production per year, given an interest rate of 12%. (4 marks)

TC = wL + rK

= R20 000 X 6 + R400 000 X 12%

= R168 000

b. Use an isoquant map with associated isocost curves to explain that when capital is allowed to vary (the long run), a producer can expand and attain a level of output that is the same as when capital is fixed (the short run), however, at a lower total cost. (6 marks)



When a firm operates in the short run, its cost of production may not be minimized because of inflexibility in the use of capital inputs.

Output is initially at level q_1. In the short run, output q_2 can be produced only by increasing labor from L_1 to L_3 because capital is fixed at K_1.

In the long run, the same output can be produced more cheaply by increasing labor from L_1 to L_2 and capital from K_1 to K_2.

(c) A monopolist faces the following demand curve, marginal revenue curve, total cost curve and marginal cost curve for its product:

Q= 200 – 2P
MR = 100 – Q
TC = 10Q
MC = 10

(i) What is the profit maximising level of output? (4)

Profit is max when the firm produce at output level where MR = MC

Find Q where MR = MC

100 – Q = 10

Q = 90

(ii) What is the profit maximising price? (3)

Q = 200 - 2P

90 = 200 – 2p

2p = 110

P = 55

(iii) What is the total profit earned? (3)

Profit = TR – TC

When firm produces 90 units, TR = P X Q = R55 X 90 = 4950, while TC = 10 X 90 = 900 (1) = 4950 – 900

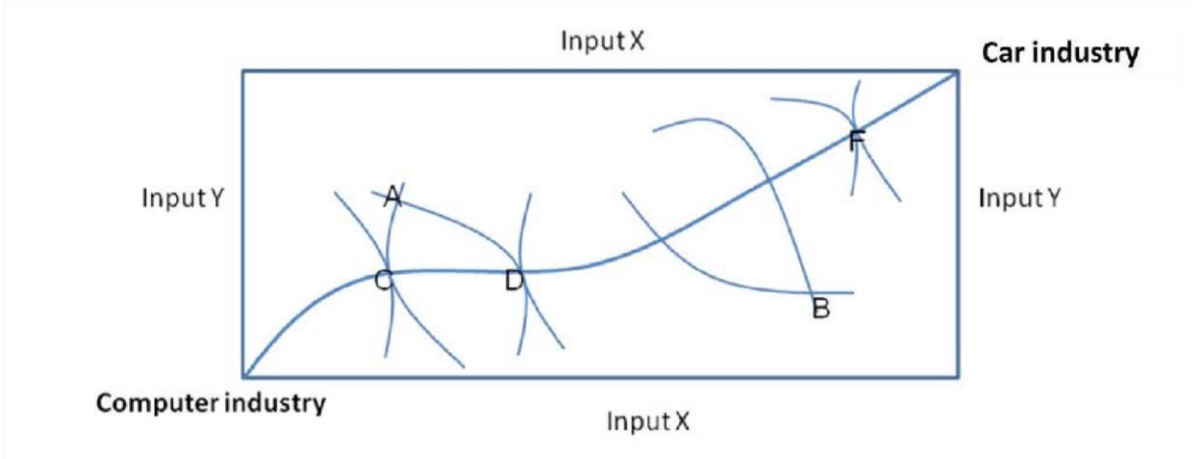
Profit = 4050

3a (i). Explain the *efficiency in production* of two industries (the car industry and the computer industry) with two inputs, X and Y. (2 marks)

Every producer's marginal rate of technical substitution between input X and Y are equal to their factor price ratio

OR MRTS = Px/ Py

Answer the following questions based on the Edgeworth box diagram below.



(ii) What is the line joining points C, D and F called? (2 marks) **Contract curve.**

(iii) List any two points where production is inefficient. (2 marks) **A and B.**

(iv) A movement from point A to point D will be to the benefit of which of the two industries? Explain your answer in no more than three sentences. (4)

It will benefit computer industry while car industry remains the same.

It is because this movement increase the output of computer industry by moving the isoquant outward / to a higher level of isoquant while the isoquant of car industry remains the same.

(v) At point C, which of the two industries is

dominant? (2) **Car industry.**

3b (i) The two leading South African manufacturers of high performance radial tires must set their advertising strategies for the coming year. Each firm has two strategies available: maintain current advertising or increase advertising by 15%. The strategies available to the two firms, G and B, are presented in the payoff matrix below.

		Firm B	
		Increase Adv.	Maintain Adv.
Firm G	Increase Adv.	27, 27	50, 12
	Maintain Adv.	12, 50	45, 45

The entries in the individual cells are profits measured in millions of rands. Firm G's outcome is listed before the comma, and Firm B's outcome is listed after the comma.

Which oligopoly model in the game theory is best suited for analyzing this decision? (2 marks)

The prisoner's dilemma model is most appropriate for analysing this situation.

B (ii) Carefully explain the strategy that should be used by each firm. Support your choice by including numbers. (6 marks)

Increasing the advertising level is the dominant strategy, since the firm is better off
increasing regardless of the rival's action.
For example, if Firm B increases, Firm G earns 27 if it increases and 12 if it does not increase. G is better off increasing.

If Firm B doesn't increase, Firm G earns 45 by not increasing and 50 by increasing. Again,
Firm G is better off to increase.
It is obvious that no matter what B does, G is better off to increase.
Firm B faces the same situation.