Micro economics

Prepared by

Gamal Ibrahim Hassan

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Chapter One

Individual Markets:

Demand and Supply

Chapter.1

Understanding Individual Markets: Demand and Supply

- The simple tools of demand and supply can take one for in understanding not only specific economic issues, but also the operation of the entire economic system.

- **The overriding goal of this chapter is to understand the nature of market.**

- **How prices and outputs are determined.**

- **How the interaction of buying decision of households and the selling decision of producers will determine the price of product and the quantity which is actually bought and sold in the market.**

Chapter One

Markets Defined

A market is defined as an institution or mechanism which brings together buyers ("demanders") and sellers ("suppliers") of particular goods and services. Markets assume a wide variety of forms. The corner gas station, the fast–food outlet, the local record shop, a farmer's roadside stand–all are familiar.

All these situations which link potential buyers with potential sellers constitute markets. As our examples imply, some markets are local while others are national or international in scope. Some are highly personal, involving face– to– face contact between demander and supplier; others are impersonal in that buyer and seller never see or know one another.

Demand

The term "demand" has a very specific meaning to the economist. Demand is defined as a schedule which shows the various amounts of a product which consumers are willing and able to purchase at each specific price in a series of possible price during some specified period of time. Demand simply portrays a series of alternative possibilities which can be set down in tubular form. It shows the quantities of a product which will be demanded at various prices, all other things being equal. As our definition indicates, we usually view demand from the vantage point of price; that is, we read demand as showing the amounts consumers will buy at various possible prices. It is equally correct and sometimes more useful to view demand from the reference point of quantity. That is, instead of asking what quantities can be sold at various prices, we can ask what prices can be gotten from consumers for various quantities of a good Table 1, is a hypothetical demand schedule for a single consumer who is purchasing bushels of corn.

Table 1, an individual buyer's demand for corn (hypothetical data).

Price per bushel	Quantity demanded per week
$5	10
4	20
3	35
2	55
1	80

Price of corn in the market happened to be $5 per bushel, our consumer would be willing and able to buy 10 bushels per week; if it were $4, the consumer would be willing and able to buy 20 bushels per week; and so forth.

The demand schedule in and of itself does not tell us which of the five possible prices will actually exist in the corn market. As we have already said, this depends on demand and supply. Demand, then, is simply a tabular statement of a buyer's plans, or intentions, with respect to the purchase of product.

Note that, to meaningful the quantities demanded at each price must relate to some specific time period– a day, a week, a month, and so forth. To say that a consumer will buy 10 bushels of corn at $5 per bushel is vague and meaningless. To say that a consumer will buy 10 bushels of corn per week at $5 per bushel is clear and very meaningful.

Law of Demand

A fundamental characteristic of demand is this: all else being constant, as price falls, the corresponding quality demanded rises. Or, alternatively, other things being equal, as price increases, the corresponding quality demanded falls. In short, there is a negative or inverse relationship between price and quantity demanded. Economists have labeled this inverse relationship the law of demand.

The Demand Curve

This inverse relationship between product price and quantity demanded can be presented on a simple two- dimensional graph measuring quantity demanded on the horizontal axis and price on the vertical axis 2. The process involved is that of placating on the graph those five Price-quantity possibilities shown in Table

1. We do this by drawing perpendiculars from the appropriate points on two axes.

Thus, for example, in plotting the $5-price-10 quantity demanded possibility, we must draw a perpendicular from the horizontal (quantity) axis at 10 to meet a perpendicular drawn from the vertical (price) axis at $5. If this is done for all five possibilities, the result is a series of points as shown in Figure 1. Each of these points represents a specific price and the corresponding quantity which the consumer will choose to purchase at that price. Now, assuming the same inverse relationship between price and quantity demanded at all points between the ones graphed, we can generalize on the inverse relationship between price and quantity demanded by drawing a curve to represent all price quantity demanded possibilities within the limits shown on the graph.

The resulting curve is called a demand curve and is labeled DD in Figure 1. It slopes downward and to the right because the relationship it portrays between prices and demanded is negative or inverse. The law of demand people buys more at a low price than they do at a high price–is reflected in the downward slope of the demand curve.

What is the advantage of graphing our demand schedule? After all, Table1, and Figure 1 contain exactly the same data and reflect the same relationship between price and quantity demanded. The advantage of graphing is that it permits us to represent clearly a given relationship–in this case the law of demand in a much simpler way than we could if we were forced to rely upon verbal and tabular presentation. A single curve on a graph, if understood, is simpler to state and to manipulate than Tables and lengthy verbal presentations would be. Graphs are invaluable tools in economic analysis. They permit clear expression and handling of sometimes complex relationships.

Determinants of Demand

When the economist constructs a demand curve such as D_1 in Figure 2, the assumption is made that price is the most important determinant of the amount of any product purchased. But economist is aware that factors other than price can and do affect purchases, thus, in locating a given demand curve such as D_1, it must also be assumed that other things are equal; that is, other non−price determinants of the amount demanded are conveniently assumed to be constant. When these non−price determinants of demand do in fact change, the location of the demand curve will shift to some new position to the right or left of D_1 for this reason these determinants are also referred to as demand shifters.

What are the major non price determinants of markets demand? The basic ones are (1) the tastes or preferences of consumers, (2) the number of consumers in the market, (3) the money incomes of consumers, (4) the prices of related goods, and (5) consumer expectations with respect to future prices and incomes.

Changes in Demand

What happens if one or more of the determinants of demand should change? We know the answer: A change in one or more of the determinants will change the demand schedule data in Table 2 and therefore the location of the demand curve in Figure 2. Such a change in the demand schedule data or, graphically, a shift in the location of the demand curve is designated as a change in demand.

(1) price per bushel	(2) Quantity demanded per week single buyer	(3) number of buyers in the market	(4) total quantity demanded per week
$5	10	× 200	= 2,000
4	20	× 200	=4,000
3	35	× 200	=7,000
2	55	× 200	= 11,000
1	80	× 200	= 16,000

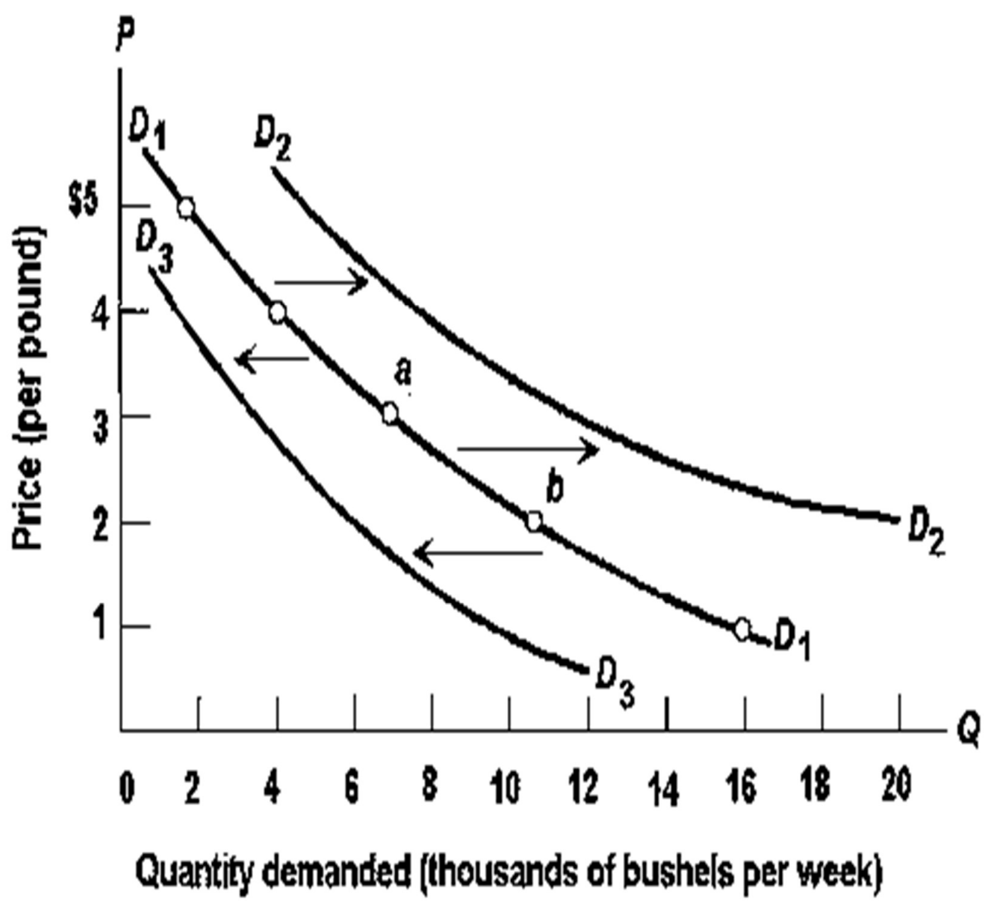


Figure 2

Change in the demand for corn

A change in one or more of the determinants of demand– consumer tastes, the number of buyers in the market, money incomes, the prices of other goods, or consumer expectations–will cause a change in demand. An increase in demand shifts the demand curve to the right, as from D_1 to D_2. A decrease in demand shifts the demand curve to the left, as from D_1 to D_3. A change in the quantity demanded involves a movement, caused by a change in the price of the product under consideration, from one point to another–as from a to b–on a fixed demand curve.

More specifically, if consumers become willing and able to buy more of this particular good at each possible price than is reflected in column 4 of Table 2, an increase in demand has occurred. In Figure 2, this increase in demand is reflected in a shift of the demand curve to the right, for example, from D_1 to D_2. Conversely, a decrease in demand occurs when, because of a change in one or more of the determinants, consumers buy less of the product at each possible price than is indicated in column 4 of Table 2. Graphically, a decrease in demand entails a shift of the demand curve to the left, for example, from D_1 to D_2 in Figure 2.

Let us now examine the effect upon demand of changes in each of the aforementioned non-price determinants.

1- Tastes A change in consumer tastes or preferences favorable to this product possibly prompted by advertising or fashion changes-will mean that more will be demanded at each price; that is, demand will increase. An unfavorable change in consumer preferences will cause demand to decrease, shifting the curve to the left. It is worth noting that technologies changes in the form of a new product may prompt a revision of consumer tastes. For example, the development and consumer acceptance of the hand calculator virtually eliminated the demand for slide rules. Similarly, the introduction of compact discs has tended to decrease the demand for long-playing records.

2- Number of buyers it is equally obvious that an increase in the number of consumers in a market will constitute an increase in demand. Fewer consumers will be reflected by a decrease in demand. Example: Dramatic improvements in communications have made financial markets international in scope, tending to increase the demand for stocks, bonds, and other financial instruments. The baby boom of the post-world war || period increased the demand for diapers, baby lotion, and services of obstetricians. Increasing life expectancy has increased the demands for medical care, retirement communities, and nursing homes. American trade negotiators are trying to reduce foreign trade barriers to American farm products in order to increase the demands for those products.

3- Income the impact of changes in money income demand is a bit more complex. For most commodities, a rise in income will cause an increase in demand. Consumers typically buy more steaks, stereos, and Scotch as their incomes in incomes. Conversely, the demand for such products will decline in response to a fall in incomes. Commodities whose demand varies directly with money income are called superior or normal goods.

Although most products are normal goods, there are a few exceptions. Examples: as incomes increase beyond some point, the amounts of bread or potatoes or cabbages purchased at each price may diminish because the higher incomes now allow consumers to buy more high-protein foods, such as dairy products and meat. Rising incomes may also tend to decrease demands for used clothing and third-hand automobiles. Similarly, rising incomes may cause the demands for hamburger and margarine to decline as wealthier consumers switch to T-bones and butter. Goods whose demand varies inversely with a change in money income are called inferior goods.

4- prices of related goods whether a given change in the price of a related good will increase or decrease the demand for the product under consideration will depend upon whether the related good is a substitute for, or a complement to, it. For example, butter and margarine are substitute goods. When the price of butter rises, consumers will purchase a smaller amount of butter and this will cause the demand for margarine to increase. Conversely, price of butter falls, consumers will buy larger quantities of butter, causing the demand for margarine to decrease. To generalize: when two products are substitutes, the price of one good and the demand for the other are directly related. So it is with Millers and Budweiser, Sugar and Nutrasweet, Toyotas and Hondas, Tea and Coffee, and so forth.

But other pairs of products are complementary goods; they go together in that they are jointly demanded. If the price of gasoline falls and, as a result, you drive your car more, this extra driving will increase your demand for motor oil. Conversely, an increase in the price of gasoline will diminish the demand for motor oil. Thus gas and oil are jointly demanded; they are complements. And so it is with ham and eggs, tuition and textbooks, VCRs and video cassettes, golf clubs and golf balls, cameras and rolls film, and so forth. When two commodities are complements, the price of one good and the demand for the other are inversely related.

Many pairs of goods, of course, are not related at all-they are independent goods. For such pairs of commodities as, for example, butter and golf balls, potatoes and automobiles, bananas and wristwatches, we should expect that a change in the price of one would have so impact upon the demand for the other.

5- Expectations consumer expectations about such things as future product prices, product availability, and future income can shift demand. Consumer expectations of higher future prices may prompt them to buy now in order to beat the anticipated price rises, and, similarly, the expectation of rising incomes may induce consumers to be less tightfisted in their current spending. Conversely, expectations of falling prices and income will tend to decrease the current demand for products. First example: if freezing weather destroys a substantial portion of Florida's citrus crop, consumers may reason that forthcoming shortages of frozen orange juice will escalate its price. Hence, they stock up on orange juice by purchasing extraordinarily large quantities now. Second example: Several years ago Jonny Carson Jokingly predicted a toilet paper shortage. Many of his **TV** fans took his comment seriously and within a few days' toilet paper was not be found on the shelves of many supermarkets. Third example: A first round **NFL** draft choice might splurge for a new: Mercedes in anticipation of a lucrative professional football contract.

We might summarize by saying that an increase in the demand for product X−the decision of consumers to buy more of X at each possible price−can be caused by (1) a favorable change in consumer tastes, (2) an increase in the number of buyers in the market, (3) a rise in income if X is a normal good or a fall in income if X is an inferior good, (4) an increase in the price of related goods Y if Y is a substitute for X or a decrease in price of related good Y if Y is a complement to X, and (5) expectations of future increases in prices and incomes. Conversely, a decrease in the demand for X can be associated with (1) an unfavorable change in tastes, (2) a decrease in the number of buyers in the market, (3) a rise in income if X is inferior good or a fall in income if X is a normal good, (4) an increase in the price of related good Y if Y is complementary to X or a decrease in the price of related good Y if Y is a substitute for X and (5) expectations of future Price and income declines. Table 3 provides a convenient listing of the determinants of demand along with additional illustrations.

Changes in Quantity Demanded

A “change in demand” must not be confused with a change in the quantity demanded. We have noted that a change in demand refers to a shift the entire demand curve either to the right (an increase in demand) or to the left (a decrease in demand). The consumer's state of mind concerning purchases of this product has been altered. The cause: a change in one or more of the determinants of demand. As used by economists, the term "demand refers to a schedule or curve; therefore, a change in demand must mean that the entire schedule has changed and that graphically the curve has shifted its position.

In contrast, a change in the quantity demanded designated the movement from one point to another point–from one price quantity combination to another–on a fixed demand curve. The cause of a change in the quantity demanded is a change in the price of the product under consideration. In Table 2 a decline in the price asked by suppliers of corn from \$5 to \$4 will increase the quantity of corn demanded from 2000 to 4000 bushels.

Figure 2 is helpful in making the distinction between a change in demand and a change in the quantity demanded. The shift of the demand curve D_1 to either D_2 or D_3 entails a “change in demand”. But the movement from point a to b on curve D_1 is a change in the quantity demanded.

The reader should decide whether a change in demand or a change in the quantity demanded is involved in each of the following illustrations:

1− Consumer incomes rise, with the result that more jewelry is purchased.

2− A barber raises the price of haircuts and experiences a decline in volume of business.

3− The price of Toyotas goes up and, as a consequence, the sales of Chevrolets increase.

Supply

Supply may be defined as a schedule which shows the various amounts of a product which a producer is willing and able to produce and make available for sale in the market at each specific price in a series of possible prices during some specified time period. This supply schedule portrays a series of alternative possibilities, such as those shown in Table 4 for a single producer. Supply tells us the quantities of a product which will be supplied at various prices, all other factors being held constant. Let us suppose, in this case, that our producer is a farmer producing corn, the demand for which we have just considered. Our definition of supply indicates that supply is usually viewed from the vantage point of price. That is, we read supply as showing the amount producers will offer at various possible prices. It is equally correct and more useful in some instances to view supply from the reference point of quantity. Instead of asking what quantities will be offered at various prices, we can ask what prices will be required to induce producers to offer various quantities of good.

Law of Supply

It will be immediately noted that Table 4 shows a positive or direct relationship between price and quantity supplied. As price rises, the corresponding quantity supplied rises; as price falls, the quantity supplied also falls. This particular relationship is called the law of supply. It simply tells us that producers are willing to produce and offer for sale more of their product at a high price than they are at a low price. Why? This again is basically a commonsense matter.

Price, we recall, is a deterrent from the consumer's standpoint. The obstacle of a high price means that the consumer, being on the paying end this price, will buy a relatively small amount of the product; the lower the price obstacle, the more the consumer will buy. The supplier, on the other hand, is on the receiving end of the product's price. To a supplier, price is revenue per unit and therefore is an inducement or incentive to produce and sell a product. The higher the price of the product, the greater the incentive to produce and offer it in the market.

Consider a farmer whose resources are shift Table within limits among alternative products. As price moves up in Table 4, the farmer will find it profitable to take land out of wheat, oats, and soybean production and put it into corn. Furthermore, higher corn prices will make it possible for the farmer to cover the costs associated with more intensive cultivation and the use of larger quantities of fertilizers and pesticides. All these efforts result in more output of corn. Consider a manufacturing concern. Beyond some point manufacturers usually encounter increasing production costs per unit of output. Therefore, a higher product price is necessary to cover these rising costs. But why do costs rise? They rise because certain productive resources–in particular, the firm's plant and machinery–cannot be expanded in a short period of time. Hence, as the firm increases the amounts of more readily variable resources such as labor, materials, and component parts, the fixed plant will at

Table 4-5 an individual producer's supply of corn (hypothetical data)

Price per bushel	Quantity demanded per week
$5	60
4	50
3	35
2	20
1	5

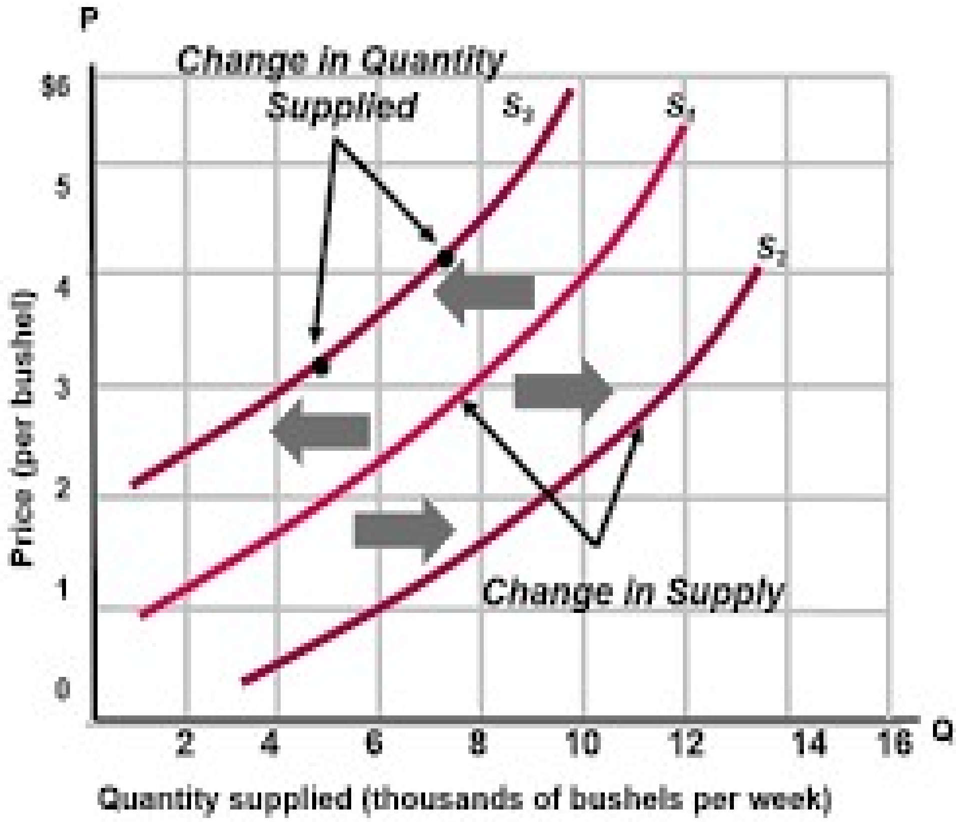


Figure 3

Changes in the Supply of Corn

A change in one or more of the determinants of supply–resource prices, productive techniques, the prices of other goods, taxes and subsidies, price expectations, or the number of sellers in the market–– will cause a change in supply. An increase in supply shifts the supply curve to the right, as from 5 to Si. A decrease in supply is shown graphically as a movement of the curve to the left, as from 5t to 53. A change in the quantity supplied involves a movement caused by a change in the price of the product under consideration, from one point to another−as from a to b−on a fixed supply curve.

Some point become crowded or congested with the result that productive efficiency declines and the cost of successive units of output increases. Producers must receive a higher price to produce these more costly units. Price and quantity supplied are directly related.

The Supply Curve

As in the case of demand, it is convenient to present graphically the concept of supply. Our axes in Figure 4−4 are the same as those in Figure 4−3, except for the change of quantity demanded to quantity supplied. The graphing procedure is the same as that previously explained, but of course the quantity data and relationship involved are different. The market supply data graphed in Figure 3 as S\ are shown in Table 5, which assumes there are 200 suppliers in the market having the same supply schedules as the producer previously portrayed in Table 4.

Table 5 Market demand of corn, 200 Producers (hypothetical data)

(1)	(2)	(3)	(4)
Price per bushel	Quantity supplied per week, single producer	Number of sellers in the market	Total quantity supplied per week
$5	60	× 200	= 12.000
4	50	× 200	= 10.000
3	35	× 200	= 7.000
2	20	× 200	= 4.000
1	5	× 200	= 1,000

Determinants of Supply

In constructing a supply curve, the economist assumes that price is the most significant determinant of the quantity supplied of any product. But, as with the demand curve, the supply curve is anchored on the other things are equal assumptions. That is, the supply curve is drawn on the supposition that certain non-price determinants of the amount supplied are given and do not change. If any of these non-price determinants of supply do in fact change, the location of the supply curve will be altered.

The basic non price determinants of supply are (1) resource prices, (2) the technique of production, (3) taxes and subsidies, (4) prices of other goods, (5) price expectations, and (6) the number of sellers in the market. To repeat: A change in anyone or more of these determinants or supply shifters will cause the supply curve for a product to move either to the right or the left. A shift to the right, from S_1 to S_2 in Figure 4 designates an increase in supply: producers are now supplying larger quantities of the product at each possible price. A shift to the left, S_1 to S_3 in Figure 4, indicates a decrease in supply: Suppliers are offering less at each price.

Changes in Supply

Let us consider the effect of changes in each of these determinants upon supply.

1- **Resource Prices**. As indicated in our explanation of the law of supply, the relationship between production costs and supply is an intimate one. A firm's supply curve is based upon production costs; a firm must receive higher prices for additional units of output because those extra units are more costly to produce. It follows that decreases in resource prices will lower production costs and increase supply that is, shift the supply curve to the right. Example: if the prices of seed and fertilizer decrease, we can expect the supply of corn to increase. Conversely, an increase in input prices will raise production costs and reduce supply, that is, shift the supply curve to the left, Example: increases in the prices of iron ore and coke will increase the cost of procuring steel and tend to reduce its supply.

2- **Technology** A technological improvement means that the discovery of new knowledge permits us to produce a unit of output more efficiently, that is, with fewer resources. Given the prices of these resources, this will lower production costs and increase supply. Example: recent dramatic breakthroughs in the area of superconductivity portend the possibility of transporting electric power with little or no loss. Currently, about 30 percent of electric power is lost when transmitted by copper cable. Consequence? Significant co reductions and supply increases in a wide range of products where energy is an important input.

3- **Taxes and subsidies** Businesses treat most taxes as costs. Therefore, an increase in, say, sales or property taxes will increase costs and reduce supply. Conversely, subsidies are “taxes in reverse”. If government subsidizes the production of some good, it in effect lowers costs and increases supply. We will see how government might tax or subsidize certain products to alter their supply for the purpose of improving the allocation of resources.

4- **Prices of other goods** Changes in the prices of other goods can also shift the supply curve for a product. A decline in the price of wheat may cause a farmer to produce and offer more corn at each possible price. Conversely, a rise in the price of wheat may make farmers less willing to produce and offer corn in the market. A firm manufacturing athletic equipment might reduce its supply of basketballs in response to a rise in the price of soccer balls.

5- **Expectations** Expectations concerning the future Price of a product can also affect a producer's current willingness to supply that product. It is difficult, however, to generalize concerning the way the expectation of, say, higher prices will affect the present supply curve of a product. Farmers might withhold some of their current corn harvest from the market, anticipating a higher corn Price in the future. This will cause a decrease in the current supply of corn. Similarly, if the price of IBM stock is expected to rise significantly in the near further, the supply offered today for sale might decrease. On the other hand, in many types of manufacturing, expected price increases may induce firms to expand their production facilities, causing supply to increase.

6- **Number of sellers** Given the scale of operations of each firm, the larger the number of suppliers, the greater will be market supply. As more firms enter an industry, the supply curve will shift to the right. The smaller the number of firms in an industry, the less the market supply will be. This means that as firms leave an industry, the supply curve will shift to the left Table 6 provides a checklist of the determinants of supply; the accompanying illustrations deserve careful study.

Changes in Quantity Supplied

The distinction between a change in supply and a change in the quantity supplied parallels that between a change in demand and a change in the quantity demanded. A change in supply is involved when the entire supply curve shifts. An increase in supply shifts the curve to the right; a decrease in supply shifts it to the left. The cause of a change in supply is a change in one or more of the determinants of supply. The term supply is used by economists to refer to a schedule or curve. A change in supply therefore must mean that the entire schedule has changed and that the curve has shifted.

A change in the quantity supplied, on the other hand, refers to the movement from one point to another point on a stable supply curve. The cause of such a movement is a change in the price of the specific product under consideration. in Table 5 a decline in the price of corn from \$5 to \$4 decreases the quantity of corn supplied from 12,000 to 10,000 bushels.

Shifting the supply curve from S_1 to S_2 or S_3 in Figure 3 entails changes in supply. The movement from point a to point b on S_1, however, is merely a change in the quantity supplied.

The reader should determine which of the following involves a change in supply and which entails a change in the quantity supplied:

1- Because production costs decline, producers sell more automobiles.

2- The price of wheat declines, causing the number of bushels of corn sold per month to increase.

3- Fewer oranges are offered for sale because their price has decreased in retail markets.

4- The Federal government doubles its excise tax on liquor.

Supply and Demand: Market Equilibrium

We may now bring the concepts of supply and demand together to see how the interaction of the buying decisions of households and the selling decisions of producers will determine the price of a product and the quantity which is actually bought and sold in the market. In Table 7, columns 1 and 2 reproduce the market supply schedule for corn (from Table 5), and columns 2 and 3, the market demand schedule for corn (from Table 2). Note that in column 2. We are using a common set of prices. We assume competition-the presence of larger number of buyers and sellers.

Table 7 market supply and demand for corn (hypothetical data)

(1)	(2)	(3)	(4)
Total quantity Supplied per week	Price per bushel	Total quantity Demanded per week	Surplus (+) or shortage (−) (arrows indicate effect on price)
12,000	$5	2,000	+ 10,000 ↓
10,000	4	4,000	+ 6,000 ↓
7,000	3	7,000	0
4,000	2	11,000	− 7,000 ↑
1,000	1	16,000	− 15,000 ↑

Now the question to be faced is this: Of the five possible prices at which corn might sell in this market, which will actually prevail as the market price for corn? Let us derive our answer through the simple process of trial and error. For no particular reason, we shall start with an examination of $5. Could this be the prevailing market price for corn? The answer is No, for the simple reason that producers are willing to produce and offer in the market some 12,000 bushels of corn at this price while buyers, on the other hand, are willing to take only 2000 bushels of the market at this price. In other words, the relatively high price of $5 encourages farmers to produce a great deal of corn, but that same high price discourages consumers from taking the product of the market. Other products appear as better buys when corn is high priced. The result in this case is a 10,000-bushel surplus or excess supply of corn in the market. This surplus, shown in column 4, is the excess of quantity supplied over quantity demanded at the price of $5. Practically put, corn farmers would find themselves with unwanted inventories of output.

Could a price of $5-even if it existed temporarily in the corn market-- persist over period of time? Certainty not, The very large surplus of corn would prompt competing sellers to bid down the price to encourage buyers to take this surplus of their hands. Suppose price gravitates down to $4. Now the situation has changed considerable. The lower price has encouraged buyers to take more of this product of the market and, at the same time, has induced farmers to use a smaller amount of resources in producing corn. The surplus, as a result, has diminished to 6000 bushels. However, a surplus or excess supply still exists and competition among sellers will once again bid down the price of corn. We can conclude, then, that prices of $5 and $4 will be unstable because they are too high. The market price for corn must be something less than $4.

To avoid letting the cat out of bag before we fully appreciate how supply and demand determine product price, let us now jump to the other end of our price column and examine $1 as the possible market price for corn. It is evident from column 4 that at this price, quantity demanded is in excess of quantity supplied by 15,000 units. This relatively low price discourages farmers from devoting their resources to corn production; the same low price encourages consumers to attempt to buy more corn than would otherwise be the case. Corn is a good buy when its price is relatively low in short, there is a 15,000- bushel shortage of, or excess demand for, corn. Can this price of $1 persist as the market price? No. Competition among buyers will bid up the price to something greater than $1. In other words, at a price of $1, many consumers who are willing and able to buy at this price will be left out in the cold. Many potential consumers, in order to ensure that they will not have to do without, will express a willingness to pay a price in excess of $1 to ensure getting some of the available corn. Suppose this competitive bidding up of price by buyers boosts the price of corn to $2. This higher price has reduced, but not eliminated, the shortage of corn. For $2, farmers are willing to devote more resources to corn production, and some buyers who were willing to pay $1 for a bushel of corn will choose not to buy corn at a price of $2, deciding to use their incomes to buy other products or maybe to save more of their incomes. But a shortage of 7000 bushels still exists at a price of $2. We can conclude that competitive bidding among buyers will push market price to some Figure greater than $2.

By trial and error, we have eliminated every price but $3. So let us now examine it. At a price of $3, and only at this price, the quantity which farmers are willing to produce and supply in the market is identical with the amount consumers are willing and able to buy. As a result, there is neither a shortage nor a surplus of corn at this price. We have already seen that a surplus causes price to decline and a shortage causes price to rise, with neither a shortage nor a surplus at $3, there is no reason for the actual price of corn to move away from this price. The economist calls this price the market-clearing or equilibrium price, equilibrium meaning in balance or at rest. At $3, quantity-supplied and quantity demanded are in balance; that is, equilibrium quantity is 7000 bushels. Hence $3 is the only stable price of corn under the supply and demand conditions shown in Table 7. Or, stated differently, the price of corn will be established where the supply decisions of producers and the demand decisions of buyers are mutually consistent. Such decisions are consistent with one another only at a price of 3$. At any higher price, suppliers want to sell more than consumers want to buy and a surplus will result; at any lower price, consumers want to buy more than producers are willing to offer for sale, as is evidenced by the consequent shortage. Discrepancies between supply and demand intentions of sellers and buyers, respectively, will prompt price changes which subsequently will bring these two sets of plans into accord with one another.

A graphic analysis of supply and demand should yield the same conclusions. Figure 4. Puts the market supply and market demand curves for corn on the same graph, the horizontal axis now measuring both quantity demanded and quantity supplied. A close examination of this diagram clearly indicates that at any price above the equilibrium price of 3$, quantity supplied will the equilibrium price of $3, quantity supplied will exceed quantity demanded. This surplus will cause a competitive bidding down of price by sellers eager to relieve themselves of their surplus. The falling price will cause less corn to be offered and will simultaneously encourage consumers to buy more. Any price below the equilibrium price will entail a shortage; that is, quantity demanded will exceed quantity supplied.

Competitive bidding by buyers will push the price up toward the equilibrium level. And this rising price will simultaneously cause producers to increase the quantity supplied and ration buyers out of the market, thereby causing the shortage to vanish. Graphically, the intersection of, the supply curve and the demand curve for the product will indicate the equilibrium point. In this case equilibrium price and quantity are $3 and 7000 bushels.

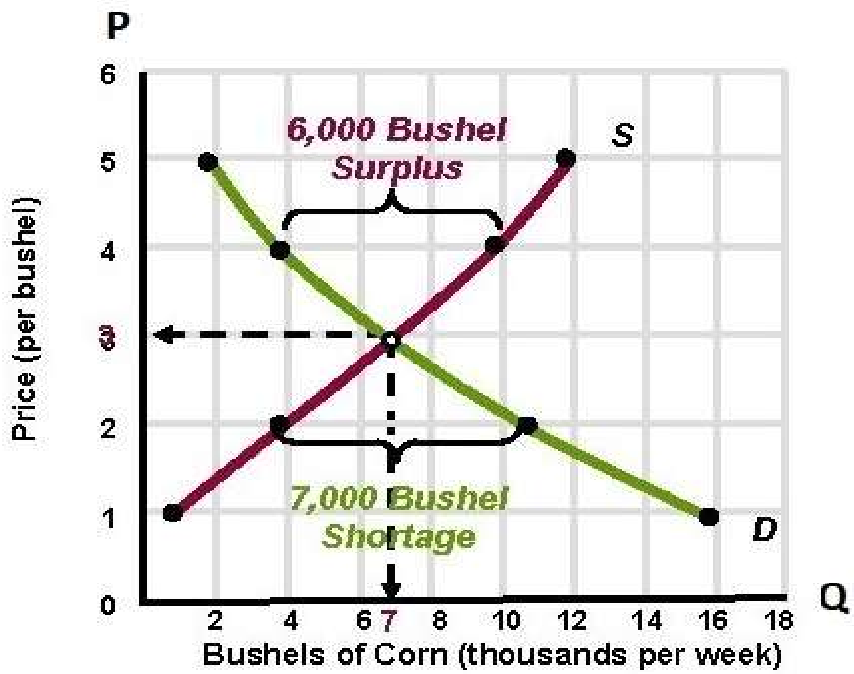


Figure 4

The equilibrium price and quantity for corn as determined by market demand and supply. The intersection of the down sloping demand curve D and the up sloping supply curve S indicates the equilibrium price and quantity, $3 and 7000 bushels in this instance. The shortages of corn which would exist at below-equilibrium prices, for example, 7000 bushels at $2, drive price up, and in so doing, increase the quantity supplied and reduce the quantity demanded until equilibrium is achieved. The surpluses which above-equilibrium prices would entail, for example, 6000 bushels at \$4, push price down and thereby increase the quantity demanded and reduce the quantity supplied until equilibrium is achieved.

Rationing Function of Prices

The ability of the competitive forces of supply and demand to establish a price where selling and buying decisions are synchronized is called the rationing function of prices. In this case, the equilibrium price of \$3 clears the market, leaving no burdensome surplus for sellers and no inconvenient shortage for potential buyers. The composite of freely made individual buying and selling decisions sets this price which clears the market. In effect, the market mechanism of supply and demand says this: Any buyer who is willing and able to pay \$3 for a bushel of corn will be able to acquire one; those who are not, will not. Similarly, any seller who is willing and able to produce bushels of corn and offer them for sale at a price of \$3 will be able to do so successfully; those who are not, will not. As we will see shortly, were it not that competitive prices automatically bring supply and demand decisions into consistency with one another, some type of administrative control by government would be necessary to avoid or control the short- ages or surpluses which might otherwise occur.

Changes in Supply and Demand

It was noted earlier that demand might change because of fluctuations in consumer tastes or incomes, Chances in consumer expectations, or variations in the prices of related goods. On the other hand, supply might vary in response to changes in technology, resource prices, or taxes. Our analysis would be incomplete if we did not stop to consider the effect of changes in supply and demand upon equilibrium price.

Changing demand let us first analyze the effects of a change in demand, assuming that supply is conveniently constant. Suppose that demand increases, as shown in Figure 4-6a. What is the effect upon price? Noting that the new intersection of the supply and demand curves is at a higher point on both the price and quantity axes can conclude that an increase in demand, other things (supply) being equal, will have a price-increasing effect and a quantity-increasing effect. (The value of graphic analysis now begins to become apparent; we need not fumble with columns of Figures in determining the effect on price and quantity but only compare the new with the old point of intersection on the graph). A decrease in demand as illustrated in Figure 5 b, reveals both price-decreasing and quantity-decreasing effects. Price falls, and quantity also declines. In brief we find a direct relationship between a change in demand and the resulting changes in equilibrium price and quantity. Changing supply let us reverse the procedure and analyze the effect of a change in supply on price, assuming that demand is constant. If supply increases, as in Figure 5c, the new intersection of supply and demand is located at a lower equilibrium price. Equilibrium quantity, however, increases. If supply decreases, on the other hand, this will tend to increase product price. Figure 6d illustrates this situation. Here, price increases but quantity declines. In short, an increase in supply has a price decreasing and a quantity increasing effect. A decrease in supply has a price-increasing and a quantity-decreasing effect. There is an inverse relationship between a change in supply and the resulting change in equilibrium price, but the relationship between a change in supply and the resulting change in equilibrium quantity is direct.

Exercises

Chapter **One**

Individual Markets: **D**emand and **S**upply

Firstly

Suppose you have the following information

$$Qd = 200 - 5P$$

$$Qs = 5P$$

Required

1- determine price and quantity and presents graphically

2- Calculate the consumer surplus

3- If the government impose the tax where TS %20 from original price. Calculate price, quantity and consumer surplus after tax present graphically

4- calculate the government revenue and the kind of good

Answer

1- by equalize demand and supply

$$200 - 5P = 5P$$

$$10P = 200$$

$$P = 20$$

Substitute by $P = 20$ to obtain Q

$$Q = 200 - 5(20) = 100$$

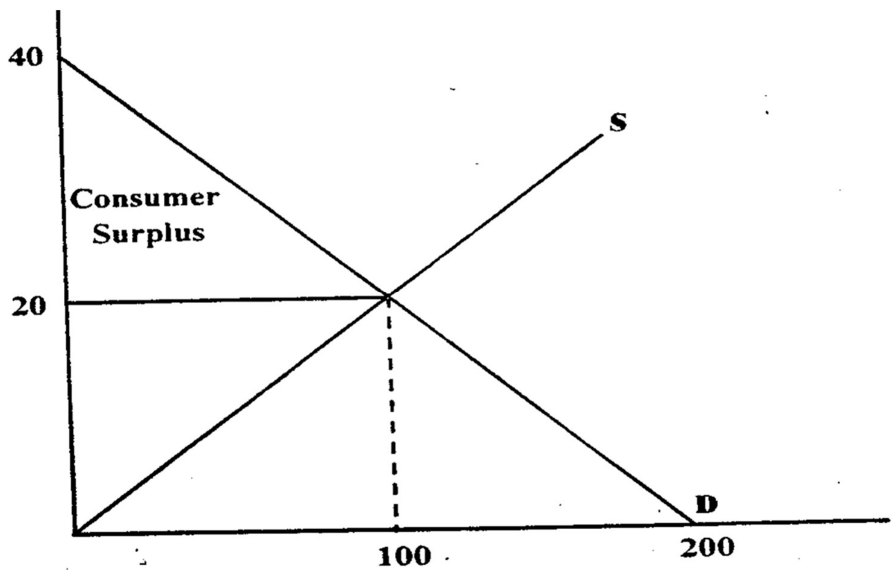
$$Q = 5\ (20) \qquad = 100$$

2‒ consumer surplus = $[(40 - 20) \times 100]\ \frac{1}{2} = 1000$

3‒ new supply function after tax

$$Q = 5\ (P - 4)$$

$$Q = 5\ P - 20$$



$$D = S$$

$$200 - 5P = 5P - 20$$

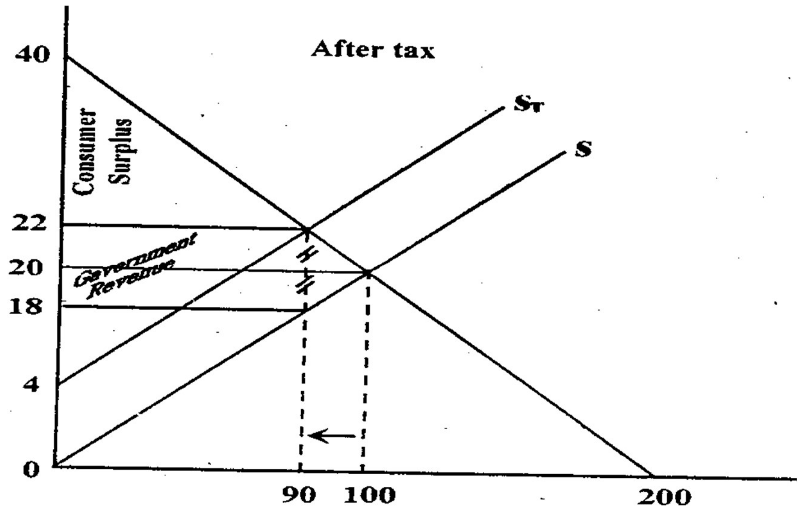
$$10P = 220$$

$$P = 22$$

Substitute by P = 22 to obtain Q

$$Q = 200 - 5\ (22) = 90$$

$$Q = 5\ (22) - 20 = 90$$



2- Consumer surplus = [(40 – 22) x 90] x $\frac{1}{2}$ = 810

4- Government revenue = (40 x 90) = 360

The good is normal because the tax divide between consumer and producer at equivalence.

Secondly

Suppose the government gave subsides to producer as %20 from original price

Required

1- price and quantity after subsides show that by graphic

2- calculate the total of subsides and kind of good

Answer

1- with subsides the supply function become to the following

$$Q = 5\ (P + 4)$$

$$Q = 5\ P + 20$$

Equalize between D = Q

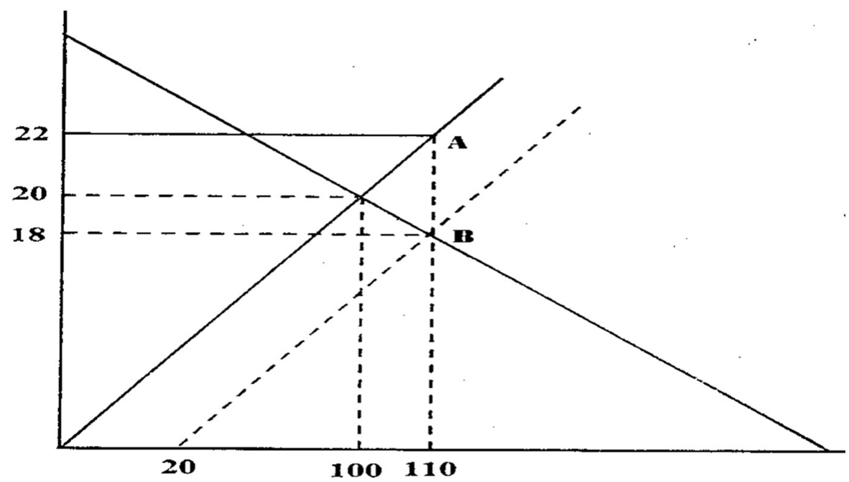
$$200 - 5P = 5P + 20$$

$$10P = 180$$

$$P = 18$$

$$Q = 200 - 5(18) = 110$$

$$Q = 5(18) + 20 = 110$$



Subsides = $110 \times 4 = 440$

The good is normal

Price Floors

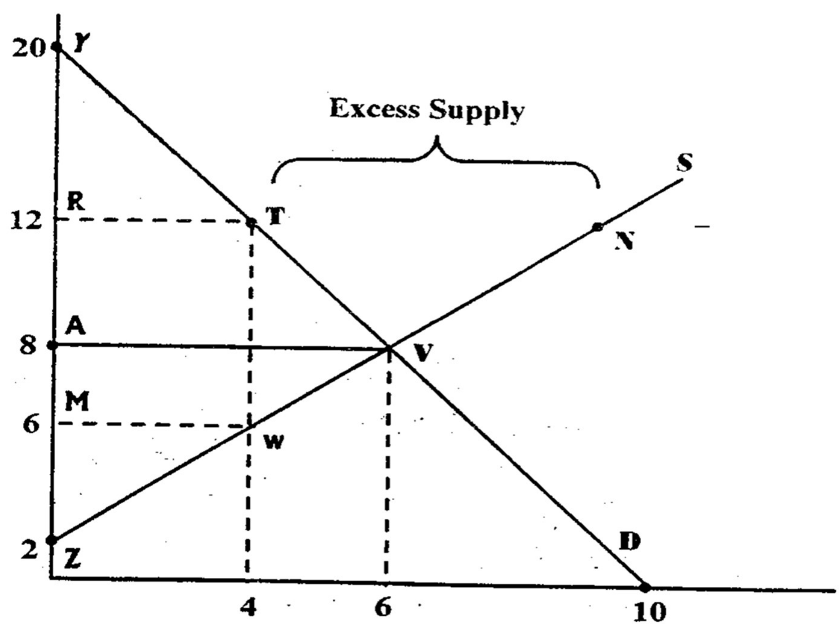
(Minimum price regulation)

As in the previous, the demand and supply curves are

$$Q^d = 10 - 0.5\ \text{P}$$

$$Q^s = \ -2 + \text{P}$$

Suppose the government sets a price floor of $\$12$ in the marked, as illustrated in the following figure



What is the size of excess supply in the market with the price floor? What is the consumer surplus?

What is the producer surplus? Assuming producers with the lowest cost sell the good? What is the net economic benefit? What is the dead weight loss?

Now we are knowing the equilibrium price and quantity as follow

$$10 - 0.5\,P = -2 + P$$

$$1.5\,P = 12$$

$$P = 8$$

And $Q = 10 - 0,5\ (8) = 6$

With the price floor, consumers demand only 4 million unit (point T), but producers want to supply 10 million units (point N) thus, the excess supply is 6 million units, equal to the horizontal distance between points T and N.

	With no price floor	With price floor
Consumer surplus	Area YVA = $36 million	Area YTR = $16 million
Producer surplus	Area YVZ = $18 million	Area RTWZ = $32 million
Net benefits consumer surplus + producer surplus)	$36 + $18 =$54 million	$16 + $32 = $48 million
Deadweight loss	Zero	$6 million

- Consumer surplus is the area below the demand curve D and above the price floor of $12. This is area YTR = $ 16 million
- Producer supply 4 million units that consumers want, producer surplus will be the area above the portion of supply curve and below the price floor. This is area

$$RTWZ = RTWM + ZMW$$

$$= (4 \times 6) + (4 \times 4 \times \tfrac{1}{2})$$
$$= 24 + 8 = \$32$$

- The net economic benefit is the sum of consumer surplus ($16 million) and producer surplus ($32 million) = $48 million
- The dead weight loss is the difference between the net economic benefit with no price flooring ($54 million) and the net economic benefit with the price flooring ($48 million) = $6 million.

Impact of a price ceiling

Suppose the demand and supply curve are

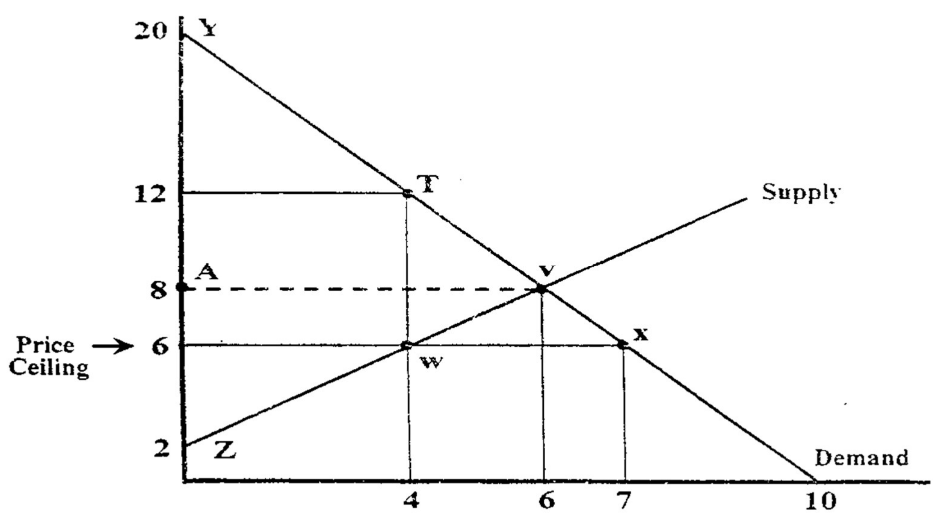
$$Q^d = 10 - 0.5 \text{ P}$$

$$Q^s = -2 + \text{P}$$

Suppose the government imposes a price ceiling of $6 in the market, as illustrated in the following Figure.

1- now what is the size of the shortage in the market with the price ceiling? What is the producer surplus?

2- what is the consumer surplus? What is the net economic benefit? What is the dead weight loss?



We can answer the above question as following. The equilibrium price before ceiling

$$Q^d = Q^s$$

$$10 - 0.5P = 2 + P$$

$$1.5P = 12$$

$$P = 8$$

Then

$$Q = 10 - 0.5\ (8) = 6$$

Now with price ceiling the consumer demand 7 unit at point X but producers supply only 4 units at point W. thus, the shortage (i.e, the excess demand) is 3 units equal to the horizontal distance between points W and X

	With no price ceiling	With price ceiling
Consumer surplus	Area YAV = $36 million	Area YTR = $40 million
Producer surplus	Area YVZ = $18 million	Area SWZ = $8 million
Net benefits consumer surplus + producer surplus)	$36 + $18 = $54 million	$40 + $8 = $48 million
Deadweight loss	Zero	$6 million

Producer surplus is the area above the supply curve s and below the price ceiling of $6. This area SWZ = $8 million

–If consumer purchases 4 units then consumer surplus will be the area below the portion of the demand curve and above the price ceiling. This is area YTWS = $40 million

The net economic benefit is the sum of consumer surplus ($40 million) and producer surplus ($8 million) = $48 million.

The deadweight loss is the difference between the net economic benefit with no price ceiling ($54 million) and the net economic benefit with the price ceiling ($48 million) = $6 million.

Exercises

Chapter one

Demand and supply

Part A: True- false Questions

Circle whether the following statements are true (T) or false (F)

1- The law of demand states that a decrease in the price of a good shifts the demand curve leftward.

2- The law of demand implies that demand curve slope down

3- Each point on the demand curve reflects the highest price consumers are willing and able to pay for that particular unit of a good.

4- A substitute is a good that can be used in place of another good

5- If income increases or the price of a complement falls, the demand curve for a normal good shifts leftward.

6- Normal goods are those for which demand decreases as income decreases

7- A normal good is good for which demand decreases when income increases.

8- Because of increases marginal cost, most supply curves have a negative slope.

9- A supply curve shows the relation between the quantity of a good supplied and the price of the good. Usually a supply curve has positive slope.

10- If a producer can use resources to produce either good A or good B, then A and B are complements in production.

11- A price below the equilibrium price results in a shortage

12- A shortage causes the price to fall.

13- If the quantity demanded exceeds the quantity supplied, then there is shortage and the price is below the equilibrium price.

14- a surplus occurs when the price is greater than the equilibrium price.

15- if the quantity supplied exceeds the quantity demanded, then there is shortage and the price is below the equilibrium price.

16- Tom's income falls by 3% at the same time, his demand for (X) falls by 4%. All other things remaining the same, necessary good.

17- Given the usually shaped supply and demand curves, if demand is more elastic than supply, the greater burden of a unit tax falls on consumers.

18- a relative price is the ratio of one price to another.

19- if the price of a hot dog is $2 and the price of a hamburger is $4, the relative price of a hamburger is ½ of a hot dog.

20- The quantity demanded is the amount of a good that consumers plan to purchase at a particular price.

21- The law of demand states that, other things remaining the same, the higher the price of a good, the smaller is the quantity of the good demanded

22- The law of demand states that, the quantity of the good demanded varies inversely with its price.

23- The demand curve for normal good shifts leftward if income decreases or the expected future price rises.

24- By definition, an inferior good is good for which demand decreases when income increases.

25- A change in the price of a good does not shift the good's demand curve but does cause a movement along it.

26- The quantity supplied of good is the amount that producers are planning to sell at a particular price during a given time period.

Part B multiple choice questions

Circle the appropriate answer

1- If the price of a candy bar is $1 and the price of a fast food meal is $5.

a- The money price of a fast food meal is 1/5 of a candy bar

b- The money price of a candy bar is 1/5 of a fast food meal

c- The relative price of a fast food meal is five candy bars

d- The relative price of a candy bar is five fast food meals

2- The law of demand implies that, other things remaining the same

a- as the demand for cheeseburgers increases, the price of a cheeseburger will fall.

b- as the price of a cheeseburgers rises, the quantity of a cheeseburger demanded will decrease.

c- as income increases, the quantity of a cheeseburgers demanded will increase.

d- as the price of a cheeseburgers rises, the quantity of a cheeseburger demanded will increase.

3- Which of the following is consistent with the law of demand?

a- a decrease in the price of a gallon of milk causes a decrease in the quantity of milk demanded.

b- an increase in the price of a soda causes a decrease in the quantity of soda demanded.

c- an increase in the price of tape causes an increase in the quantity of tapes demanded.

d- a decrease in the price of juice causes no change in the quantity of juice demanded.

4- The law of demand implies that if nothing else changes, there is

a- a linear relationship between the price of a good and the quantity demanded

b- a positive relationship between the price of a good and the quantity demanded

c- a negative relationship between price of a good and the quantity demanded

d- an exponential relationship between price of a good and the quantity demanded

5- People buy more of good 1 when the price of good 2 rises. These goods are

a- normal good   b- complements

c- substitutes   d- inferior goods

6- Which of the following influences people's buying plans and varies moving along a demand curve?

a- preference   b- the price of the good

c- income   d- the prices of related goods

7- The demand for a good increase when the price of a substitute and also increase when the price of a complement

a- falls; fall   b- rises; falls

c- rises; rises   d- falls; rises

8- A complement is a good

a- used in conjunction with another good

b- used instead of another good

c – of lower quantity than another good

d- of higher quantity than another good

9- Suppose people buy more of good 1 when the price of good 2 falls. these goods are

a- substitutes   b- inferior

c- normal   d- complements

10- People come to expect that the price of a gallon of gasoline will rise next week as a result

a- next week's supply of gasoline decreases.

b- the price of a gallon of gasoline falls today

c- today's supply of gasoline increases

d- today's demand for gasoline increases

11- Inferior goods are those for which demand increases as

a- income decreases | b- income increases

c- the price of a substitute rises | d- the price of a substitute falls

12- If a good is an inferior good, then purchases of that good will decrease when

a- the demand for it increases | b- population increases

c- income increases | d- the price of a substitute rises

13- A reduction in the price of a good

a- does not shift the good's demand curve leftward but does decrease the quantity demanded.

b- shifts the good's demand curve leftward but does not decrease the quantity demanded

c- shifts the good's demand curve leftward and also decreases the quantity demanded.

d- neither shifts the good's demand curve leftward nor decrease the quantity demanded.

14- A decrease in quantity demanded caused by an increase in price is represented by a

a- movement up and to the left along the demand curve

b- movement down and to the right along the demand curve

c- leftward shift of the demand curve

d- rightward shift of the demand curve

15- When we say demand increases, we mean that there is a

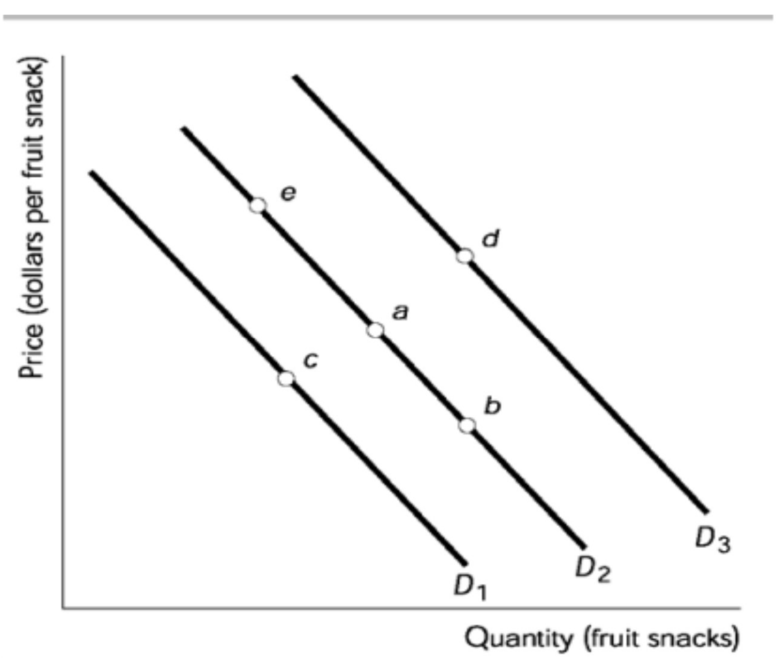
a- movement to the right along the demand curve

b- movement to the left along the demand curve

c- leftward shift of the demand curve

d- rightward shift of the demand curve

According to the following figure, answer the questions of (16) to (23)



16- In the figure above, which movement reflects an increase in demand?

a- from point a to point e　　　　b- from point a to point c

c- from point a to point b　　　　d- from point a to point d

17- In the figure above, which movement reflects a decrease in quantity demand?

a- from point a to point c　　　　b- from point a to point e

c- from point a to point d　　　　d- from point a to point b

18- In the figure above, which movement reflects how consumer would react to an increase in the price of a non-fruit snack?

a- from point a to point b　　　　b- from point a to point d

c- from point a to point c　　　　d- from point a to point e

19- In the figure above, which movement reflects an increase in the price of substitute for fruit snack?

a- from point a to point d　　　　b- from point a to point e

c- from point a to point b　　　　d- from point a to point c 51)

20- In the figure above, which movement reflects an increase in the price of a complement for fruit snack?

a- from point a to point b　　　　b- from point a to point d

c- from point a to point e　　　　d- from point a to point c

21- In the figure above, which movement reflects an increase in income if fruit snacks are an inferior good?

a- from point a to point d b- from point a to point c

c- from point a to point b d- from point a to point e

22- In the figure above, which movement reflects an increase in income if fruit snacks are a normal good?

a- from point a to point d b- from point a to point e

c- from point a to point b d- from point a to point c

23- In the figure above, which movement reflects a decrease in population?

a- from point a to point d b- from point a to point c

c- from point a to point e d- from point a to point b

24- The quantity supplied of a good or service is the quantity that a producer

a- actually sells at a particular price during a given time period.

b- should sell at a particular price during a given time period.

c- is willing to sell at a particular price during a given time period.

d- needs to sell at a particular price during a given time period.

25- A fall in the price of a good causes producers to reduce the quantity of the good they are willing to produce. This fact illustrates

a- a change in supply b- the law of demand

c- the nature of an inferior good d- the law of supply

26- Each point on a supply curve represents

a- the highest price sellers can get for each unit over time

b- the lowest price buyers will accept per unit over time

c- the lowest price for which a supplier can profitably sell another unit

d- the highest price buyers will pay the good

27- Which of the following is not held constant while moving along a supply curve?

a- prices of resources used in production

b- expected future prices

c- the number of sellers

d- the price of the good itself

28- An increase in the number of fast – food restaurants

a- increases the price of fast-food meals

b- raises the price of fast -food meals

c- increases the supply of fast–food meals

d- increase the demand for fast-food meals.

29- Which of the following will shift the supply curve for good X leftward?

a- a situation in which quantity demanded exceeds quantity supplied

b- an increase in the cost of the machinery used to produce X c- A decrease in the wages of workers employed to produce X

d- a technological improvement in the production of X

30- Which of the following does not shift the supply curve?

a- an increase in the price of the good

b- a fall in the price of a substitute in production

c- a decrease in the wages of labor used in production of the good

d- a technological advance

31- If the price of a good changes but everything else influencing suppliers' planned sales remains constant, there is a

a- rotation of the initial supply curve around the initial price

b- new supply curve that is to the right of the initial supply curve

c- new supply curve that is to the left of the initial supply curve

d- movement along the supply curve

32- A decrease in the quantity supplied is represented by

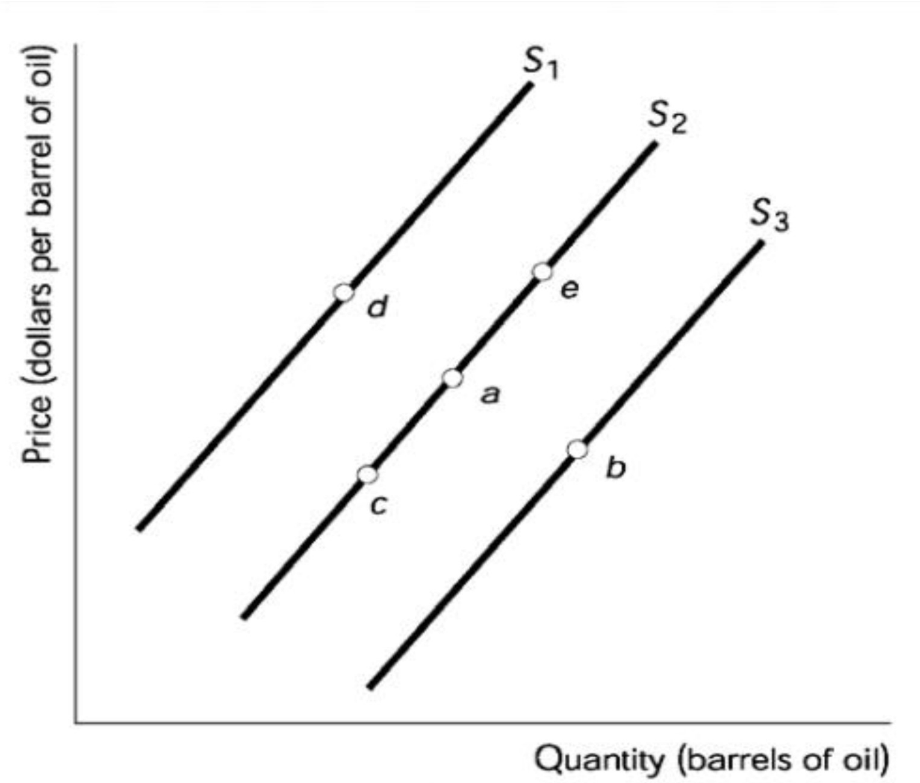
a- rightward shift in the supply curve

b- movement down the supply curve

c- leftward shift in the supply curve

d- movement up the supply curve

according to the following figure, answer the questions of (33 to (37)



33- In the figure above, an increase in the supply of oil would result in a movement from

a- point a to point d

b- point a to point e

c- point a to point b

d- point a to point c

34- In the figure above, an increase in the quantity of oil supplied but not in the supply of oil is shown by a movement from

a- point a to point c

b- point a to point b

c- point a to point e

d- point a to point d

35- In the figure above, a decrease in the quantity of oil supplied but not in the supply of oil is shown by a movement from

a- point a to point e   b- point a to point d

c- point a to point b   d- point a to point c

36- In the figure above, which could be caused by an increase in the wages of oil workers

a- point a to point d   b- point a to point b

c- point a to point c   d- point a to point e

37- In the figure above, which movement could be caused by the development of a new, more efficient refining technology?

a- point a to point e   b- point a to point c

c- point a to point b   d- point a to point d

38- The interaction of supply and demand explains

a- both the prices and the quantities of goods and services

b- the quantities of goods and services but not their prices

c- the prices of goods and services but not their quantities

d- neither the prices nor the quantities of goods and services

39- When the quantity demanded, equals quantity supplied

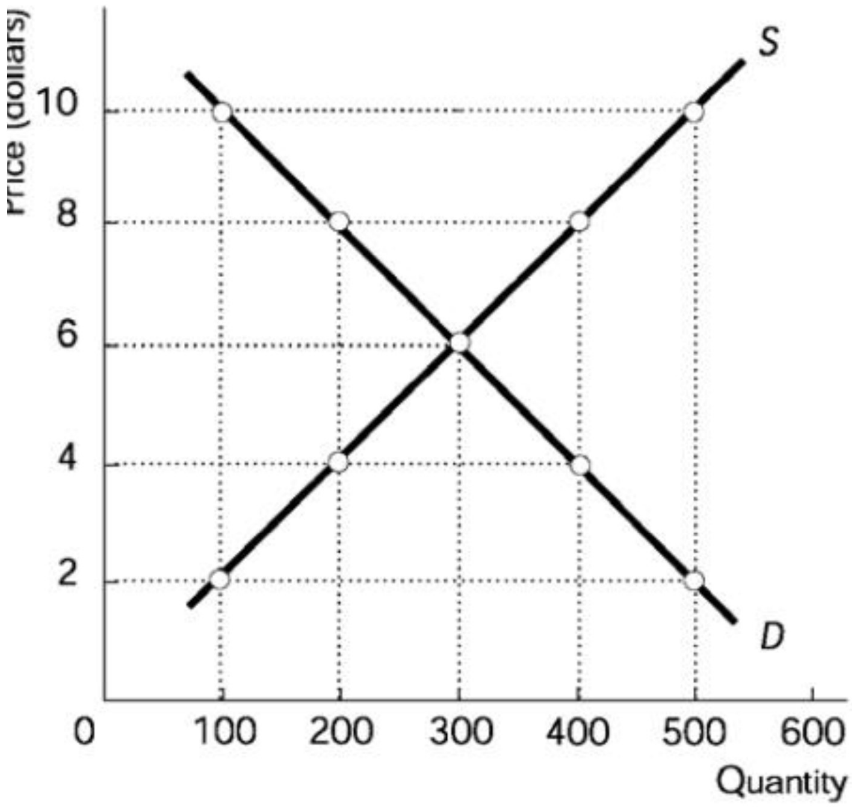
a- the government must be intervening in the market

b- there is a shortage

c- there is a surplus

d- none of the above

according to the following figure, answer the questions of (40 to (46)



40- The equilibrium price in the above figure is

a- $2 b-$8 c- $4 d- $6

41- The equilibrium quantity in the above figure is

a- 400 units b- 300 units c- 600 units d- 200 units

42- At a price of $10 in the above figure, there is

a- surplus of 400 units b- a shortage of 200 units

c- surplus of 200 units d- a shortage of 400 units. 99)

43- At a price of $4 in the above figure,

a- there is a surplus of 200 units

b- the equilibrium quantity is 400 units

c- the quantity supplied is 400 units

d- there is a shortage of 200 units.

44- If the good in the above figure is a normal good and income rises, then the new equilibrium quantity

a- is more than 300 units

b- is less than 300 units

c- could be less than, equal to, or more than 300 units

d- is 300 units.

45- The initial supply and demand curves for a good are illustrated in the above figure. If there are technological advances in the production of the good, then good, the good, then the new price for the good

a- is $6

b- is more than $6

c- could be less than equal to, or more than $6

d- is less than $6

46- The initial supply and demand curves for a good are illustrated in the above figure. If there is a rise in the price of the resources used to produce the good, then the new price

a- is less than $6 b- is more than $6

c- could be less than equal to, or more than $6 d- is $6

47- When the demand for a good decrease, its equilibrium price and equilibrium quantity

a- rises; decreases b- falls; decreases

c- falls; increases d- rises; increases

48- If good A is a normal good and income increases, the equilibrium price of A

a- and the equilibrium quantity will increase

b- and the equilibrium quantity will decrease

c- will rise and the equilibrium quantity will decrease

c- will fall and the equilibrium quantity will increase

49- When supply decreases and demand does not change, the equilibrium quantity

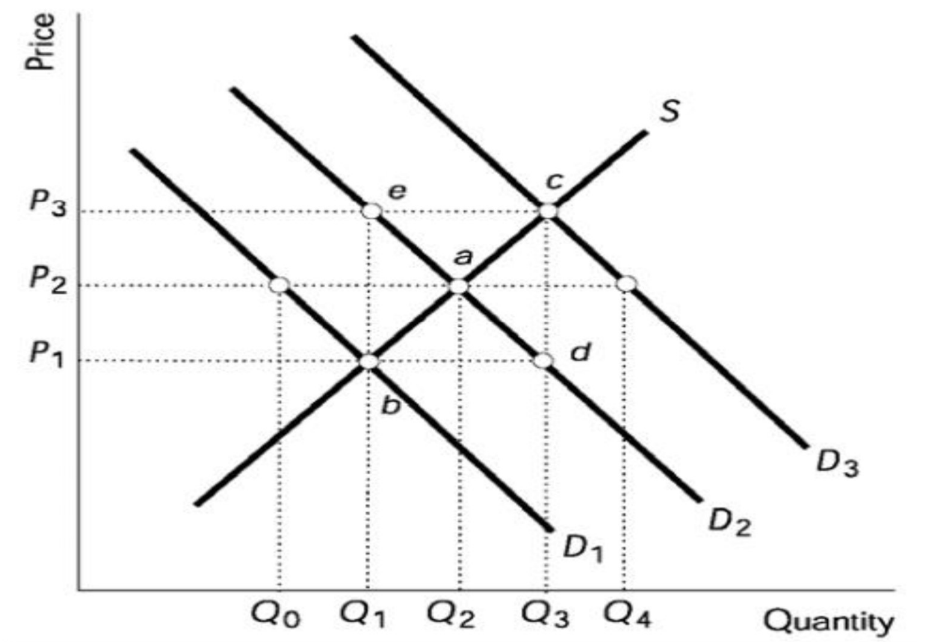
a- decreases and the prices rises

b- increases and the prices falls

c- decreases and the prices falls

d- increases and the prices rises

According to the following figure, answer the questions of (50 to (56)



50- In the above figure, a change in quantity demanded with unchanged demand is represented by movement from

a- point a to point c

b- point a to point e

c- point a to point b

d- none of the above represent a change in the quantity demanded with an unchanged demand

51- In the above figure, a change in quantity supplied with unchanged supply is represented by movement from

a- point b to point e

b- point b to point a

c- point e to point c

d- point a to point e

52- In the above figure, if D2 is the demand curve, then a price of P3 would result in

a- A surplus of Q3 – Q1 b- A shortage of Q4 – Q3

c- A surplus of Q4 – Q0 d- A shortage of Q3 – Q1 130)

53- In the above figure, if D2 is the original demand curve for a normal good and income decreases, which price and quantity may result?

a- point c, with price P3 and quantity Q3

b- point a, with price P2 and quantity Q2

c- point b, with price P1 and quantity Q1

d- point d, with price P1 and quantity Q3

54- In the above figure, if D2 is the original demand curve of substitute in consumption rises, which price and quantity may result?

a- point c, with price P3 and quantity Q3

b- point d, with price P1 and quantity Q3

c- point a, with price P2 and quantity Q2

d- point b, with price P1 and quantity Q

55- In the above figure, if D2 is the original demand curve and consumers come to expect that the price of the good will rise in the future, which price and quantity may result?

a- point a, with price P2 and quantity Q2

b- point c, with price P3 and quantity Q3 c- point d, with price P1 and quantity Q3

d- point b, with price P1 and quantity Q1

56- In the above figure, if D2 is the original demand curve and the population falls, which price and quantity may result?

a- point d, with price P1 and quantity Q3

b- point c, with price P3 and quantity Q3

c- point b, with price P1 and quantity Q1

d- point a, with price P2 and quantity Q2

problem

problem1

suppose that the market demand for potatoes is given by Q_d = 100 −4P and the market supply of potatoes is given by Q_s = 6P, where P is the price per bag of potatoes and Q is the number of bags per month.

Required

1- Compute the price and quantity that make that equilibrium and show that by graphically

2- Calculate the consumer and producer surplus

3- Suppose the government impose tax every unit produced where T = 10 then compute the new price and quantity after tax with graphically

4- Compute the consumer and producer surplus after tax

5- Calculate the total government revenue

6- What is the kind of good?

Problem 2

The demand and supply schedules for broccoli are given in the following tables. use this information to answer the question below.

Price (per pound)	Quantity demanded (1000 pounds)	Quantity supplied (1000 pounds)
1.00	100	0
1.50	90	40
2.00	80	80
2.50	70	120
3.00	60	160
3.50	50	200
4.00	40	240

1- What are the equilibrium price and quantity in the broccoli market? Illustrate your answer graphically.

2- Explain why the market will be in disequilibrium at a price of $3.50 per pound

3- Explain how the market will adjust from a price of $3.50 per pound to the equilibrium identified in part (1)

4- New studies indicate that broccoli has significant healing powers if it is consumed daily. How will these studies affect the broccoli market? Explain the adjustment process to the new equilibrium

5- Suppose instead that tighter immigration restrictions reduce the number of farm of farm laborers. How will these restrictions affect the broccoli market? Explain the adjustment process to the new equilibrium.

Problem3

Suppose that the market demand for potatoes is given by Q_d = 200 −5P and the market supply of potatoes is given by Q_s = 5P, where P is the price per bag of potatoes and Q is the number of bags per month.

Required

1− Compute the price and quantity that make that equilibrium and show that by graphically

2− Calculate the consumer and producer surplus

3− Suppose the government impose tax on every unit produced where T = 12 then compute the new price and quantity after tax with graphically

4− Compute the consumer and producer surplus after tax

5− Calculate the total government revenue

Problem 4

Suppose the demand function for necessary good as following

$$Q = 48 - 2P$$

$$Q = 4P$$

1− Calculate price and quantity which equilibrium position with graphically

2− Calculate consumer and producer surplus, also total benefit and deadweight

3− Suppose the government setting P = 12 as flooring price and then compute consumer, producer surplus and total benefit and also deadweight with graphically.

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Chapter Two

The Theory of Consumer Behavior

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The Theory of Consumer Behavior

The overriding goal of this chapter is to understand

- Low of diminishing marginal utility.

- Consumer choice and budget restraint.

- Utility maximizing rule.

- Indifference curve analysis.

- The effects of change in price or income: an algebraic approach.

- Finding income and substitution effects algebraically.

- Exercises

Chapter Two

The Theory of Consumer Behavior

Two Explanations of the Law of Demand

The law of demand may be treated as a commonsense notion. A high price usually does discourage consumers from buying; a low price typically does encourage them to buy. Now let us explore two complementary explanations of the downsloping nature of the demand curve which will back up our everyday observation.[1]

Income and Substitution Effects

You may recall that the law of demand– the downsloping demand curve– can be explained in terms of the income and substitution effects. Whenever the price of a product decreases, two

[1] - A third explanation, based upon indifference curves is in some respects more precise and more sophisticated than the two we now discuss –an introduction to indifference curve analysis is provided in this appendix to this chapter.

1- Income Effect

If the price of a product - say, steak- declines, the real income or purchasing power of anyone buying that product will increase. This increase in real income will be reflected in increased purchases of a variety of products, including steak. For example, with a constant money income of, say, $20 per week you can purchase 10 pounds of steak at a price of $2 per pound. But if the price of steak falls to $1 per pound and you buy 10 pounds of steak, $10 per week is freed for buying more of this and other commodities. A decline in the price of steak increases the real income of the consumer, enabling him or her to purchase a larger quantity of steak.[2] This is called the income effect.

2- Substitution Effect

The lower price of a product means that it is now cheaper relative to all other products and consumers will tend to substitute the cheaper product for other products which are now relatively more expensive. In our example, as the price of steak fall- the prices of other products

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[2] - We assume here that steak is a normal or superior good.

being unchanged steak will become more attractive to the buyer. At $1 per pound it is a better buy than at $2 per pound. Consequently, the lower price will induce the consumer to substitute steak for some of the now relatively less attractive items in the budget. Steak may well be substituted for pork, chicken, veal, fish, and a variety of other foods. A lower price increases the relative attractiveness of a product and makes the consumer willing to buy more of it. This is known as the substitution effect.

The income and substitution effects combine to make a consumer able and willing to buy more of a specific good at a low price than at a high price.

Law of Diminishing Marginal Utility

A second explanation centers upon the notion that, although consumer wants in general may be insatiable, wants for specific commodities can be fulfilled. In a given span of time, wherein the tastes of buyers are unchanged, consumers can get as much of specific goods and services as they want. The more of specific product consumers obtain, the less anxious they are to get more units of the same product. This can be most readily seen for durable goods. A consumer's want for an automobile, when he or she has none, may be very strong; the desire for a second car is much less intense; for a third or fourth, very weak. Even the wealthiest of families rarely have more than a half-dozen cars, despite the fact that their incomes would allow them to purchase and maintain a whole fleet of them.

Economists put forth the idea that specific consumer wants can be fulfilled with succeeding units of a commodity in the law of diminishing marginal utility. Let us dissect this law to see exactly what it means. That a product has utility if it has the power to satisfy a want. Utility is want satisfying power. Two characteristics of this concept must be emphasized: First, utility and usefulness are by no means synonymous. Paintings by Picasso may be useless in the functional sense of the term yet be of tremendous utility to art connoisseurs. Second, and implied in the first point, utility is a subjective notion. The utility of a specific product will vary widely from person to person. A bottle of muscatel wine may yield substantial utility to the Skid Row alcoholic, but zero or negative utility to the local temperance union President. A pair of eyeglasses has great utility to someone who is extremely far - or nearsighted, but no utility to a person having 20-20 vision.

By marginal utility we simply mean the extra utility, or satisfaction, which a consumer gets from one additional unit of a specific product. In any relatively short time wherein the consumer's tastes can be assumed not to change, the marginal utility derived from successive units of a given product will decline.[3] Why? Because a consumer will eventually become relatively saturated, or filled up, with that particular product. The fact that marginal utility will decline as the consumer acquires additional units of a specific product is known as the law of diminishing marginal utility.

We have noted that utility is a subjective concept. As a result, it is not susceptible to precise quantitative measurement. But for purposes of illustration, let us assume that we can measure satisfaction with units we shall call “utils”. This mythical unit of satisfaction is merely a convenient pedagogical device which will allow us to quantity our thinking about consumer behavior. Thus, in Table 1, we can illustrate the relationship

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[3] - For a time the marginal utility of successive units of a product may increase. A third can of beer may yield a larger amount of extra satisfaction than the first or second. But beyond some point, we can expect the marginal utility of added units to decline in the case of beer this decline may be abrupt.

between the quantity obtained of a product–say, fast–food hamburgers– and the accompanying extra utility derived from each successive unit. Here we assume that the law of diminishing marginal utility Sets in with the first hamburger consumed.

Table 1, the law of diminishing marginal utility as applied hamburgers (hypothetical data)

Unit of hamburgers	Marginal utility utils	Total utility utils
First	10	10
Second	6	16
Third	2	18
Fourth	0	18
Fifth	−5	13

Each successive hamburger yields less and less extra utility than the previous one as the consumer's want for hamburgers comes closer and closer to fulfillment. Total utility can be found for any number of hamburgers by cumulating the marginal– utility Figures as indicated in Table 1. The third hamburger has a marginal utility of 2 utile; 3 hamburgers yield a total utility of 18 utile (=10 + 6 + 2). Notice that marginal utility becomes zero for the fourth hamburger and negative for the fifth.

Now, how does the law of diminishing marginal utility explain why the demand curve for a specific product is downsloping? If successive units of goods yield smaller amounts of marginal, or extra, utility, then the consumer will buy additional units of a product only if its prices falls. The consumer for whom these utility data are relevant may buy, say, 2 hamburgers at a price of $1. But, owing to diminishing marginal utility from additional hamburgers, a consumer will choose not to buy more at this price, because giving up money really means giving up other goods, that is, alternative ways of getting utility. Therefore, additional hamburgers are not worth it unless the price (sacrifice of other goods) declines. (when marginal utility becomes negative, McDonalds or Burger King would I've to pay you to consumer another hamburger!) From the seller's viewpoint, diminishing marginal utility forces the producer to lower the price in order to induce buyers to take a larger quantity of the product. This rationale supports the notion of a downsloping demand curve.

Theory of Consumer Behavior

In addition to providing a basis for explaining the law of demand, the idea of diminishing marginal utility also plays a key role in explaining how consumers should allocate their money income among the many goods and services which are available for them to buy.

Consumer Choice and Budget Restraint

We can picture the situation of the typical consumer being something like this:

1- Rational Behavior

The average consumer is a fairly rational person, and attempts to dispose of his or her money income in such a way as to derive the greatest amount of satisfaction, or utility, from it. Typical consumers want to get the most for their money or, more technically, to maximize total utility.

2- Preferences

We many suppose, too, that the average consumer has rather clear-cut preferences for various goods and services available in the market. We assume that buyers have a good idea of how much marginal utility they will get from successive units of the various products which they might choose to purchase.

3- Budget Restraint

The consumer's money income is limited in amount. Because a consumer supplies limited amounts of human and property resources to businesses, the money income received will be limited. With a few possible exceptions–the Rockefellers, Bob Hope, Michael Jackson, and Saudi Arabia's King Fahd – all consumers are subject to a budget restraint.

4- Prices

The goods and services available to consumers have price tags on them. Why? Because they are scarce in relation to the demand for them, or stated differently, their production entails the use of scarce and therefore valuable resource. In the ensuing examples we shall suppose that product prices are not affected by the amounts of specific goods which the individual consumer buys; pure competition exists on the buying or demand side of the market.

Obviously, if a consumer has a limited number of dollars and the products he or she wants have price tags on them. The consumer will be able to purchase only a limited amount of goods the consumer cannot buy everything wanted when each purchase exhausts a portion of a limited money income. It is precisely this point which brings the economic fact of scarcity home to the individual consumer.

In marking his choices, our typical consumer is in the same position as the Western prospector... Who is restocking for his next trip into the back country and who is forced by the nature of the terrain to restrict his luggage to whatever he can carry on the back of one burro. If he takes a great deal of one item, say baked beans, he must necessarily take much less of something else, say bacon. His job is to find that collection of products which, in view of the limitations imposed on the total, will best suit his needs and tastes.[4]

The consumer must make compromises; choices must be made among alternative goods to obtain with limited money resources the most satisfying mix of goods and services.

5- E. T Weller the economic system (New York the Macmillan company, 1952), P89.

Utility Maximizing Rule

The question then boils down to this: of all the collections of goods and services which a consumer can obtain within the limit of his or her budget, which specific collection will yield the greatest utility or satisfaction? Bluntly put, the rule to be followed in maximizing satisfactions is that the consumer's money income should be allocated so that the last dollar spent on each product purchased yields the same amount of extra (marginal) utility. We shall call this the utility maximizing rule. When the consumer is balancing his Margin's in accordance with this rule, there will be no incentive to alter his or her expenditure pattern. The consumer will be in equilibrium and, barring a change in tastes, income, or the prices of the various goods, he or she will be worse off− total utility will decline − by any alteration in the collection of goods purchased.

A numerical illustration will help explain the validity of the rule. For simplicity's sake we limit our discussion to just two products. Keep in mind that analysis can readily be extended to any number of goods. Suppose that consumer brooks are trying to decide which combination of two products – A and B – she should purchase with her limited daily income of $10. Obviously, Brook's preferences for these two products and their prices will be basic data determining the combination of A and B which will maximize her satisfactions. Table 2 summarizes Brook's preferences for products A and B. Column 2a shows the amount of extra or marginal utility Brooks will derive from each successive unit of A. Column 3a reflects Brook's preferences for product B. In each case the relationship between the number of units of the product obtained and the corresponding marginal utility reflects the law of diminishing marginal utility. Diminishing marginal utility is assumed to occur with the first unit of each product purchased.

Table 2 the utility maximizing combination of products A and B obtainable with an income of $ 10*[5] (hypothetical data)

(1)	(2) product A: price = $1		(3) product B: price = $2	
Unit of product	(a) marginal utility, utils	(b) marginal utility per dollar (MU/ price)	(a) marginal utility utils	(b) superior utility per dollar (MU/price)
First	10	10	24	12
Second	8	8	20	10
Third	7	7	18	9
Fourth	6	6	16	8
Fifth	5	5	12	6
Sixth	4	4	6	3
Seventh	3	3	4	2

But before we can apply the utility maximizing rule to these data, we must put the marginal– utility information of two columns 2a and 3a. Peru dollars spent basis Why? Because a consumer's choices will be influenced not only by the extra utility which successive units of, say,

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[5] - It is assumed in this table that the amount of marginal utility received from additional units of each of the two products is independent of the quantity of the other product. For example, the marginal utility schedule for product A is independent of the amount of B obtained by the consumer.

product A will yield, but also by how many dollars (and therefore how many units of alternative good B) she must give up to obtain those added units of A. Example: Suppose you prefer a compact disc whose marginal utility is, say, 36 utile to a m whose marginal utility is just 24 utile. But if CD's price is $12 and the movie only $6, the choice would be for the movie rather than the CD! Why? Because the marginal utility per dollar spent would be 4 unils for the movie (4 = 24 ÷$6) as compared to only 3 utile for the CD (3 = 36 ÷ $12). You co buy two movies for $12 and, assuming the marginal utility of the second movie is, utile, your total utility would be 40 utile. Forty of satisfaction from two movies is clearly superior to 36 utile derived from the same $12 expenditure on one CD. The point is this: to make the amounts of extra utility derived from differently priced goods comparable, marginal utility must be put on a per dollar spent basis. This is done in columns 2b and 3b. These Figures are obtained by dividing the marginal utility data of columns 2a and 3a by the assumed prices of A and B – $1 and $2, respectively.

Now we have brooks' preferences– on unit and per dollar bases and the price tags of and B before us. Brooks stands patiently with $10 to spend on A and B. In what order should she allocate her dollars on units of A and B to achieve the highest degree of utility the limits imposed by her money income? And what specific combination of A and B will she have obtained at the time that she exhausts her $10?

Concentrating on columns 2b and 3b of Table 2, we find that Brooks should first spend $2 on the first unit of B. Why? Because its marginal utility per dollar of 12 utile is higher than A's but now Brooks finds herself indifferent about whether she should buy a second unit of B or the first unit of A, because the marginal utility per dollar of both is 10. So she buys both of them. Brooks now has 1 unit of A and 2 of B. Note that with this combination of goods the last dollar spent on each yield the same amount of extra utility. Does this combination of A and B therefore represent the maximum amount of utility which Brooks can obtain? The answer is "No." this collection of goods only costs $5 [= (1×$1) + (2 × $2)]; Brooks has $5 of income remaining, which she can spend to achieve a still higher level of total utility.

Examining columns 2b and 3b again, we find that Brooks should spend the next $2 on a third unit of B because the marginal utility per dollar for the third unit of B is 9 as compared to 8 for the second unit of A. But now, with 1 unit of A and 3 of B, we find she is again indifferent to a second unit of A and a fourth unit of B. Let us again assume Brooks purchases one more unit of each. Marginal utility per dollar is now the same at utile for the last dollar spent on each product, and Brook's money income of $10 is exhausted [(2 × $1) ÷ (4 × $2)]. The utility is combination of goods attainable by Brooks units of A and $ of B.[6] By summing the marginal utility information of columns 2a and 3a we find that Brooks is realizing 18 (= 10 + 8) utils of satisfaction from the 2 units of A and 78 (=24 + 20 + 18 + 16) utils of satisfaction from the 4 units of B. Her $10 of income, optimally spent, yields 96 (= 18 + 78) utils of satisfaction. Table 3 summarizes this step by step process for maximizing consumer utility and merits careful study by the reader. It is to be emphasized that there are other combinations of A and B which are obtainable with $10. but none of these will yield a level of total utility as high as do 2 units of A and 4 of B. For example, 4 units of A and 3 of B can be obtained for $10. However, this combination violates the utility maximizing rule; total utility here is only 93 utils, clearly inferior to the 96 units yielded by 2 of A and B. furthermore, there are other

[6] -To simplify we assume in this example that brooks spend her entire income: she neither borrows nor saves. Saving can be regarded as a utility yielding commodity and incorporated in our analysis. it is treated thus in question 5 at end of the chapter

combinations of A and B (such as 4 of A and 5 of B or 1 of A and 2 of B) wherein the marginal utility of the last dollar spent is the same for both A and B. but all such combinations are either unobtainable with Brooks 's limited money income (as 4 of A and 5 of B) or fail to exhaust her money income (as 1 of A and 2 of B) and therefore do not yield her the maximum utility attainable.

Table 3 sequence of purchases in achieving consumer equilibrium

Potential choice	Marginal utility per dollar	Purchase decision	Income remaining
First unit of A First unit of B	10 12	First unit of B for $2	$8 =$10-$2
First unit of A second unit of B	10 10	First unit A for $1 and second unit of B for $2	$5 =$8-$3
Second unit A Third unit of B	8 9	Third unit of B for $2	$3 =$5-$2
Second unit of A Fourth unit of B	8 8	Second unit of A for $1 And fourth unit of B for $2	$0 =$3-$3

Algebraic Restatement

We are now in position to restate the utility maximizing rule in simple algebraic terms. Our rule merely says that a consumer will maximize her satisfactions when she allocates her money income in such a way that the last dollar spent on product A, the last on product B, and so forth, yield equal amounts of additional, or marginal, utility.

Now the marginal utility per dollar spent on A is indicated by MU of product A L price of A (column 2b of Table 2) and the marginal utility per dollar spent on B by MU of product B/price of B (column 3b of Table 2). our utility− maximizing rule merely requires that these rations be equal. That is,

$$\frac{MU\ \ of\ product\ A}{Price\ of\ A} = \frac{MU\ \ of\ product\ B}{Price\ of\ B}$$

And, of course, the consumer must exhaust her available income. Our tabular illustration has shown us that the combination of 2 units of A and 4 of B fulfills these conditions in that

$$\frac{8}{1} = \frac{16}{2}$$

And the consumer's \$ 10 income is spent.

If the equation is not fulfilled, there will be some reallocation of the consumer's expenditures between A and B, from the low to the high marginal utility per dollar product, which will increase the consumer's total utility. For example, if the consumer were to spend \$10 on 4 of A and 3 of B, we would find that

$$\frac{MU\ of\ A{:}\,6\ utils}{Price\ of\ A{:}\,\$1} < \frac{MU\ of\ B{:}\,18\ utils}{Price\ of\ B{:}\,\$2}$$

The last dollar spent on A provides only 6 until satisfaction, and the last dollar spent on B provides $9(=18 \div \$2)$. On a per dollar basis, units of B provides more extra satisfaction than units of A. Hence, the consumer will increase her total satisfaction by purchasing more of B and less of A. As dollars are reallocated from A to B, the marginal utility from additional units of B will decline as the result of moving down the diminishing marginal utility schedule for B, and the marginal utility of A will rise as the consumer moves up the diminishing marginal utility schedule for A. At some new combination of A and B specifically, 2 of A and 4 of B the equality of the two ratios and therefore consumer equilibrium will be achieved. As we already know, the net gain in utility is 3 utility utils $(= 90 - 93)$.

Indifference Curve Analysis

The Budget Line: What Is Obtainable

A budget line simple shows the various combinations of two products which can be purchased with a given money income. For example, if the price of product A is $\$1.50$ and the price of B is $\$1.00$, then the consumer could purchase all the combinations of A and B shown in Table 1 with $\$12$ of money income. We note that at one extreme the consumer might spend all of his or her income on 8 units of A and have nothing left to spend on B. Or, by giving up 2 units of A and thereby freeing $\$3$, the consumer could have 6 units of A and 3 of B. and so on to the other extreme, at which the consumer could buy 12 units of B at $\$1.00$ each, thereby expending his or her entire money income on B and having nothing left to spend on A.

Figure 1 shows the budget line graphically. Note that the slope of the budget line measures the ratio of the price of B to the price of A; more precisely, the absolute value of mathematical P_B/P_A = $\$1.00/\$1.50$ =$2/3$. This is merely the mathematical way of saying that the consumer must forgo 2 units of A (measured on the vertical axis) at $\$1$. Each in order to make available $\$3$ to spend on 3 units of B (measured on the horizontal axis). In other words, in moving down the budget or price line, 2 of A (at $\$1.50$ each) must be given up to obtain 3 of B (at $\$1.00$ each). This yields a slope of $\frac{2}{3}$

Table 1 the budget line: combinations of A and B obtainable with an income of $12 (hypothetical data)

Units of A (price =$1.50)	Units of B (price = $1.00)	Total expenditures
8	0	$12 (=$12+$0)
6	3	$12(=$9+$3)
4	6	$12(=$6 +$6)
2	9	$12(=$3 + $9)
0	12	$12 (=$0+$12)

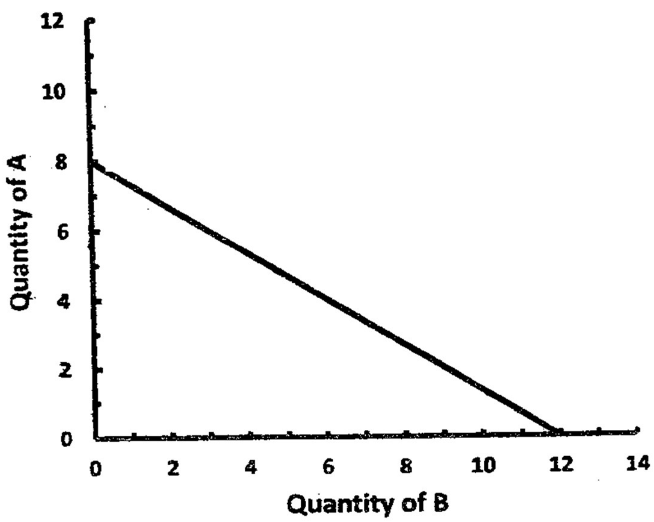


Figure 1 a Consumer's budget line

The budget line shows all the various combinations of any two products which can be purchased, given the prices of the products and the consumer's money income

Two other characteristics of the budget line merit comment.

1- Income Change

The location of the budget line varies with money income. Specifically, an increase in money income will shift the budget line to the right; a decrease in money income will move it to the left to verify these statements, simply recalculate Table 1 on the assumption that money income in (a) \$24 and (b) \$6 and plot the new budget lines in Figure 1.

Price Changes

A change in product prices will also shift the budget line. A decline in the prices of both products which is the equivalent of a real income increase–will shift the curve to the right. You can verify this assertion by recalculating Table1 replotting Figures 1 on the assumption that P_A = \$75 and P_B = \$50. Conversely, an increase in the prices of A and B will shift the curve to the left. Again, assume P_A = \$3 and P_B = \$2 and rework Table 1 Figure 1 to substantiate this statement. Note in particular what happens if we change P_B while holding P_A (and money income) constant. The reader should verify that, if we lower P_B from \$1.00 to \$50, the budget line will fan outward to the right. Conversely, by increasing P_B from, say, $\$1.00$ to $\$1.50$, the line will fan to the left. In instances the line remains anchored at 8 units on the vertical axis because P_A has not changed.

Indifference Curves: What Is Preferred

We know budget lines reflect market data having to do with income and prices. The budget line reveals the combinations of A and B which are obtainable, given money income and prices. Indifference curves, on the other hand, embody subjective information about consumer preferences for A and B by definition, an indifference curve shows all products A and B which will yield the same level of satisfaction or utility to the consumer. Table 2 and Figure 2 present a hypothetical indifference curve involving products A and B. The consumer's subjective preferences are such that he or she will realize the same total utility from each combination of A and B shown in the Table or curve; hence the consumer will be indifference as to which combination is actually obtained.

It is essential to understand several characteristics of indifference curves.

1-Downsloping

Indifference curves are downsloping for the simple reason that both product A and B yield utility to the consumer. Hence, in moving from combination j to combination K, the consumer is obtainable more of B and thereby increasing his or her total utility; therefore, some of A must be taken away to decrease total utility by a precisely offsetting amount. In brief, more of B necessitates less of A so that the quantities of A and B are inversely related. And any curve which reflects inversely related variables is downsloping

Table 2 an indifference schedule (hypothetical data)

Combination	Units of A	Units of B
j	12	2
K	6	4
l	4	6
m	3	8

2- Convex Origin

But, as viewed from the origin, a downsloping curve can be concave (bowed outward) or convex (bowed inward). A concave curve has an increasing (steeper) slope as one moves down the curve, while a convex curve has a diminishing (flatter) slope as one moves down it. (Recall that the production possibilities curve of Figure 2 is concave, reflecting the law of increasing opportunity costs)

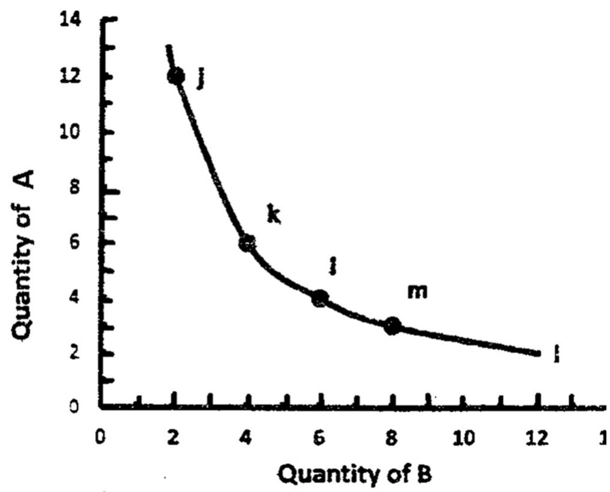


Figure 2

Consumer's indifference curve represents some combination of products A and B which is equality satisfactory to the consumer, that is, each combination of A and B embodies the same level of total utility.

We note in Figure 2 that the indifference curve is convex as viewed from the origin. That is, the slope diminishes or becomes flatter as we move from j to k, to l, to m, and so on down the curve. Technically, the slop of the indifference curve measures the marginal rate of substitution (MRS) because it shows the rate, at the margin, at which the consumer is prepared to substitute one good for the other (B for A) so as to remain equally satisfied. The diminishing slope of the indifference curve means the willingness to substitute B for A diminishes as one moves down the curve.

What is the rationale for this convexity; that is, for a diminishing MRS? The answer is that a consumer's subjective willingness to substitute B for A (or vice versa) will depend upon the amounts of B and A which he or she has to begin with. Consider Table 2 and Figure 2 once again, beginning at point j. Here, in relative terms the consumer has a substantial amount of A and very little of B. this means that at the margin B is very valuable (that is, its marginal utility is high), while A is less valuable at the margin (its margin utility is low). It follows that the consumer will be willing to give up a substantial amount of A to get 2 More unit of B. In this particular case, the consumer is willing to forgo 6 units of A to get 2 more units of B; the MRS. $\frac{6}{2}$ or 3. But at point K the consumer now has less A and more B. This means that A will now be somewhat more valuable, and B somewhat less valuable, at the margin. Hence, considering the move from point K to point l, the consumer is only willing to give up 2 units of A to get 2 more units of B so the MRS is now only $\frac{2}{2}$, or 1. having still less of A and more of B at point l, the consumer is only willing to give up 1 unit of A in return for 2 more of B and, hence, the MRS falls to $\frac{1}{2}$. In general, as the amount of B increases the marginal utility of additional units of B decreases. Similarly, as the quantity of A decreases, its marginal utility increases. This means in Figure 3 that in moving down the curve the consumer will be willing to give up smaller and smaller amounts of A as an offset to acquiring each additional unit of B. the result is a curve with a diminishing slope, that is, one which is convex when viewed from the origin. Alternatively stated, the **MRS** declines as one moves southeast along the indifference curve.

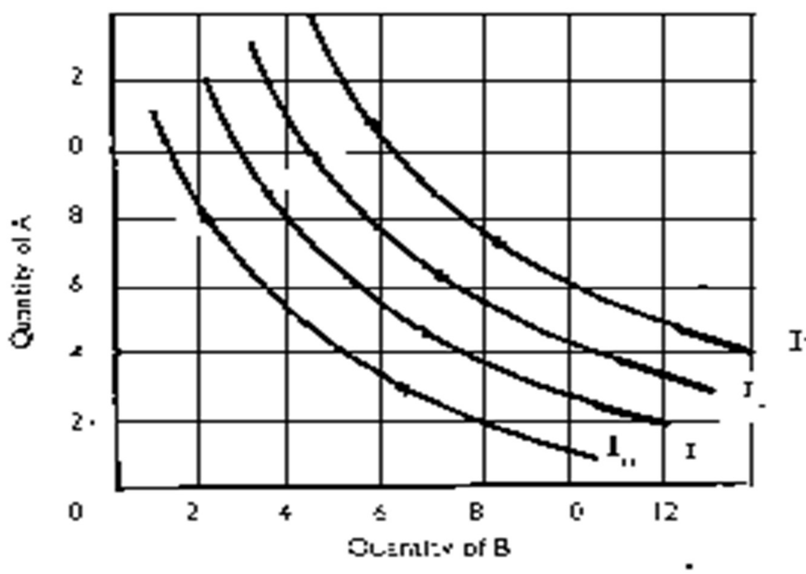


Figure 3

An indifference map

An indifference map is comprised of a set indifference curves. Each successive curve further from the origin indicates a higher level of total utility. That is, any combination of products A and B shows by a point on 14 is superior to any combination of Aa shown by a point 13, 12, 11

Indifference Map

The single indifference curve of Figure 2 reflects some constant (but unspecified) level of total utility or satisfaction. It is possible and useful for our analysis to sketch a whole series of indifference curves or, in other words, an indifference map as shown in Figure 3. Each curve reflects a difference level of total utility. Specifically, each curve to the right of our original curve (labeled I_3 in Figure 3) reflects combinations of A and B which yield more utility than I_3. Each curve to the left of I_3 reflects less total utility than I_3. In other words, as we move out form the origin each successive indifference curve entails a higher level of utility. This can be simply demonstrated by drawing a line in a northeasterly direction from the origin and noting that its points of intersection with each successive curve entail larger amounts of both A and B and therefore a higher level of total utility. Noting that axes of Figures 1 and 3 are identical, we can now determine the consumer's equilibrium position by combining the budget line and the indifference map as shown in Figure 4. Recall that, by definition, the budget line indicates all combinations of A and B which the consumer can attain, given his or her money income and the prices of A and B. The question is: of these attainable combinations, which will the consumer most prefer? The answer is: that combination which yields the greatest satisfaction or utility. Specifically, the utility-maximizing combination level be the one lying on the highest attainable indifference curve. In terms of Figure 4 the consumer's utility maximizing or equilibrium combination of A and B is at point X where the budget line is tangent to I_3. Why not, for example point Y? Because Y is on a lower indifference curve, I_2. By trading down the budget line- by shifting dollars from purchases of A to purchases of B - the consumer can get on an indifference curve further from the origin and thereby increase total utility from the same income. Why not Z? Same reason: point Z is on a lower indifference curve I_1. By trading Up the budget line - by reallocating dollars from B to A - it is possible for the consumer to get on higher indifference curve I_3 and increase total utility. How about point W on indifference curve L_4? While it is true that W entails a higher level of total utility than does X, point W is beyond (outside) the budget line and hence not attainable to the consumer. Point X is the best or optimal attainable combination of products A and B. At this point we note that by definition of tangency, the slope of the highest obtainable indifference curve equals the slope of the budget line. Because the slope of the indifference curve reflects the

MRS and the slope of the budget line $P_B\ /P_A$ the optimal or equilibrium position is where

MRS = P_B/P_A

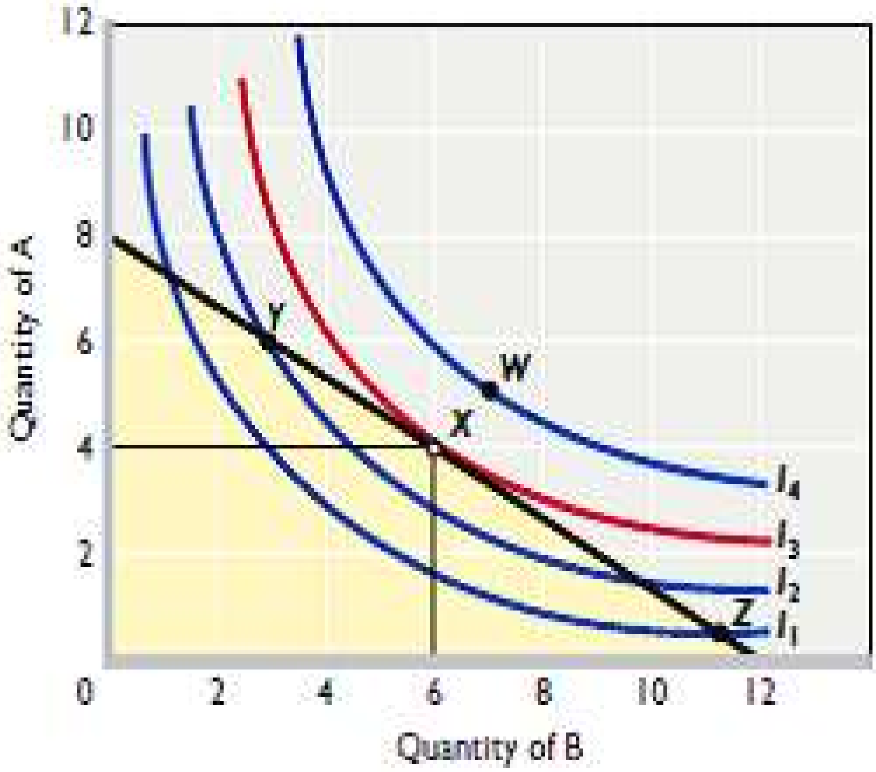


Figure 4

The consumer's equilibrium position is at point X, where the budget line is tangent to the highest attainable indifference curve 13. In this case the consumer will buy 4 units of A at \$1.50 per unit and 6 of B at \$1 per unit with a \$12 money income points Z and Y also represent attainable combinations of A and B, but yield less total utility as is evidenced by the fact they are on lower indifference curves. While W would entail more utility than X it is outside the budget line and therefore unattainable.

Digression: The Measurement of Utility

The alert reader may have sensed an important difference between the marginal utility theory and the indifference curve theory of consumer demand. The marginal–utility theory assumes that utility is numerically measurable. That is, the consumer is assumed to be able to say how much extra utility he or she derives from an extra unit of A or B. Given the prices of A and B, the consumer must be able to measure the marginal utility derived from successive units of A and B in order to realize the utility maximizing (equilibrium) position as previously indicated by

$$\frac{Marginal\ utility\ of\ A}{price\ of\ A} = \frac{Marginal\ utility\ of\ B}{price\ of\ B}$$

The Effects of a Change in Income

What happens to the consumer's choices of food and clothing as income changes? Let's look at the optimal choice diagram Figure.2 (a), which measures the quantity of food consumed (x) on the horizontal axis and the quantity of clothing (y) on the vertical axis. Suppose the price of food is P_x = $2 and the price of clothing is P_y = $4 per unit, with both prices held constant. The slope of her budget lines is $P_x/P_y = --1/2$.

We saw also that an increase in income results in an outward, parallel shift of the budget line. Figure 2 (a) illustrates the consumer's budget lines and optimal choices of food and clothing for three different levels of income, as well as three of her indifference curves (U_1, U_2 , and U_3) initially, when the consumer's weekly income is I_1 = $40, her budget line is BL_1. She chooses basket A, consuming 10 units of food and 5 units of clothing per week. As her income rises to I_1 = $68, the budget line shifts out BL_2. she then chooses basket B, with a Weekly consumption of 18 units of food and 8 units of clothing. If her income increases to I_3 = $92, she faces budget line BL_3. Her optimal basket is C, with 24 units of food and 11 units of clothing.

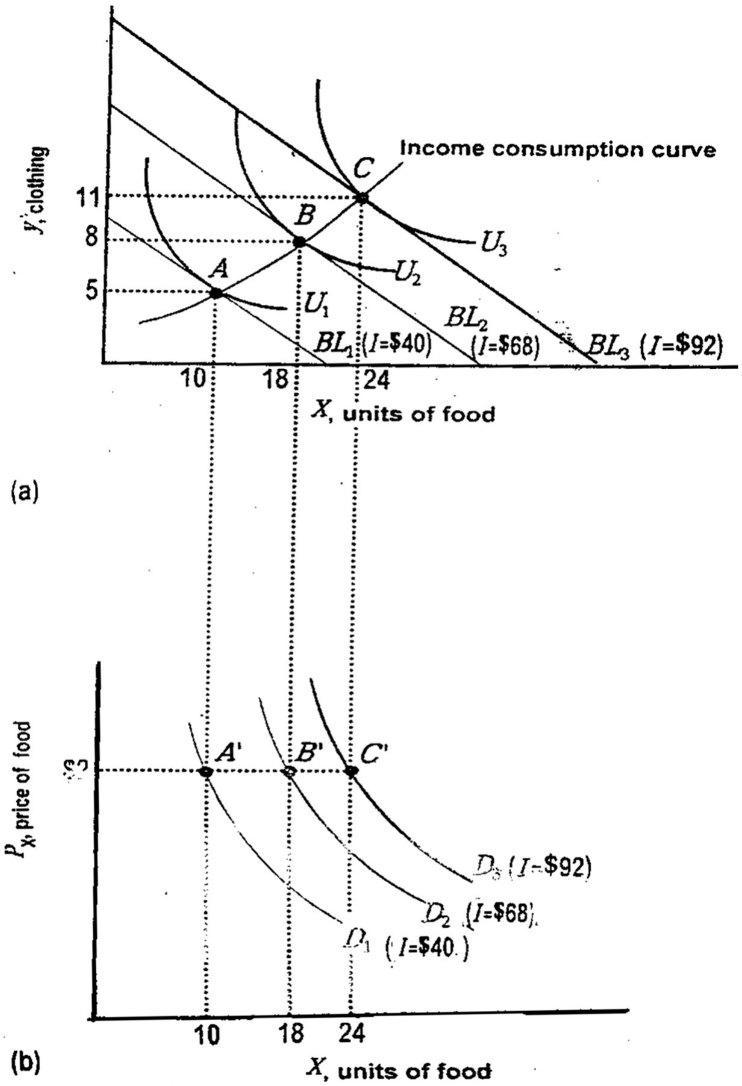
One way we can describe how changes in income affect the consumer's purchases is by drawing a curve that connects all the baskets that are optimal as income changes (keeping prices constant). this curve is called the income consumption curve. In Figure. 2 (a), the optimal baskets A, B, and C lie on the income consumption curve.

Changing Income: Shifting a Demand Curve

In Figure 2. (a) the consumer purchases more of both goods as her income rises. In other words, an increase in income results in a rightward shift in her demand curve for each good.

In Figure. 2 (b) we illustrate this by seeing how a change in income affects her demand curve for food. The price of food (held constant at \$2) appears on the vertical axis, and the quantity of food on the horizontal axis. When the consumer's weekly income is \$40, she buys 10 units of food each week, corresponding to point A on demand curve D_1 in Figure. 2 (b). If her income rises to \$68, she buys 18 units of food, corresponding to point B on demand curve D_2. Finally, if her income rises to \$92, she buys 24 units of food, corresponding to point C on demand curve D_3.

Using a similar approach, you can also show the demand curve for clothing shift as income changes (see Problem 1, at the end of this chapter).



(a) Figure 2 the effects of changes in income on consumption

The consumer buys food at P_x = $2 per unit clothing at P_y = $4 per unit. Both prices are held constant as income varies.

(b) Optimal choice diagram. The budget lines reflect three different levels of income. The slope of budget lines is P_x / P_y = $-1/2$. BL_1 is the budget line when the weekly income is $40 BL_1 and BL_2 are the budget lines when income is $68 and $92, respectively. We can draw a curve connecting the baskets that are optimal (A, B, and C) as income changes. This curve is called the income consumption curve.

The Effects of Changes in Price or Income an Algebraic Approach

So far, in this chapter, we have used a graphical approach to show how the amount of a good consumed depends on the levels of prices and income. We have shown how to find the shape of the demand curve when the consumer has a given level of income (as in Figure 1), and how the demand curve shifts as the level of income changes (as in Figure 2).

We can also describe the demand curve algebraically. In other words, given a utility function and a budget constraint, we can find the equation of the − consumer's demand curve. The next two exercises illustrate this algebraic approach.

Finding a Demand Curve (No Corner Points)

A consumer purchases two goods, food and clothing. The utility function is U (x,y) = xy, where x denotes the amount of food consumed and y the amount of clothing. The marginal utilities are MU_x = y and MU_y = x the price of food is P_x, the price of clothing is P_y, and income is I.

Problem

(a) show that the equation for the demand curve for food is x = I1 $(2P_x)$.

(b) is food a normal good? Draw D_1, the consumer's demand curve for food when the level of income is I = \$120. Draw D_2 the demand curve when I = \$200.

Solution

(a) in learning by Doing Exercise 3, we learned that the indifference curves for the utility function U(x,y) = xy are bowed in toward the origin and do not intersect the axes. So any optimal basket must be interior that is, the consumer buys positive amounts of both food and clothing.

How do we determine the optimal choice of food? We know that an interior optimum must satisfy two conditions:

An optimal basket will be on the budget line. This means that equation (4.1) must hold: $P_x x + P_y y$ = I .

Since the optimum is interior, the tangency condition equation (4.3) must also hold: $MU_x/MU_y = P_x/P_y$, or with the marginal utilities given y/x = P_x/P_y, or y = (P_x/P_y)X.

We can now solve for X by substituting y = $(P_x/P_y)X$ into the equation for the budget line $P_x x + P_y y$ = I this gives us:

$$P_x x + P_y y \left(\frac{P_x}{P_y}\right) = I$$

$$\text{Or } x = I/(2P_x)$$

This is the equation of the demand curve for food. Given the consumer's income and the price of food, we can easily find the quantity of food the consumer will purchase.

(a) if income is $\$120$, the equation of the demand curve for food D_1 will be X = $120/{=}(2P_x)$ = $60/P_x$ we can plot points on the demand curve, as we have done in Figure.5.

An increase in income to $\$200$ shifts the demand curve rightward to D_2, with the equation x − $200/\ (2P_x)$ = $100/P_x$. Thus, food is a normal good.

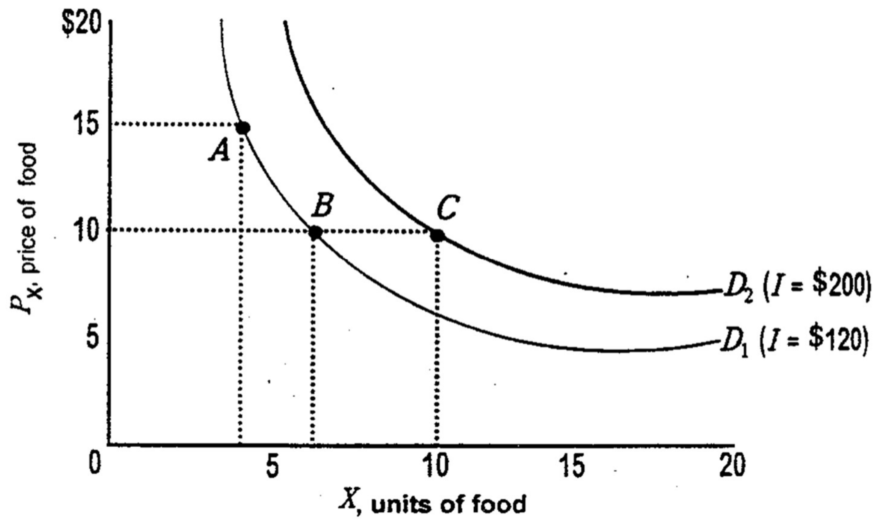


Figure 5 demand curve for food at different income levels

The quantity of food demanded x, depends on the price of food, P_x and on the level of income. I. the equation representing the demand for food is x = I ($2P_x$). When income is $120, the demand curve is D_1 in the graph. Thus if the price of food is %15. The consumer buyer 4 units of food (point A). if the price of food drops to $10. She buyer 6 units of food (point B). if income rises to $200. The demand curve shifts to the right, to D_2. In this case, if the price of food is $10, the consumer buys 10 units of food (point C).

Similar Problems 5 and 7.

The solution to part (a) of this exercise starts out looking very much like the solution to learning–By–Doing Exercise 4.2, where we were interested in finding the optimal consumption of food and clothing given a specific set of prices and level of income. Learning By–Doing Exercise 2, however, goes farther. By using the exogenous variables (P_x, P_y and I) instead of actual numbers, we find the equation of the demand curve, which lets us determine the quantity of food demanded for any price and income.

Finding a Demand Curve (With a Corner Point Solution)

A consumer purchases two goods, food and clothing. He has the utility function $U(x,y) = x\,y + 10x$, where x denotes the amount of food consumed and y the amount of clothing. The marginal utilities are $MU_x = y + 10$ and $MU_y = x$. The consumer's income is $100, and the price of food is $1. The price of clothing is P_y

Problem: Show that the equation for the consumer's demand curve for clothing is

$$y = \frac{100-10P}{2P} \text{ when } P_y < 10$$

$$y = 0, \text{ when } P_y \geq 10$$

Use this equation to fill in the following Table to show how much clothing he will purchase at each price of clothing (these are points on his demand curve):

P_y	2	4	5	10	12
y					

Solution: In learning by doing exercise. 3, we learned that the indifference curves for the utility function U (x , y) = xy + 10x are bowed in toward the origin. They also intersect the x axis, since the consumer could have a positive level of utility with purchases of food (x > 0) but no purchases of clothing (y = 0). So he might not buy any clothing (I.e., choose a corner point) if the price of clothing is too high.

How do we determine the consumer's optimal choice of clothing? If he is at an interior optimum, we know that this optimal basket will be the budget line. This means that equation (4.1) must hold with the price of x and income given: $x + P_y y = 100$. At an interior optimum, the tangency condition as expressed in equation (4,4) must also hold : $MU_x / MU_y = P_x/P_y$ or with the marginal utilities given, $(y + 10)/x = 1/P_y$, or more simply, $X = P_y y + 10\ P_y$.

We can now solve for y by substituting $x = P_y y + 10P_y$ into the equation for the budget line x + Pyy = 100. This gives us $2P_y y + 10P_y = 100$, or $y = (100 - 10P_y) / (2P_y)$. Note that the value of this equation for the consumer's demand curve for clothing is positive when $P_y < 10$. But if $P_y \geq 10$, then $100 - 10P_y$ is zero or negative, and the consumer will demand no clothing (in effect, $y = 0$ when $P_y \geq 10$, since the consumer can't demand negative amounts of clothing). In other words, when $P_y \geq 10$ the consumer will be at a corner point at which he buys only food.

Using the equation for the demand curve, we can complete the Table as follows:

Py	Py	2	4	5	10	12
y	y	20	7.5	5	0	0

Similar problem 1.4

In the previous section, we analyzed the overall effect of a change in the price of a good. Here, we refine our analysis by breaking this effect down into two components − a substitution effect and an income effect:

- When the price of a good falls, good becomes cheaper relative to other goods. Conversely, a rise in price makes the good more expensive relative to other goods. In either case,

The consumer experiences the substitution effect−− the change in the quantity of the good the consumer would purchase after the price change to achieve the same level of utility. For example, if the price of food falls, the consumer can achieve the same level of utility by substituting food for other goods (I.e., by buying more food and less of other goods); similarly, if the price of food rises, the consumer may substitute other goods for food to achieve the same level of utility.

- When the price of a good falls, the consumer's purchasing power increases, since the consumer can now buy the same basket of goods as before the price decrease and still have money left over to buy more goods. Conversely, a rise in price decreases the consumer's purchasing power (I.e., the consumer can no longer afford to buy the same basket of goods). This change in purchasing power is termed the income effect because it affects the consumer in much the same way as a change in income would; that is, the consumer realizes a higher or lower level of utility because of the increase or decrease in purchasing power and therefore purchases a higher or lower amount of the good whose price has changed the income effect accounts for the part of the total difference in the quantity of the good purchased that isn't accounted for by the substitution effect.

2- Change in the price of a good: substitution effect and income effect.

The substitution effect and the income effect occur at the same time when the price of a good changes, resulting in an overall movement of the consumer from an initial basket (before the price change) to a filial basket (after the price change). To better understand this overall effect of a price change, we will show how to break it down (de-compose it) into its two components-the substitution effect and the income effect.

In the following sections, we perform this analysis in relation to price decreases. (Learning-By-Doing Exercise, shows a corresponding analysis in relation to a price increase).

The Substitution Effect

Suppose that a consumer buys two goods, food and clothing, that both goods have a positive marginal utility, and that the price of food decreases. The substitution effect is the amount of additional food the consumer would buy to achieve the same level of utility. Figure 6 shows three optimal choice diagrams that illustrate the steps involved in finding the substitution effect associated with this price change.

Step1 Find the initial basket (the basket the consumer chooses at the initial priceP_{x_1}) as shown in Figure. 6 (a), when the price of food is P_{x_1} the consumer faces budget line BL_1 and maximizes utility by choosing basket A on indifference curve U_1. The quantity of food she purchases is x A.

Step 2. Find the final basket (the basket the consumer chooses after the price falls to P_{x_2}). As shown in Figure 6 (b), when the price of food falls to P_{x_2} the budget line rotates outward to BL_2, and the consumer maximizes utility by choosing basket C on indifference curve U_2. The quantity of food she purchases is XC. Thus, the overall effect of the price change on the quantity of food purchased is X C − X A . predictably, the consumer realizes a higher level of utility as a result of the price decrease, as shown by the fact that the initial basket A lies inside the new budget line BL_2

Step 3 Find an intermediate decomposition basket that will enable us to identify the portion of the change in quantity due to the substitution effect. We can find this basket by keeping two things in mind. First, the decomposition basket reflects the price decrease, so it must lie on a budget line that is parallel to BL_2. Second, the decomposition basket reflects the assumption that the consumer achieves the initial level of utility after the price decrease, so the basket must be at the point where the budget line is tangent to indifference curve U_1. As shown in Figure 6 (C). These two conditions are fulfilled by basket BL_d (the decomposition budget line). At basket B, the consumer purchases the quantity of food X B. Thus , the substitution effect accounts for the consumer's movement from basket A to basket B that is , the portion of the overall effect on the quantity of food purchased that can be attributed to the substitution effect is XB − XA

The Income Effect

Still looking at Figure 6, suppose the consumer has income I. When the price of food is P_{x_1}, she can buy any basket on BL_1, and when the price of food is P_{x_2}, she can buy any basket on BL_2. Note that the decomposition budget line BL_d. Lies inside BL_2., which means that the income I_d that would be needed to buy a basket on BL_d. is less

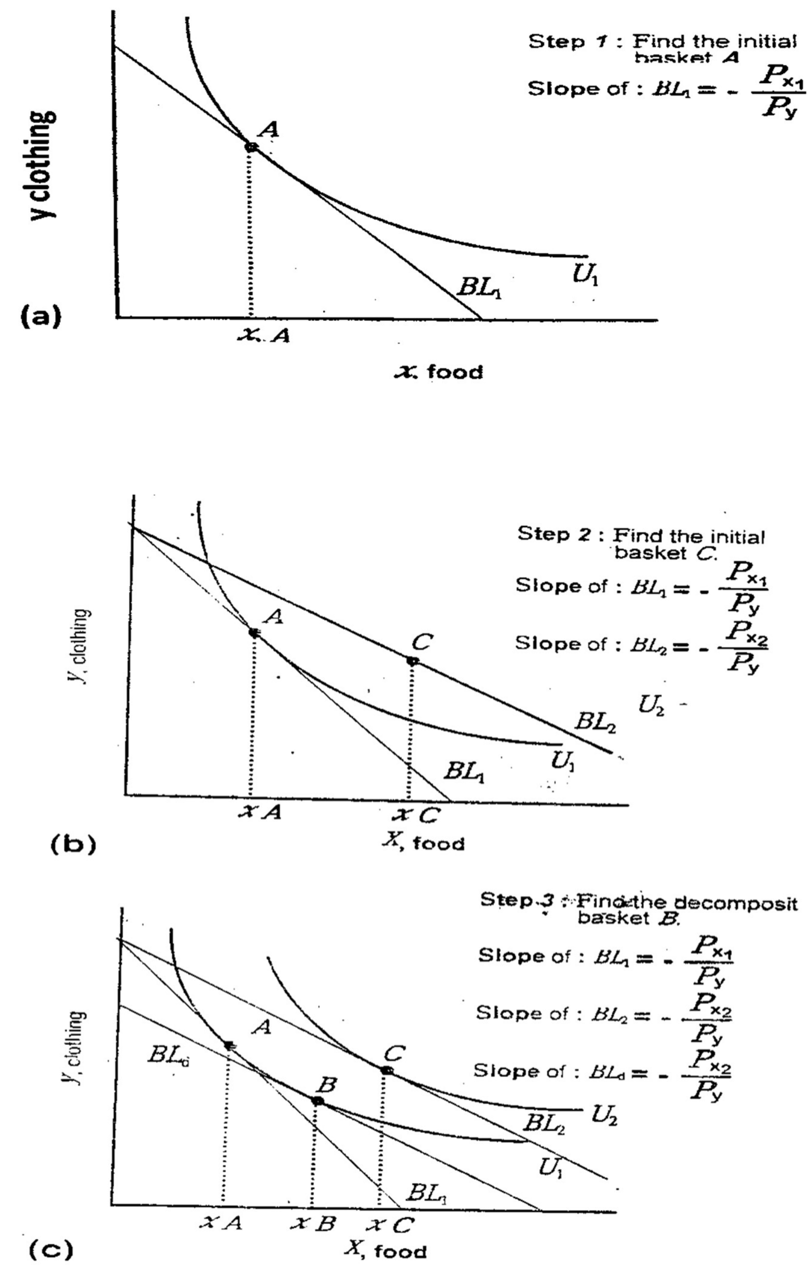


Figure 6 income and substitution effects. Case 1 (X is a Normal Good)

As the price of food drops from P_{x_1}, to P_{x_2}, the substitution effect leads to an increase in the amount of food consumed from X_A to X_B (so the substitution effect is $X_B - X_A$). The income effect also leads to an increase in food consumption, from X_B to X_c (so the income effect is $X_c - X_B$). The overall increase in food consumption is $X_c - X_A$. When a good is normal, the income and substitution effects reinforced each other.

Change in the Price of a Good Substitution Effect and Income Effect

Than the income I needed to buy a basket on BL_2. Also note that basket A (on BL_1) and basket B (on BL_d) are on the same indifference curve U_1 (I.e., the consumer would be equally satisfied by baskets A and B), which means that the consumer would be indifferent between the following two situations: (1) having a higher income I when the price of food is higher at P_{X_1} (I.e., buying basket A) and (2) having a lower income I_d when the price of food is lower at P_{X_2} (I.e., buying basket B). Another way of saying this is that the consumer would be willing to have her income reduced to Id if she can buy food at the lower price P_{X_2}.

With this in mind, let's find the income effect, the change in the amount of a good consumed as the consumer's utility changes. In the example illustrated by Figure 6, the movement from basket A to basket B (I.e., the movement due to the substitution effect) doesn't involve any change in utility, and as we have just seen, we can view this movement as the result of a reduction in income from I to I_d as the price falls from P_{X_1} to P_{X_2}. In reality, however, the consumer's income doesn't fall when the price of food decreases, so her level of utility increases, and we account for this by "restoring" the "lost" income. When we do this, the budget line shifts from BL_d to BL_2, and the consumer's optimal basket shifts from basket B (on BL_2) to basket C (on BL_2) . thus, the income effect accounts for the consumer's movement from the decomposition basket B to the final basket C –that is , the portion of the overall effect on the quantity of food purchased that can be attributed to the income effect is $X_C - X_B$.

In sum, when the price of food falls from P_{X_1} to P_{X_2} the total change on food consumption is $(X_C - X_A)$. This can be decomposed into the substitution effect $(X_B - X_A)$ and the income effect $(X_C - X_B)$. When we add the substitution effect and the income effect, we get the total change in consumption.

Income and Substitution Effects When Goods Are Not Normal

As we noted earlier, the graphs in Figure. 6 are drawn for the case (we call it Case 1) in which food is a normal good. As the price of food falls, the income effect leads to an increase in food consumption. Also, because the marginal rate of substitution is diminishing, the substitution effect leads to increased food consumption as well. Thus, the income and substitution effects work in the same direction. The demand curve for food will be downward sloping because the quantity of food purchased will increase when the price of food falls. (Similarly, if the price of food were to rise, both effects would be negative. At a higher price of food, the consumer would buy less food.)

However, the income and substitution effects do not always work in the same direction. Consider Case 2, in Figure.7 (instead of drawing three graphs like those in Figure. 6, we have only drawn the final graph like Figure 6 (c)] with the initial, final, and decomposition baskets). Note that basket C, the final basket, lies directly above basket B, the decomposition basket. As the budget line shifts out from BL_d to BL_2, the quantity of food consumed does not change. The income effect is therefore zero $(X_C - X_B = 0)$. Here a decrease in the price of food leads to a positive substitution effect on food consumption $(X_B - X_A > 0)$ and a zero income effect. The demand curve for food will still be downward sloping because more food is purchased at the lower price $(X_C - X_A > 0)$.

The income and substitution effects might even work in opposite directions, as in Case 3, in Figure 8, where food is an inferior good. When a good is inferior, the indifference curves will show that the income effect is negative (I.e., the final basket C will be to the left of the decomposition basket B); as the budget line shifts out from BL_d to BL_2, the quantity of food consumed decreases ($X_C - X_B < 0$).

In contrast, the substitution effect is still positive ($X_B - X_A > 0$) in this case, because the substitution effect is larger than the income effect, the total change in the quantity of food consumed is also still positive ($X_C - X_A > 0$), and therefore, the demand curve for food will still be downward sloping.

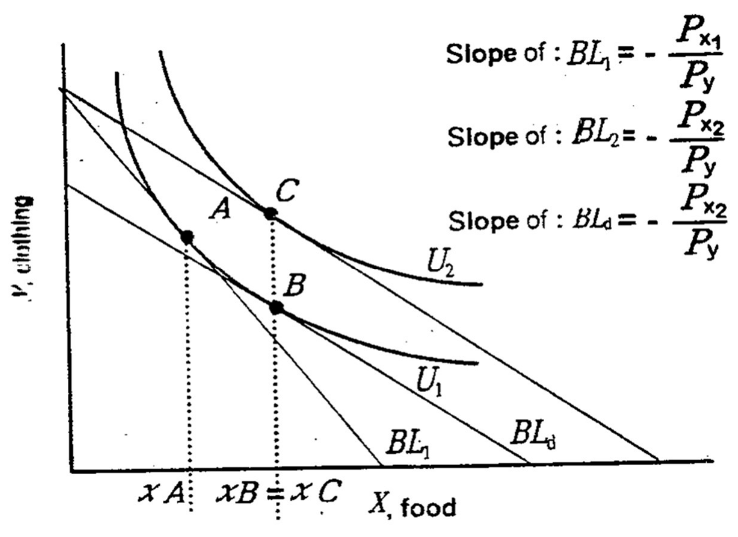


Figure 7 income and substitution effects. Case 2 (X is neither a Normal Good nor an inferior Good))

As the price of food drops from P_{x_1}, to P_{x_2}, the substitution effect leads to an increase in the amount of food consumed from X_A to X_B (so the substitution effect is $X_B - X_A$). The income effect on food consumption is zero because , X_B is the same as X_c (so the income effect is $X_c - X_B = 0$). The overall effect on food consumption is $X_c - X_A$.

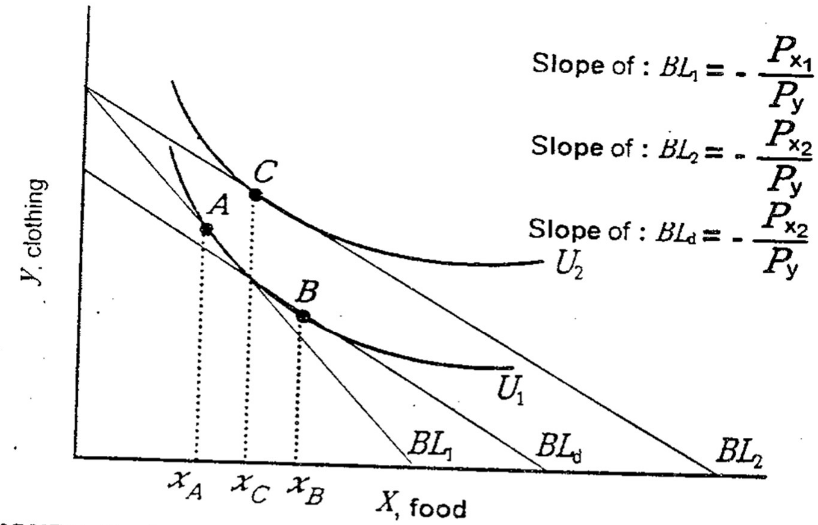
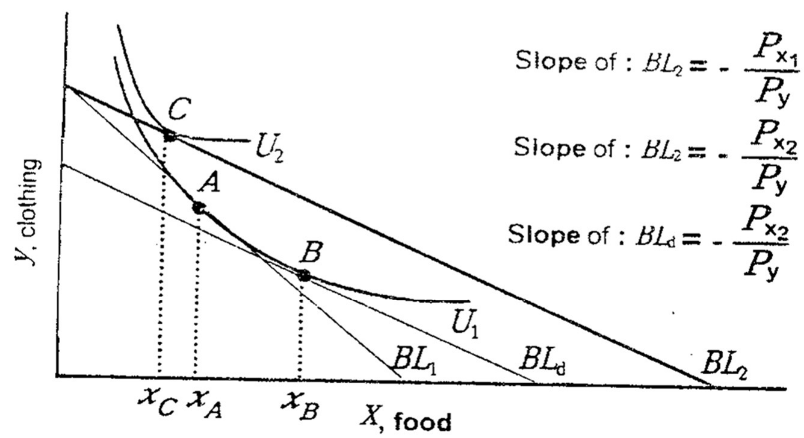


FIGURE. 8 Income and Substitution Effects: Case 3 (x Is an Inferior Good) with a Downward-Sloping Demand Curve

As the price of food drops from P_{x1}, to P_{x2}, the substitution effect leads to an increase in the amount of food consumed from x_A to x_B (so the substitution effect is The income effect on food consumption is negative ($x_C - x_B < 0$). The overall effect on food consumption is $x_C - x_A > 0$. When a good is inferior. the income and substitution effects work in opposite directions.



Income and Substitution Effects: Case 4 (x Is a Giffen Good)

As the price of food drops from P_{x1}, to P_{x2}, the substitution effect leads to an increase in the amount of food consumed from x_A to x_B (so the substitution effect is The income effect on food consumption is negative ($x_C - x_B < 0$). The overall effect on food consumption is $x_C - x_A > 0$.

Case 4, in Figure. 9, illustrates the case of a so-called Giffen good. In this case, the indifference curves indicate that food is a strongly inferior good, with the final basket C lying not only to the left of the decomposition basket B, but also to the left of the initial basket A. The income effect is so strongly negative that it more than cancels out the positive substitution effect.

What about the demand curve for food in the case illustrated by Figure 5. 9? When the price of food drops from P_{X_1} to P_{x_2}, the quantity of food actually decreases from X_A to X_C, so the demand curve for food will be upward sloping over that range of prices. A Giffen good has a demand curve with a positive slope over part of the curve.

As we have already noted, some goods are inferior over some price ranges for some consumers. For instance, your consumption of hot dogs may fall if your income rises, if you decide to eat more steaks and fewer hot dogs.

But expenditures on inferior goods typically represent only a small part of a consumer's income. Income effects for individual goods are usually not large, and the largest income effects are usually associated with goods that are normal rather than inferior, such as food and housing, for an inferior good to have an income effect large enough to offset the substitution effect, the income elasticity of demand would have to be negative and the expenditures on the good would need to represent a large part of the consumer's budget , thus, while the Giffen good is intriguing, it is not of much practical concern.

While researchers have not yet found data that confirm the existence of a Giffen good for human beings, some economists have suggested that the Irish potato famine (see Applications. 2) came close to creating the right environment. However, as Joel Mokyr observed, for people with a very low income, potatoes might have well been a normal good. But consumers with higher levels of income could afford other types of food, and therefore consumed fewer potatoes. Thus, while expenditures on potatoes did constitute a large part of consumer expenditures, potatoes may not have been inferior at low incomes. This may explain why researchers have not shown the potato to have been a Giffen good at that time.

Finding Income and Substitution Effects Algebraically

In learning By Doing exercises. We met a consumer who purchases two goods food and clothing. He has the utility function U((x,y) − xy, where x denotes the amount of food consumed and y the amount of clothing. His marginal utilities are MU_X = y and MU_y = x. Now suppose that he has an income of $72 per week and that the price of clothing is

P_y = \$1 per unit. Suppose that the price of food is initially P_{X_1} -- \$9 per unit, and that the price subsequently falls to P_{X_2} = \$4 per unit.

Change in The Price of a Good: Substitution Effect and Income Effect solution

To find the income and substitution effects, we follow the procedure explained earlier in this section.

Step 1. Find the initial consumption basket A when the price of food is \$9. We know that two conditions must be satisfied at an optimum. First, an optimal basket will be on the budget line. This means that P_{X_x} + P_{X_y} = I, or with the given information, 9 x + y = 72.

Second, since the optimum is interior the tangency condition must hold. From equation (4.3), we know that at a tangency, $MU_X / MU_y = P_X \ / \ P_y$, which with the given information simplifies to y = 9x.

When we solve these two equations with two unknowns, we find that x = 4 and y = 36. So at basket A the consumer purchases 4 units of food and 36 units of clothing each week.

Step 2. Find the final consumption basket C when the price of food is $4. We repeat step 1, but now with price of a unit of food of $4, which again yields two equations with two unknowns:

4x + y = 72 (coming from the budget line) y = 4x (coming from the tangency condition)

When we solve these two equations, we find that X = 9 and y = 36. So at basket C, the consumer purchases 9 units of food and 36 units of clothing each week.

Step 3. Find the decomposition basket B. The decomposition basket must satisfy two conditions. First, it must lie on the original indifference curve U_1 along with basket A. recall that this consumer's utility function is U(X,y) = y, so at basket A, utility U_1 = 4(36) = 144. At basket B the amounts of food and clothing must also satisfy xy = 144. Second, the decomposition basket must be at the point where the decomposition budget line is tangent to the indifference curve. Remember that the price of food P_X on the decomposition budget line is the final price of $4. The tangency occurs when MU_x / MU_y = P_X / P_y that is, when y/x = 4/1, or y = 4x. When we solve the two equations $Xy = 144$ and $y = 4x$, we find that, at the decomposition basket, $x = 6$ units of food and $y = 24$ units of clothing.

Now we can find the income and substitution effects. The substitution effect is the increase in food purchased as the consumer moves along initial indifference curve U_1 from basket A (At which he purchases 4 units of food) to basket B (at which he purchases 6 units of food) the substitution effect is therefore $6 - 4 = 2$ unit of food.

The income effect is the increase in food purchased as he moves from basket B at which he purchases 6 units of food) to basket C (at which he purchases 9 units of food,). The income effect is therefore $9 - 6 = 3$ unit of food.

Figure, 10 graphs the income and substitution effects. In this exercise food is a normal good. As expected, the income and substitution effects have the same sign. The consumer's demand curve for food downward sloping because the quantity of food he purchases increases when the price of food falls.

Exercises

Chapter Two

1)

Suppose the utility function is $U = XY$ and consumer income $I = 1000$ suppose also $Px1 = 50$ $PY = 10$

a- Find the optimal combination from X and Y by algebraically and graphically

b- suppose the X price is decrease from $Px1 = 50$ to $Px2 = 12.5$

1- find the optimal combination from X and Y

2- find by algebraically and graphically approach the substitute effect and income effect.

2)

Suzie purchases two goods, food and clothing. she has the utility function $U(X,Y) = XY$, where X denotes the amount of food consumed and Y the amount of clothing

Show that the equation for her demand curve for clothing $Y = \frac{1}{2Py}$

- Is clothing a normal good? Draw her demand curve for clothing when the level of income is $I = 200$ label this demand curve D1. Draw the demand curve when $I = 300$ and label this demand curve D2.

-What can be said about the cross price elasticity of demand of food with respect to the price to clothing?

3)

Rick purchase two goods food (X) and clothing (Y). he has utility function U = Xy.

(a) Calculate his optimal basket when Px = 4 and Py = 1

(b) Calculate his income and substitution effects of decrease in the price of food to Px = 3.

For Chapter (Two)

1- Suppose available the following information about perfect competition industry for you.

$$Q_d = 280 - P$$

$$Q_s = 40 + 4P$$

Suppose also the total cost is.

$$TC = 100 + 16Q + 2Q^2$$

Required

1- Calculate price and quantity at industry level.

2- Write the supply function for the individual firm.

3- Calculate the number firms which services in the market.

4- Calculate the profit or loss for the individual firm at the short run present by graphically.

Answer

1− Setting demand and supply function equal.

$$280 - P = 40 + 4P$$

$$5P = 240$$

$$P = \frac{240}{5} \quad 48$$

Then

$$Q = 280 - 48 = 232$$

$$Q = 40 + 4\,(48) = 232$$

2− by setting the P = Mc we can get the supply function for the firm

$$P = Mc$$

$$P = 16 + 4P$$

$$40 = P - 16$$

$$Q_r = \frac{1}{4}\,(P) - 4$$

$$Q_r = \frac{1}{4}\,(48) - 4 = 8$$

3− now we can compute the number of firms which service in the market as follow.

$$nf = \frac{total\ production\ at\ industry\ level}{Optimal\ production\ \ at\ individual\ firm}$$

$$nf = \frac{232}{8} = 29$$

4− $\pi = total\ reenue - total\ cost$

$$\pi = (8 \times 48) - (96 + (16 \times 8) + 2(8)^2$$

$$= 384 - (96 + 128 + 128) =$$

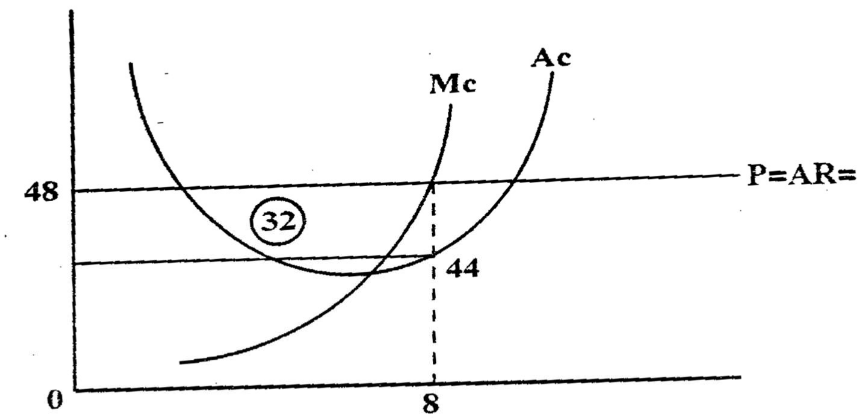
$$\pi = 384 - 352$$

Or $\pi = P - Ac$

$$= \frac{96 + 16Q + 2Q^2}{Q}$$

$$= 48 - (44) = 4$$

$$= 4 \times 8 = 32$$



you

$$Q_d = 420 - 2P$$

$$Q_s = 120 - 3P$$

Suppose also the total cost function is

TC = $96 + 12Q + 2Q^2$

Required

1- Determine the price and quantity at industry level.

2- Write the individual firm supply function

3- Determine the optimal product for individual firm

4- Determine the number of firm which are service in the market.

5- Calculate the profit or loss for individual firm by graphically

3- suppose the following information about perfect competition industry for you

$$Q_d = 280 - P$$

$$Q_s = 80 + 4P$$

Suppose also the total cost function is

$$TC = 3200 + 8Q + Q^2$$

Required

1- Determine the price and quantity at industry level.

2- Write the individual firm supply function

3- Calculate the number of firm which are services

4- Calculate the profit or loss for individual firm by graphically

Exercises

Chapter two

The theory of consumer behavior

Part A: True- false Questions

Circle whether the following statements are true (T) or false (F)

1- Utility of every addition unit is called marginal utility.

2- When total utility reach at maximum marginal utility becomes positive.

3- The law of diminishing marginal utility states that the consumer consumes more of a commodity the utility of every additional unit (MU) consumed diminishes

4- A higher in difference cure represent a higher level of satisfaction

5- Indifference curve s are convex to the origin

6- MU = TUn + TUn -1

7- Price effect is equal to income effect

8- Utility mean want satisfying power of a commodity

10- A change in total utility resulting from a one – unit change in the consumption of a commodity at particular point of time is called marginal utility

11- Total utility is the sum of marginal utility

12- The magnitude of the slope of an indifference curve is the marginal rate of substitution

13- A consumption point inside the budget line is possible to afford but has some unspent income

Part B multiple choice questions

Circle the appropriate answer

1- Marginal utility measures

a- the total utility of all your consumption

b- the total utility divided by the price of the good

c- the increase in utility from consuming one additional unit

d- none of the above

2- A curve showing all the output combinations that yield the same level of satisfaction is called

a- an indifference curve b- a supply curve

c- a cost curve d- an isoquant curve

3- Normally a price change moves an individual to a new indifference curve at the new prices, the amount of income necessary to move the individual to the old level of utility is called

a- an equivalent variation b- a slutsky variation

c- Marshallian consumer surplus d- a compensating variation

4- When comparing equivalent and compensating variation, we know that

a- the two figure will be the same

b- equivalent variation will be greater

c- compensating variation will be greater

d- none of the above

5- MU is equal to:

a- TUn + TUn-1 b- TUn – Tun-1

c- TUn – Tun+1 d- TUn +TUn+1

6- As the consumer consumes more of a commodity, the utility of every additional unit (MU) consumed diminishes this is

a- law of diminishing marginal utility

b- equi-diminishing marginal utility

c- indifference curve theory

d- revealed preference theory

7- The condition for equilibrium of the consumer is

a- Mux/Px = Muy/Py b- Mux/ Muy = Py /Px

c- a & b d- Mux = Muy

8- What are true for indifference curves?

a- indifference curves slope downward to the right

b- indifference curves are convex to the origin

c- A higher indifference curves represent a higher level of satisfaction

d- all of the above are correct

9- The convexity of indifference curves is due to

a- diminishing MRS

b- increasing MRs

c- constant MRs

d- none

10- The slope of indifference curve is known as

a- marginal rate of substitution   b- marginal utility

c- elasticity of substitution   d- none

11- In indifference curve analysis, the consumer will be in equilibrium when

a- A given budget line must be tangent to an indifference curve

b- the indifference curve must be convex to the origin at the point of tangency

c- a & b

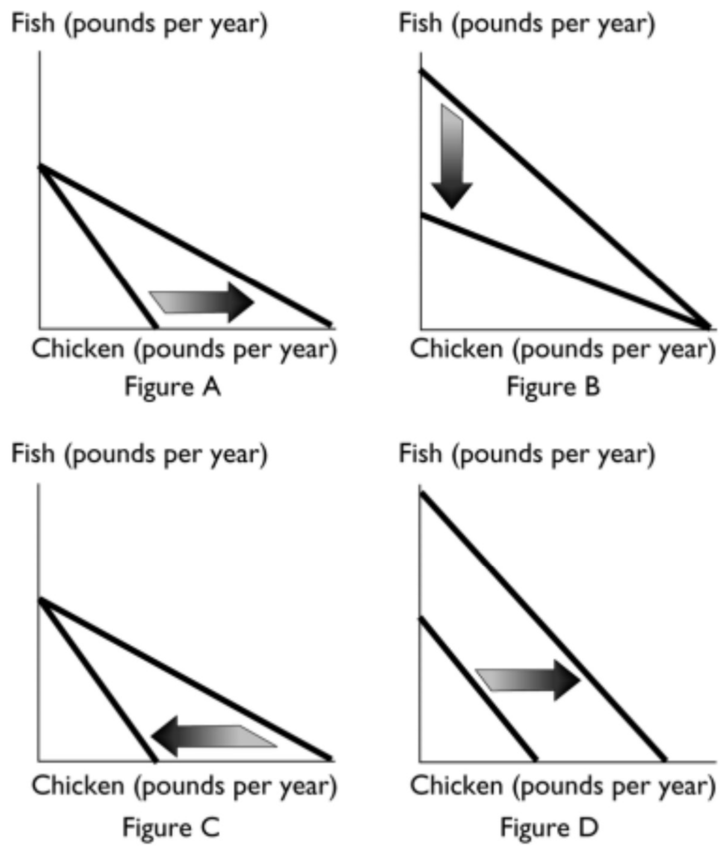
d- none of the above

12- Price effect is equal to

a- substitution effect   b- income effect

c- a + b   d- a – b

According to the following figure answer the questions of (13) to (16)



13- In the above figure, which one reflects an increase in the price of chicken?

a- figure a b- figure B c- figure C d- figure D

14- In the above figure, which one reflects a decrease in the price of chicken?

a- figure A b- figure B c- figure C d- figure D

15- In the above figure, which one reflects an increase in the consumer's income?

a- figure A b- figure B c- figure C d- figure D

16- In the above figure, which one reflects an increase in the price of fish?

a- figure a   b- figure B   c- figure C   d- figure D

17- Moving along an indifference curve the

a- consumer prefers some of the consumption points to others

b- marginal rate of substitution for good increases as more of the good is consumed

c- marginal rate of substitution is constant

d- consumer does not prefer one consumption point to another

18- The marginal rate of substitution of one good for another is measured by moving

a- among different indifference curve

b- along a budget line,

c- among different budget lines

d- along an indifference curve

19- Suppose a consumer has $100 to spend on two goods shoes and shirts, if the price of a pair of shoes is $20 per pair and the price of a shirt is $15 each, which of the following combination is unaffordable to the consumer?

a- 0 pair of shoes and 0 shirts

b- 2 pair of shoes and 4 shirts

c- 5 pair of shoes and 0 shirts

d- 0 pair of shoes and 7 shirts

20- Which of the following describes what happens to a consumer's budget line if that consumer's budget increases? The budget line

a- become steeper

b- shifts farther away from the origin of the graph

c- does not change

d- becomes more horizontal

Problem

Problem 1

Suppose the $Px1 = 50$ $Py = 10$ $I = 1000$

<u>required</u>

1- Calculate the optimal combination from (X) and (Y) with graphic

2- Suppose the price of (X) reducing to $Px2 = 12.5$ calculate the optimal combination from (X) and (Y) with graphic

3- Calculate the substitution effect and income effect

4- Calculate the equivalent variation and compensation variation with graphic

Problem 2

Suppose the $Px1 = 16$ $Py = 2$ $I = 128$

<u>required</u>

1- Calculate the optimal combination from (X) and (Y) with graphic

2- Suppose the price of (X) reducing to $Px2 = 4$ calculate the optimal combination from (X) and (Y) with graphic

3- Calculate the substitution effect and income effect

4- Calculate the equivalent variation and compensation variation with graphic.

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Chapter Three

Short–Run Costs and Output Decisions

Chapter Three

Short-Run Costs and Output Decisions

That main goal of this chapter is to understand

- Costs in the short run.

- The relationship between average total cost and marginal cost.

- Fixed costs.

- Total variable cost.

- Average variable cost.

- The relationship between average cost and marginal cost.

- Exercises

Chapter Three

Short run costs and output decisions

This chapter continues our examination of the decisions that lie behind competitive supply and demand curve. You have seen that firms in perfectly competitive industries make three very specific decisions. (See Figure 1.) These decisions are

1- How much output to supply

2 How to produce that output (that is, which production technique to use); and

3- What quantity of each input to demand

Remember though that all types of firms make these decisions. We continue to use perfectly competitive firms as a teaching device, but much of the material in this chapter applies to firms in noncompetitive industries as well.

We have assumed so far that firms are in business to earn profits and that they make choices in order to maximize those profits. remember that profit is the difference between revenues and costs). Because firms in perfectly competitive makers are price takers in both input and output markets, many decisions depend upon prices over which firm have no control. Like households, firms also face market constraints.

Decisions	Information
1- the quantity of output to supply	1- the price of inputs*
2- how to produce that output (which technique to use	2- techniques of production available*
The quantity of each input to demand	3-The price of output
	*determines production costs

This chapter focuses on costs of production. To calculate costs, a firm must know two things: the quantity and combination of input it needs to produce its product and how much those inputs cost. as we begin to examine how technology and input prices determine costs, we focus first on input markets. By the end of the chapter, we will have enough information to Figure out how much of its product a firm is likely to supply (that is, how much output to produce) at each possible price. In other words, we will have derived the supply curve of a competitive firm in the short run.

Costs in The Short Run

Our emphasis in chapter is on costs in the short run only. You have seen that the short run is that period during which two conditions hold (1) Existing firms face limits imposed by some fixed factor of production and (2) new firms cannot enter and existing firms cannot exist, an industry.in the short run, all firms (competitive and noncompetitive) have costs that they must bear regardless of their output. Some costs, in fact, must be paid even if the firm stops producing (that is, even if output is zero). These kinds of costs are called fixed costs, and the important thing to remember about them is that firms can do nothing in the short run to avoid them or to change them. In the long run, a firm has no fixed costs, because it can change its scale of operation or exit the industry.

Firms do have certain costs in the short run that depend on the level of output they have chosen. these kinds of costs are called variable costs. Fixed costs and variable costs together make up total costs:

$$\boxed{TC = TFC + TVC}$$

Where TC denotes total costs, TFC denotes total fixed costs, and TVC denotes total variable costs.

Fixed Costs

Total Fixed cost (TFC) the total of all fixed costs is sometimes referred to as overhead. If you operate a factory, you must heat the building to keep the pipes from freezing in the winter.

Even if no production is taking place, you may have to keep the roof from leaking, pay a guard to protect the building from vandals, and make payments on a long-term lease. There may also be insurance premiums, taxes, and city fees to pay, as well as contract obligations to workers.

Fixed costs represent a larger portion of total costs for some firms than for others. Electric companies, for instance, maintain generating plants, thousands of miles of distribution wires, poles, transformers, and so forth usually, such plants are financed by issuing bonds to the public (that is, by borrowing). The interest that must be paid on these bonds represents a substantial part of the utilities operating cost and is a fixed cost in the short run, no matter how much, if any, electricity is being produced

For the purposes of our discussion in this chapter, we will assume that firms use only two inputs: labor and capital recall that capital is both produced and yields services over time in the production of other goods and services. It is the plant and equipment of a manufacturing firm; the computers, desks, chairs, doors, and walls of a law office; and the boat that bill and Colleen built on their desert island. It is sometimes assumed that capital is a fixed input in the short run and that labor is the only variable input. To be a bit more realistic, however, we will assume that capital has both a fixed and a variable component. After all, some capital can be purchased in the short run.

Consider a small consulting firm that employs several economists, research assistants, and secretaries. It rents space in an office building and has a five- year lease. The rent it pays on the office space can be thought of as a fixed cost in the short run. The monthly electrics and heating bills are also essentially fixed (although the amounts may vary slightly from month to month). So are the salaries of the basic administrative staff. Payments on some capital equipment-a large copying machine, for instance, and the main word processing system-can also be thought of as fixed.

The same firm also has costs that vary with output. When there is a lot of work, the firm hires more employees at both the professional and research assistant level. The capital used by the consulting firm may also vary, even in the short run. Payments on the computer system do not change, but the firm may rent additional computer time when necessary. It can buy additional personal computers and word processing terminals quickly, if need be. It must pay for the copy machine, but the machine costs more when it is running than when it is not.

Total fixed costs (TFC), then, are those costs that do not change with output, even if output is zero. Table 1 presents data on the fixed costs of a hypothetical firm. Fixed costs are $1000 at all levels of output. Figure2 a shows total fixed costs as a function of output. Since TFC does not change with output, the graph is simply a straight horizontal line at $1000. The important thing to remember here is that:

Firms have no control over fixed cost in the short run for this reason fixed costs are sometimes called sunk costs.

Average fixed cost (AFC) average fixed cost (AFC) is total fixed cost (TFC) divided by the number of units of output (q):

$$AFC = \frac{TFC}{q}$$

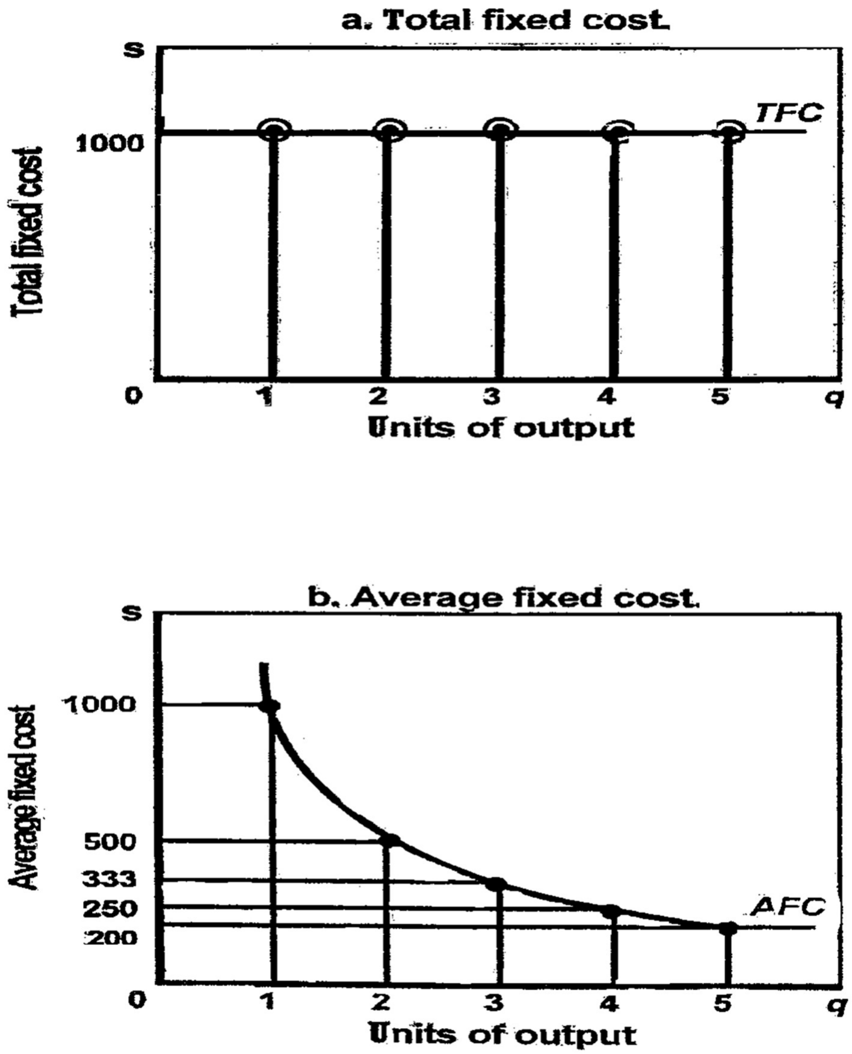


Figure 8.2

Short –run cost (total and average) of a Hypothetical Firm. Average fixed cost is simply total fixed cost divided by the quantity of output. As output increase, average fixed cost declines because we are dividing a fixed number ($1000) by a larger and larger quantity

For example, if the firm in Figure 2 produced three units of output, average fixed costs would be \$333 (\$1000 divided by three,). If the same firm produced five units of output, average fixed cost would be \$200 (\$1000 divided by five). Average fixed cost falls as output rises, because the same total is being spread over, or divided by, a larger number of units (see Table1) .this phenomenon is sometimes called spreading overhead.

Graphs of average fixed cost, like that in Figure 2b (which presents the average fixed cost data from Table 1), are downward- sloping curves. Notice that AFC approaches zero as the quantity of output increases. If output were 100,000 units, average fixed cost would equal only one cent per unit in our example of (\$1,000 ÷ 100,000 = \$.01). Of course, AFC approaches but never actually reaches zero.

Variable Costs

Total v**ariable cost (TVC)** total variable costs (TVC) are those costs that depend on, or vary with, output in the short run. To produce more output, a firm uses more inputs. The cost of additional output depends directly on the additional inputs that are required and how much they cost.

As you saw in last chapter, input requirements are determined by technology. Firms generally have a number of production techniques available to them, and the option they choose is assumed to be the one that produces the desired level of output at the least cost. To find out which technology involves the least cost, a firm must compare the total variable costs of producing that level of output using different production techniques.

This is as true of small businesses as it is of large manufacturing firms. Suppose, for example, that you are a small farmer. A certain amount of work has to be done in order to plant and harvest your 120 acres. You can get this work done in a number of ways. You might hire four farm hands and divide up the tasks, or you might buy several pieces of complex farm machinery (capital) and do the work single-handedly. Clearly, your final choice depends on a number of things. What machinery is available? What does it do? Will it work on small fields such as yours? How much will it cost to buy each piece of equipment? What wage will you have to pay farm hands? How many will you need to get the job done? if machinery is expensive and labor is cheap, you will probably choose the labor intensive technology. If farm labor is expensive and the local farm equipment dealer is going out of business, you might get a good deal on some machinery and choose the capitals intensive method.

Having compared the costs of alternative production techniques, the firm may be influenced in its choice by the current scale of its operation. Remember, in the short run a firm is locked into a fixed scale of operations. A firm currently producing on a small scale may find that a labor-intensive technique is the least costly, whether or not labor is comparatively expensive; the same firm producing on a larger scale might find a capital- intensive technique less costly.

The total variable cost curve is a graph that shows the relationship between total variable cost and the level of a firm's output (q). At any given level of output, total variable cost depends on (1) the techniques of production that are available and (2) the prices of the inputs required by each technology. To examine this relationship in more detail, let us look at some production Figures for some hypothetical items called "Frumps".

Table2 presents an analysis that might lie behind three points on the total variable cost curve of a typical frump firm. In this case, there are two production techniques available, one somewhat more capitals intensive than the other. We will assume that the price of labor is S1 per unit and the price of capital is S2 per unit. For the purposes of this example, we focus on variable capital-- that is, on capital that can be changed in the short run. In practice, some capital (such as buildings and large, specialized machines) is fixed in the short run. in our example, we will use k to denote variable capital. Remember, however, that the firm has other capital, capital that is fixed in the short run.

Analysis reveals that to produce on unit of output, the labor intensive technique is least costly. Technique A requires four units of both capital and labor, which would cost a total of $12. Technique B requires six units of labor but only two units of capital for a total cost of only $10. To maximize profits, the firm would use technique B to produce one frump. The total variable cost of producing one unit of output would thus be $10.

The relatively labor-intensive technique B is also the best method of production for two units of output. Using B, the firm can produce two Frumps for $18. If the firm decides to produce three Frumps, however, technique A is the cheaper. Using the least- cost technology (A), the total variable cost of production is \$24. The firm will use nine units of capital at \$2 each and six units of labor at \$1 each.

Produce	Using technique	Units of units of input (production function		Total variable cost assuming P_k = \$2, P_L = \$1 TVC = K(P_k) +L(P_L)
		K	L	
1 unit of output	A	4	4	(4x\$2) +(4x\$1) =\$12
	B	2	6	(2x\$2) +(6x\$1) =\$10
2 unit of output	A	7	6	(7x\$2) +(6x\$1) =\$20
	B	4	10	(4x\$2) +(10x\$1) =\$18
3 unit of output	A	9	6	(9x\$2) +(6x\$1) =\$24
	B	6	14	(6x\$2) +(14x\$1) =\$26

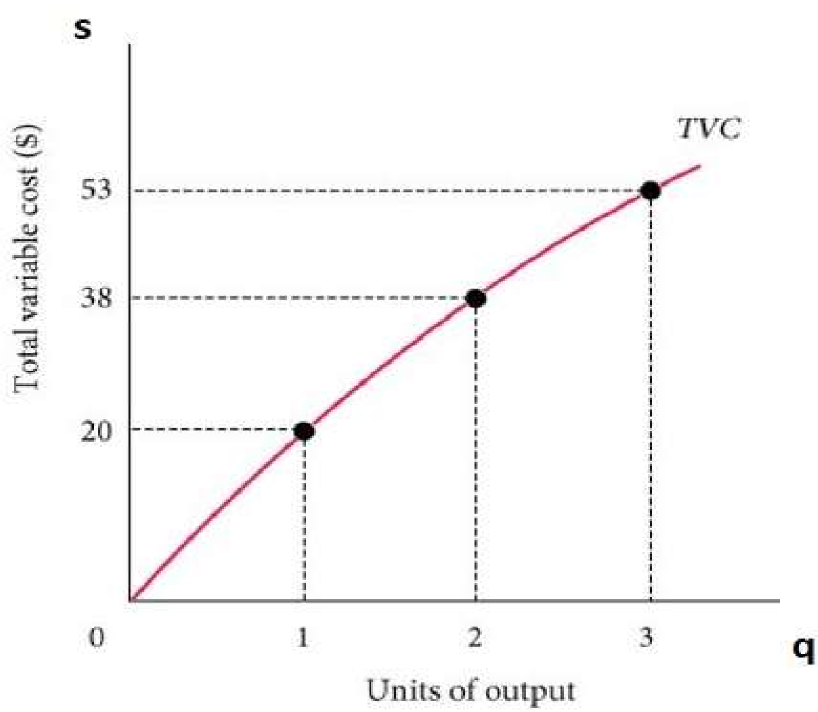


Figure 3 graphs the relationship between variable costs and output based on the data in Table8.2, assuming the firm chooses, for each output, the least cost technology.

The important point to remember here is that:

The total variable cost curve embodies information about factor, or input prices and technology. It shows the cost of product using the best available technique at each output level given current factor prices.

Marginal cost (MC) the most important of all cost concepts is that of marginal cost (MC), the increase in total cost that results from the production of one more unit of output. Let us say, for example, that a firm is producing 1,000 units of output and decides to raise output to 1,001. Producing the extra unit raises cost, and the increase (that is, the cost of producing the 1,001st unit) is the marginal cost. Focusing on the margin is one way of looking at variable costs: marginal costs reflect variable costs because they vary when output changes. Fixed costs do not change when output changes.

Table 3 shows how marginal cost is derived from total variable cost by simple subtraction. The total variable cost of producing the first frump is $10. Raising production from one unit to two units increases total variable cost from S10 to S18; the difference is the marginal cost of the second unit, or S8. Raising output from two to three units increases total variable cost from S18 to S24. The marginal cost of the third unit, therefore, is S6.

Table 3

Derivation of Marginal Costs

Cost from total variable

Unit of output (Frumps)	Total variable costs ($)	Marginal costs ($)
0	0	
		—
1	10	
		10
2	18	8
3	24	6

Table 4

Derivation of marginal cost from total variable cost, technology, and factor prices

	Least-cost technology	Input requirements K	L		Total variable cost
Unit 2	B	2	6	(2x\$2) + (6 x\$1)=	\$ 10
Unit 1	B	4	10	(4x\$2) + (10 x\$1)=	\$18
	Additional inputs needed	+ 2	+ 4		
	X Price of inputs	X \$2	X \$1		
	= Marginal cost (of unit 2)	\$4	\$4	→	\$8 =MC
Unit 2	B	2	10	(4x\$2) + (10 x\$1)=	\$18
Unit 1	A	9	6	(4x\$2) + (6 x\$1)=	\$24
	Additional inputs needed	+ 5	− 4		
	X Price of inputs	X \$2	X \$1		
	= Marginal cost (of unit 3)	\$10	− \$4	→	\$6 = MC

Table 4 shows that marginal cost is simply the cost of the additional inputs, or resources, needed to produce the marginal unit of output. You saw in Table 8.2 that the least expensive method of producing one frump or two Frumps was technique B. Here is what happens when the firm raises output from one unit to two units: to produce one unit of output, it uses of capital at $2 per unit and six units of labor as $1 per unit, for a total variable cost of S10 technique B requires four units of capital (at S2 per unit) and ten units of labor (at S1 per unit) to produce two units of output, for the total variable cost of $18. To produce the second unit, therefore, our frump producer needs to use two units of additional capital (at $2 each) and four units of additional labor (at $1 each), for a total additional cost $8. Thus, the marginal cost of the second unit is $8-- the cost of the added resources needed to produce it.

But what happens when total output goes up by one more unit? To produce three Frumps, the firm switches to technique A, which requires nine units of capital (at $2 each), more than twice as much capital as it took to produce two Frumps. Why spend so much more on variable capital? Because this expenditure means that the firm can cut down on the amount of labor it uses. producing two Frumps required ten units of labor (at \$1 each); producing three Frumps requires only six. Although increasing output from two Frumps to three requires the firm to spend an additional \$10 on capital (five additional units at \$2 each), it also means that it can cut back on labor, using four fewer units (at S 1 each) and saving the firm \$4. The marginal cost of the third unit is thus \$6 (\$10−\$4).

In reality, firms generally do not hire less labor when output rises. When firms in the real world expand, they normally use more capital and hire more labor, as our firm does in moving from one unit of output to two. Still, this example should drive home two points: (1) that costs at any level of output depend on technology and factor prices and (2) that the technology appropriate at one level of production may not be appropriate at other levels of production.

While the easiest way to derive marginal cost is to look at total variable cost subtract (as in Table3), don't lose sight of fact that. When a firm increases its output level, it hires or demands more inputs. Marginal cost measures the additional cost of inputs required to produce each successive unit of output.

The Shape of the Marginal Cost Curve in the Short Run

The assumption of a fixed factor of production in the short run means that a firm is stuck at its current scale of operation (in our example, the size of the plant) as a firm tries to increase its output, it will eventually find itself trapped by that scale. Thus, our definition of the short run also implies that marginal cost eventually rises with output. The firm can hire more labor and use more materials−that is, it can add variable inputs−but diminishing returns eventually set in. now recall the sandwich shop, with one grill and too many workers trying to prepare sandwiches on it, from last chapter. With a fixed grill capacity, more laborers could make more sandwiches, but the marginal product of each successive cook declined as more people tried to use the grill. if each additional unit of labor adds less and less to total output, it follows that it requires more labor to produce each additional unit of output. Thus, each additional unit output costs more to produce. In other words diminishing returns, or decreasing marginal product, implies increasing marginal cost (see Figure 4).

Recall too the accountant who makes a living by helping people file their tax returns. He has an office in his home and works alone. His fixed factor of production is his own time: there are only so many hours in a day, and he has only so much stamina. In the long run, he may decide to hire and train an associate, but in the meantime (the short run) he has to decide how much to produce, and that decision is constrained by his current scale of operations. The fact that he has no trained associate and that each day contains only 24 hours constrains the number of clients that he can face on. the biggest component of the accountant's cost is time. When he works, he given up leisure and other things that he could do with his time with more and more clients, he works later and later into the night; as he does so, he becomes less and less productive, and his hours become more and more valuable for sleep and relaxation. In other words, the marginal cost of doing each successive tax return rises.

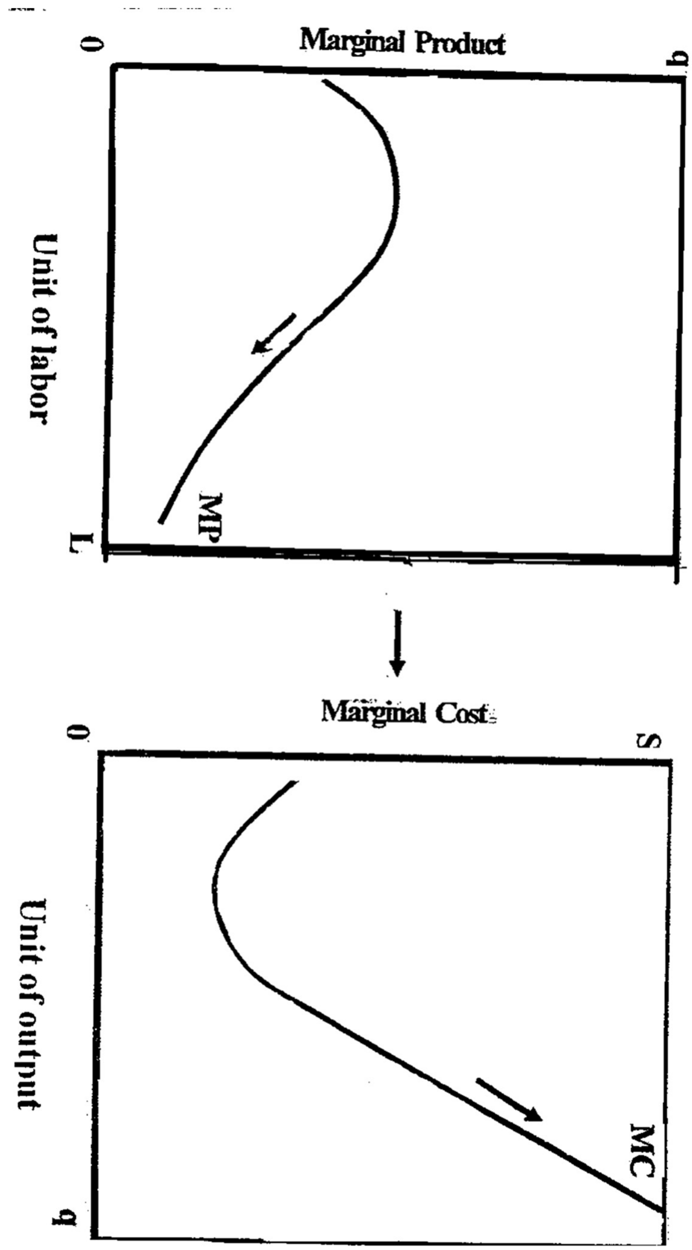


Figure 3

Declining marginal product implies that marginal cost will Eventually rise with output

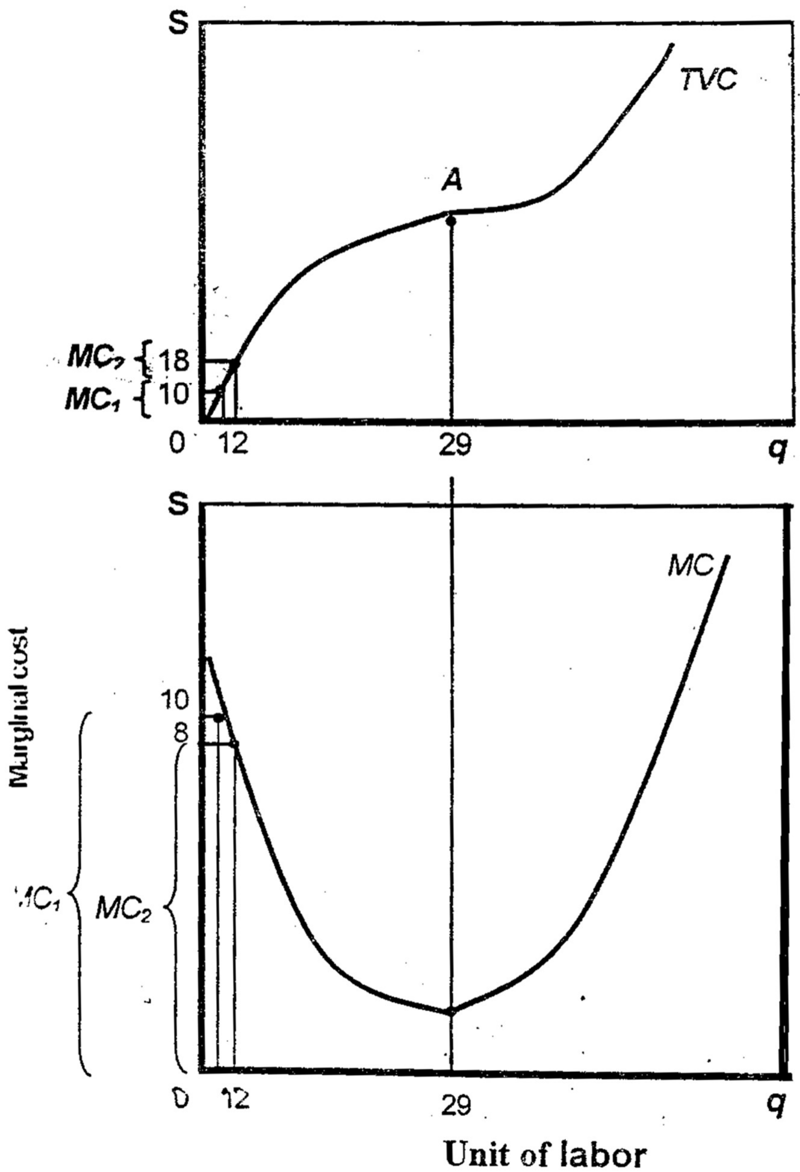
In the short run, every firm is constrained by some fixed factor of production. Having a fixed input implies diminishing returns) declining marginal product) and a limited capacity to produce.as that limit is approached marginal costs rise.

In the short-run, every firm is constrained by some fixed input that leads to diminishing returns to variable input and limits its capacity. As a firm approaches that to produce capacity, it becomes increasingly costly to produce successively higher levels of output marginal costs ultimately increase, with output in the short-run.

Graphing Total Variable Costs and Marginal Costs

Figure 5, shows how the total variable cost curve and the marginal cost curve of a typical firm might look. The numbers shown for the first two units of output are those arrived at by the frump producer (see Figure 3). Notice first that the shape of the marginal cost curve is consistent with short- run diminishing returns. At first MC declines, but eventually the fixed factor of production begins to constrain the firm, and marginal Cost rises. Up to 29 units of output, producing each successive unit of output costs slightly less than producing the one before. Beyond 29 units, however, the cost of each successive unit is greater than the one before.

Clearly, more output costs more in total than less output. Total variable costs (TVC), therefore always increase when output increases. Even though the cost of each additional unit changes total variable cost rises when output rises. Thus the total variable cost curve always has a positive slope.



The slope of the total variable cost curve varies, however. The slope of the curve reveals how quickly costs increase with output, and this relationship is reflected in marginal cost. Look carefully at the diagram in Figure 5. The marginal cost the first unit (MC_1) is $\$10$. Going from zero to one unit of output increases total variable cost by $\$10$, from zero to $\$10$. The point on the total variable cost curve at two units is $\$18$, but the cost of increasing production from one to two units – that is, the marginal cost of the second unit – is only $\$8$.

Remember that the numerical value of the slope of a line is equal to the change in Y divided by the change in X; the slope of a total variable cost curve is thus the change in total variable cost divided by the change in output$(\Delta TVC/\Delta q)$. Since marginal cost is by definition the change in total variable cost resulting from an increase in output of one unit$(\Delta q = 1)$, marginal cost actually is the slope of the total variable cost curve:

$$\boxed{\textbf{Slope of TVC } = \frac{\Delta\ \mathbf{TVC}}{\Delta \mathbf{q}} = \frac{\Delta\ \mathbf{TVC}}{\mathbf{1}} = \Delta\ \mathbf{TVC} = \mathbf{MC}}$$

Notice that up to 29 units, marginal cost is decreasing and the variable cost curve is becoming flatter. The slope of the total variable cost curve is declining; that is, total variable cost increases, but at a decreasing rate. Beyond 29 units of output, marginal cost increases and the total variable cost curve gets steeper; total variable costs continue to increase, but at an increasing rate.

The point at which a decreasing slope becomes an increasing slope, or at which marginal cost stops declining and begins increasing, is referred to as inflection point. In Figure5, the inflection point is found at point A.

Average variable cost (AVC) A more complete picture of the costs of a hypothetical firm appears in Table 5. The second column shows total variable costs−derived, we assume, from information on input prices and technology. The third column derives marginal cost by simple subtraction. For example, raising output from three units to four units increases variable costs from $24 to $32, making the marginal cost of the fourth unit $8($32 − $240). The marginal cost of the fifth unit is $10, the difference between $32(TVC) for four units and $42 TVC for five units.

Average variable cost (AVC) is total variable cost divided by the number of units of output (q):

$$\boxed{\mathrm{AVC} = \frac{\mathrm{AVC}}{\mathrm{q}}}$$

Table 5

Short–run cost of a hypothetical firm

(1) q	(2) TVC	(3) MC (ATVC)	(4) AVC (TVC/q)	(5) TFC	(6) TC (TVC+TFC)	(7) AFC (TFC/q)	(8) ATC TC/q or AFC +AVC
	$ 0	$	$	$1000	$1000	$	$
1	10	10	10	$1000	$1010	1000	1010
2	18	8	9	$1000	$1018	500	509
3	24	6	8	$1000	$1024	333	341
4	32	8	8	$1000	$1032	250	258
5	42	10	8.4	$1000	$1042	200	208.4
____	____	____	____	____	____	____	____
____	____	____	____	____	____	____	____
____	____	____	____	____	____	____	____
500	8000	20	16	1000	9000	2	18

In Table 5, the AVC in the fourth column is calculated by dividing the numbers in the second column (TVC) by the numbers in the first column (q). For example, if the total variable cost of producing five units of output is $42, then the average variable cost is $42 divided by five units, or $8.40.

The important distinction to remember here is as follows:

Marginal cost is the cost of one additional unit. Average variable cost is the average variable cost per unit of all the units being produced.

The Relationship between Average Variable Cost and Marginal Cost

Average variable cost and marginal cost are related in a very specific way. When marginal cost is below average, average variable cost declines toward it. Think again of the test score analogy introduced in last chapter. If you have an average score of 85 on three exams, and you then receive a 75, your average will fall). In table 5, the average variable cost of producing two unit is $9 (TVC/q = $18 ÷ 2). The marginal cost of the third is $6, an amount lower than the marginal cost of the second unit. The average thus falls to $8 (24 ÷ 3).

Similarly, when marginal cost is above average variable cost, average variable cost increases toward it. If you had received a 95 on your last test instead of a 75, your average would have risen. In table 8.5 the average variable cost of four units is $8. The marginal cost of the fifth unit is $10, and the average rises to $8.40. It follows, then, that

Average variable cost always moves toward marginal cost.

Graphing Total, Average Variable and Marginal Costs

The relationship between average variable cost and marginal cost can be illustrated graphically. Figure 6 duplicates the diagrams in Figure 5 but adds average variable cost. As the graphs show, average variable cost follows marginal cost, but lags behind because it is the average of all previous units.

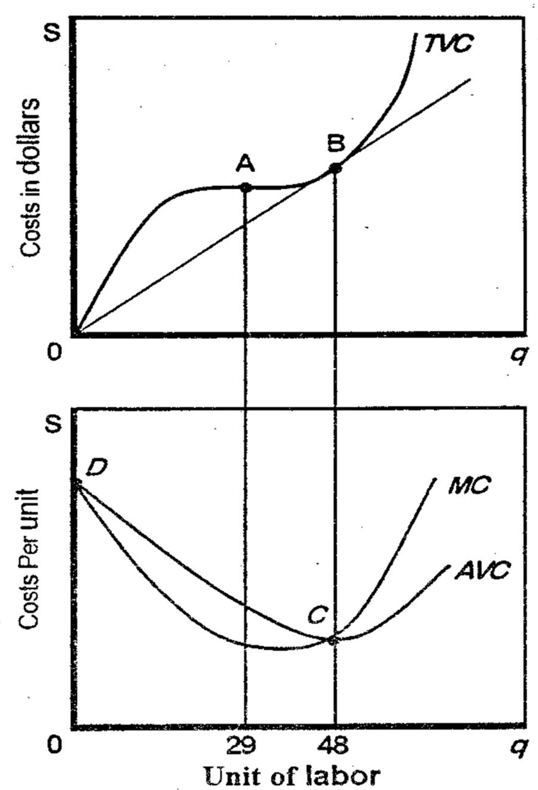


Figure 8.6

More short−Run Costs

The relationship between marginal cost and average cost is important. When marginal cost is below average cost, average cost is declining. When marginal cost is above average cost, average cost is increasing. If follows that rising marginal cost will intersect average variable cost at the minimum point of AVC. The marginal cost of the first unit is the same as the average variable cost of producing just that unit, so marginal cost and average variable cost start together at point D. (if the reason for this is not clear to you, go back to table 8.5 and review why for one unit AVC = MC = $10). Average variable costs from point D follow marginal cost down to point C. marginal cost begins to rise at 29 units, but average cost does not begin to rise until marginal cost crosses it and rises above it this occurs at 48 units. Point C. it is always true that.

Marginal cost intersects average variable cost at the lowest, or minimum, point of AVC

Another example using test scores should help you to understand why this is so. Consider the following sequence of test scores: 95,85,92,88. The average of these four is 90. Now suppose you get an 80 on your fifth test. This score will drag down your average to 88. Now suppose that you get an 85 on your sixth test. This score is higher than 80, but it's still below your 88 average. As a result, your average continues to fall (from 88 to 97.5, even though your marginal test score rose. But if instead of an 85 you get an 89 – just one point over your average – you've turned your average around: it is now rising.

Total Costs

We are now ready to complete the cost picture by adding fixed costs to variable costs. Total cost (TC), you remember, is simply the sum of total fixed and total variable costs:

Total cost = total fixed cost + total variable cost

Total cost is graphed in figure 7, where the same vertical distance (equal to TFS which is constant) is simply added to TVC at every level of output. In table 5 the sixth column adds the fixed cost of $1000 to total variable cost to arrive at total cost.

Average total cost (ATC) average total cost (ATC) is total cost divided by the number of units of output (q)

$$\boxed{ATC = \frac{TC}{q}}$$

Column 8 in table 5 shows the result of dividing the numbers in column 6 by the numbers in column 1. For example, at five units of output, total cost is $1042; average total cost is $1042 divided by five, or $208.40. The average total cost of producing 500 units of output, however, is only $18– that is, 49000 divided by 500.

Another, more revealing, way of deriving average total cost is to add average variable cost and average fixed cost together:

$$\boxed{\mathbf{ATC = AFC + AVC}}$$

Look back at the derivation of average fixed cost in table 1 and figure 2. Because fixed cost is a constant number that does not change with output, average fixed cost, or TFC/q, is simply fixed cost (a constant number) divided by an ever–increasing number of units of output. This means that as output increases, average fixed cost declines steadily. If the output level is very high, average fixed cost is very small. The data used in figure 2, where the AFC of two units of output is $500, and in table 5, where the AFC drops to $200 at five units, show this quite clearly. If the firm goes on to produce 500 units of output, AFC declines to only $2 (see column 7 in Table 5)

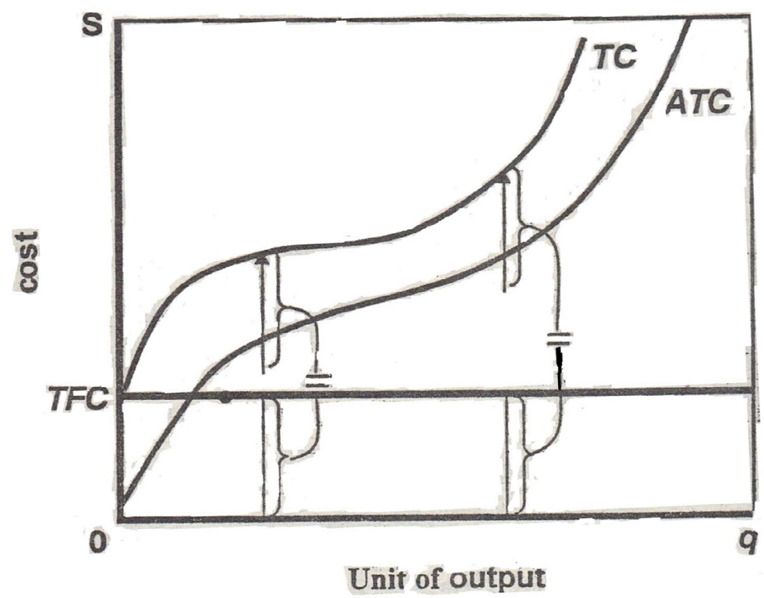


Figure 7

Total cost equal fixed cost plus variable cost

Adding total fixed cost to total variable cost means adding the same amount of total fixed cost to every level of total variable cost. Thus the total cost curve has the same shape as the total variable cost curve; it is simply higher by an amount equal to TFC.

We can also derive average total cost in a second way. The numbers in column 8 in table 5 can be derived either by dividing total cost by the quantity of output or by summing AVC and AFC from columns 4 and 7 respectively. In other words, ATC =AFC + AVC.

Figure 8 derives average total cost graphically. The bottom part of the figure graphs the average fixed cost from Figure 2. The top part shows the declining average fixed cost added to average variable cost at each level of output. Because AFC gets smaller and smaller, ATC gets closer and closer to AVC as output increases, but the two lines never cross.

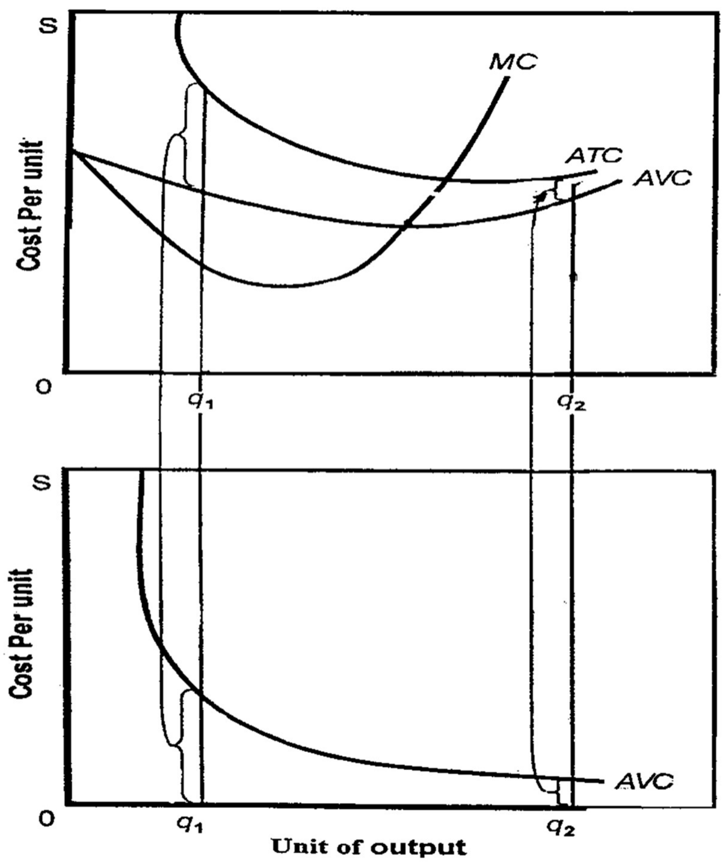


Figure 8

Average total cost = average variable cost + average fixed cost

To get average total cost, we add average fixed and average variable costs at all levels of output. Since average fixed cost falls with output, an ever–declining amount is added to AVC. Thus, AVC and ATC get closer together as output increases

The Relationship between Average Total Cost and Marginal Cost

The relationship between average total cost and marginal cost is exactly the same as the relationship between average variable cost and marginal cost. The average total cost curve follows the marginal cost curve, but lags behind because it is an average over all units of output. The average total cost curve lags behind the marginal cost curve even more than the average variable cost curve does, because the cost of each added unit of production is now averaged not only with the variable cost of all previous units produced, but with fixed costs as well.

Fixed costs equal $1000 and are incurred even when the output level is zero. Thus, the first unit of output in the example in Table 5 costs $10 in variable cost to produce. The second unit costs only $8 in variable cost to produce. The total cost of two unit is $1018; average total cost of the two is ($1010 + $8)/2, or 4509. The marginal cost of the third unit is only $6. The total cost of three units is thus $1024, or $1018 + $6, and the average total cost of three units is ($1010 + $8 + $7) /3, or $341.

As you saw with the test scores example, the marginal cost is what drives the changes in average total cost:

If marginal cost is below average total cost, average total cost will decline toward marginal cost, if marginal cost is above average total cost. Average total cost will increase. As a result, marginal cost intersects average total cost at ATC's minimum point, for the same reason that it intersects the average variable cost curve at its minimum point.

Short-Run Costs: A Review

Let us now pause for a moment to review what we have learned about the behavior of firms. We know that firms make three basic choices: how much product or output to produce or supply, how to produce that output, and how much of each input to demand in order to produce what they intend to supply. We assume that these choices are made in order to maximize profits. Profits are equal to the difference between a firm's revenue from the sale of its product and the costs of producing that product: profits = total revenue minus total cost.

So far, we have looked only at costs, but costs are only one part of the profit equation. To complete the picture, we must turn to the output market and see how these costs compare with the price that a product commands in the market before we do so, however, it is important to consolidate what we have said about costs.

Before a firm does anything else, it needs to know the different methods that it can use to produce its product. The technologies available determine the combinations of inputs there are needed to produce each level of output. Firms choose the technique that produces the desired level of output at least cost. The cost curves that result from the analysis of all this information show the cost of producing each level of output using the best available technology.

Remember that so far we have talked only about short-run costs. The curves we have drawn are therefore short-run cost curves. The shape of theses curves s determined in large measure by the assumptions that we make about the short run, especially the assumption that some fixed factor of production leads to diminishing returns. Given this assumption, marginal costs eventually rise, and average cost curves are likely to be U-shaped. After gaining a complete knowledge of how to produce a product and how much it will cost to produce it at each level of output, the firm turns to the market to find out what it can sell its product for. It is to the output market that we now turn our attention.

Exercises

Chapter Three

Short run costs and output decisions

Part A: True- false Questions

Circle whether the following statements True are (T) or false (F)

1- Variable costs are costs that change with the level of production

2- A firm's marginal cost is the change in its total cost divided by the change in its output

3- A firm's average total cost is $100 its average variable cost is $90, and its total fixed cost is $1,000. Its output is between 120 and 170 units.

4- A firm's average total cost is $80, its average variable cost is $75, and its output is 50 units its total fixed cost is between $200 and $300.

5- A firm's average variable cost is $60, its total fixed cost is $3,000, and its output is 600 units its average total cost is more than $64

6- The vertical distance between a firm's total cost (TC) and its total variable cost (TVC) curve is equal to the total fixed cost TFC

7- The marginal cost (MC) curve intersects the ATC and AVC curves at their minimum points.

8- The vertical distance between a firm's total cost curve (ATC) and its average variable cost curve (AVC) increases as output increases.

9- Total revenue equals price times quantity sold

10- For a monopoly the industry demand curve is the firm's demand curve

11- Monopolists are price takers.

Circle the appropriate answer

1- The firm's short-run marginal cost is the change in the short-run

a- total cost due to the use of one more unit of input

b- average cost due to the use of one more unit of input

c- total cost due to the production of more unit of output

d- average cost due to the production of one more unit of output

2- A firm profit-maximizing level of output generates a total revenue of \$2000. The firm's costs are as follows: total cost = \$4000, total variable cost = \$1500, total fixed cost = \$2500 in the short-run the firm should

a- leave output at its current level

b- increase output

c- decrease output

d- shut-down

3- The short run is a time period in which

A – all resources are fixed

b- the level of output is fixed

c- the size of the production plant is variable

d- some resources are fixed and other are variable

4- If you know that with 8 units of output average fixed cost is $12.50 and average variable cost is $81.25, then total cost at this output level is

a- $93.75 b- $97.78 c- $750 d- $880

5- With fixed costs of $400. A firm has average total costs of $3 and average variable costs of $2.50. its output is:

a- 200 units b- 400 units c- 800 units d- 1.600 units

6- If the short-run average variable costs of production for a firm are rising then this indicates that

a- average total costs are at a maximum

b- average fixed costs are constant

c- marginal costs are above average variable costs.

d- average variable costs are below average fixed costs.

7- Total cost is the sum of fixed costs and

a- implicit costs b- accounting costs

c- explicit costs d- variable costs.

8- Marginal cost is

a- all the costs of production of goods

b- all the costs of the fixed inputs

c- the change in the total cost resulting from a one unit change in output

d- all the costs that vary with output

9- A company could produce 99 units of a good for $\$316$ or produce 100 units of the same good for $\$320$. The marginal costs of 100^{th} unit

a- is $\$320$

b- is $\$3.20$

c- is $\$4.00$

d- cannot be calculated with this information

10- A company could produce 100 units of a good for $\$320$ or produce 101units of the same good for $\$324$. The $\$4$ difference in costs is

a- the marginal benefit of producing the 101^{st} unit.

b- the marginal cost of producing the 101^{st} unit.

c- both the marginal benefit and the marginal cost of producing the 101^{st} unit

d- neither the marginal benefit nor the marginal cost of producing the 101^{st} unit

11- Average total costs are total divided by

a- total fixed costs

b- total output

c- the total number of workers employed

d- total variable costs

According to the following table answer the questions of (12) to (17)

Cost schedule		
Output (units per day)	Total fixed cost (dollars)	Total variable cost (dollars)
0	20	0
4	20	25
9	20	50
13	20	75
16	20	100
18	20	125

12- In the above table the total cost of producing 9 units of output is

a- $20 b- $50 c- $70 d- $30

13- The above table shows a firm's

a- short-run and long-run costs

b- long –run costs

c- short-run costs

d- more information is needed to determine if the costs are long run costs or short-run costs

14- In the above table the total variable cost of producing 16 units of output is

a- $60 b- $20 c- $100 d- $120

15- Using the data in the above table when output increases from 4 to 9 units the marginal cost of one of those 5 units is

a- $4.25 b- $4.00 c- $6.25 d- $5.00

16- Using the data in the above table, the average fixed cost of product 9 units per day is

a- $2.22 b- $20.00 c- $5.00 d- $5.55

17- using the data in the above table, the average total cost of product 16 units per day is

a- $6.25 b- $1.25 c- $7.00 d- $7.50

According to the following table answer the questions of (18) to (23)

Cost schedule		
Output (units per day)	Total variable cost (dollars)	Total cost (dollars)
0	0	30
3	20	50
8	40	70
12	60	90
14	80	110
15	100	130

18- In the above table the total fixed cost is

a- $30 b- $50 c- $20 d- $0

19- In the above table the total fixed cost is 3 unit of output is

a- $30 b- $60 c- $90 d- $0

20- In the above table when output increases from 8 to 12 units, the marginal cost of one of those 4 unit is

a- \$1.20 b- \$15.00 c- \$5.00 d- \$2.00

21- In the above table, the average fixed cost of producing 15 units output is

a- \$6.66 b- \$0.50 c- \$2.00 d- \$8.66

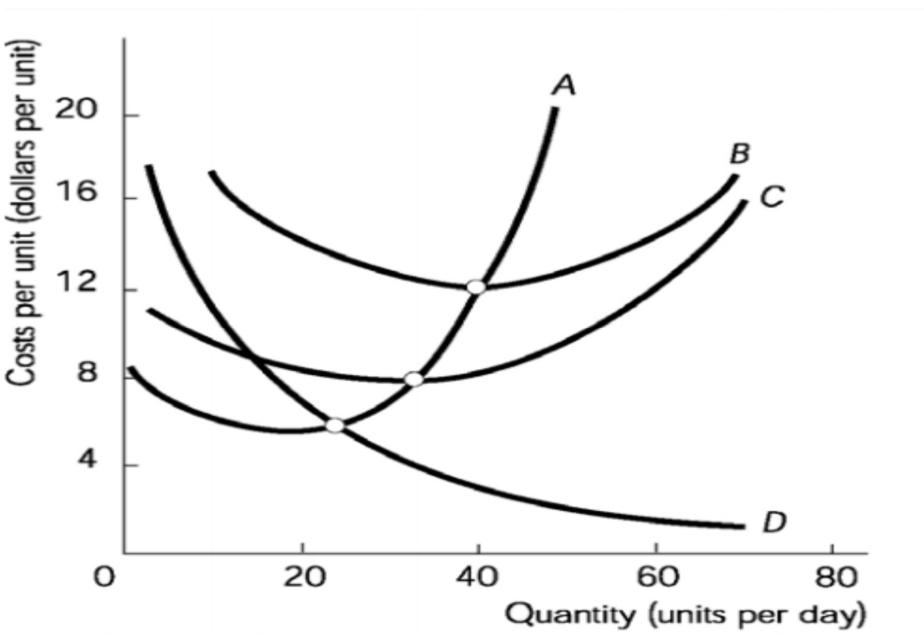
22- In the above table, the average variable cost of producing 14 units of output is

a- \$0.175 b- \$7.86 c- \$5.71 d- \$10.00

23- In the above table, the average total cost of producing 14 units output is

a- \$5.71 b- \$7.00 c- \$7.86 d- \$6.75

According to the following table answer the questions of (18) to (23)



24- In the above figure, the marginal cost curve is curve

a- A b- B c- C d- D

25- In the above figure, the average fixed cost curve is curve

a- A b- B c- C d- D

26- In the above figure, the average variable cost curve is curve

a- A b- B c- C d- D

27- In the above figure, the average total cost curve is curve

a- A b- B c- C d- D

28- In the above figure, as output increases. The distance between curves B and C decreases because

a- average fixed cost decreases as output increases

b- total cost decreases as output increases

c- there are increasing marginal costs as output increases

d- there are diminishing returns to average total cost

29- In the above figure, curve D slopes downward because

a- there are diminishing returns

b- average fixed cost decreases as output increases

c- all costs decrease as output increases

d- there are decreasing marginal costs

30– In the above figure, the intersection of curves A and C is the point at which

a– total product is maximized

b– average fixed cost is minimized

c– average variable cost is minimized

d– average total cost is minimized

31– In the above figure, the intersection of curves A and B is the point at which

a– average total cost is minimized

b– total product is maximized

c– average variable cost is minimized

d– average fixed cost is minimized

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Chapter Four

Price and Output Determination in a Perfect Competition Markets

Chapter Four

Price and output determination a perfect competition market

The overriding goal of this chapter is to understand.

-Total revenue and marginal revenue.

-The difference between the industry and the individual firm.

-The optimal produce for individual firm at short-run.

-Exercises.

Chapter Four

Price and Output Determination in a Perfect Competition Markets

In order to calculate potential profits, firms must combine their cost analyses with information on potential revenues from sales. After all, if a firm can't sell its product for more than it costs to produce it, it won't be in business long. On the other hand, if the market gives the firm a price that is significantly greater than the cost it incurs to produce a unit of its product; the firm may have an incentive to expand output. Large profits might also attract new competitors to the market.

Let us now examine in detail how a firm goes about determining how much output to produce. For the sake of simplicity, we will continue to examine the decisions of a perfectly competitive firm. A perfectly competitive industry, you will recall, has many firms that are small relative to the size of the market. In such an environment, firms have no control over the market price of their products. Product price is determined by the interaction of many suppliers and many demanders.

Figure 9 shows a typical firm in a perfectly competitive industry. Price is determined in the market at P*. The individual firm can change any price that it wants for its product, but if it charges above P*, the quantity demanded falls to zero, and the firm won't sell anything. Many other firms are producing exactly the same product, so why should consumers pay more than the going market price? The firm could also sell its product for less than P* but there is no reason to do so. If the firm can sell all it wants to sell at the going market price of P*, and we assume that it can, it would not be sensible to sell it for less. All this implies that

In the short run a competitive firm faces a demand curve that is simply a horizontal line at the market equilibrium price. In other words competitive firms face perfectly elastic demand in the short run.

In figure 9, market equilibrium price is P* and the firm's perfectly elastic demand curve is labeled d.

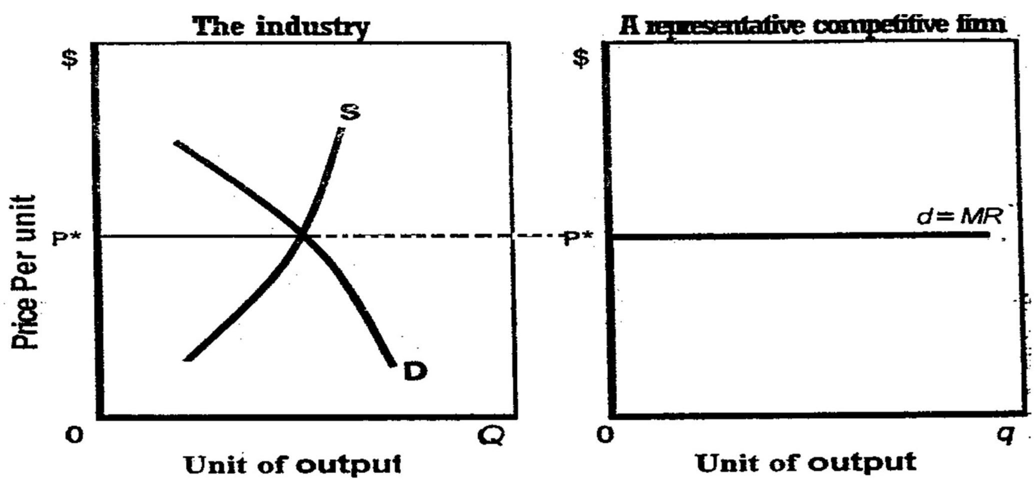


Figure 9. demand facing a typical firm in a perfectly competitive market Because perfectly competitive firms are very small relative to the market, they have no control over price. A firm can sell all it wants at the market price but would sell nothing if it changed a higher price. Thus, the demand curve facing a perfectly competitive firm is simply a horizontal line at the market equilibrium price P*.

Total revenue (TR) and marginal revenue (MR) profit is the difference between total revenue and total cost. Total revenue is the amount that a firm takes in from the sale of its product. A perfectly competitive firm sells each unit of product for the same price, regardless of the output level it has chosen. Therefore, total revenue (TR) is simply the price per unit times the quantity of output that the firm decides to produce:

$$\boxed{\begin{array}{c}\textbf{Total revenue} = \textbf{Price X Quantity} \\ \textbf{TR} = \textbf{P X q}\end{array}}$$

Recall that price is assumed to be fixed in a competitive industry. Our firm is so small relative to the industry that changes in its output do not affect the market price. Thus, the only way a firm can affect the amount of revenue that it takes in is by adjusting output.

Marginal revenue (MR) is the added revenue that a firm takes in when it increases output by one additional unit. If a firm producing 10,521 unit of output per month increases that output to 10,522 units per month, it will take in an additional amount of revenue each month. The revenue associated with the 10,522nd unit is simply the amount that the firm sells that one unit for. Thus, for a competitive firm, marginal revenue (MR) is simply equal to the current market price of each additional unit sold. In figure 9, for example, the market price is P*. Thus, if the representative firm raises it output from 10,521 units to 10,522 units, its revenue will increase by P*.

A firm's marginal revenue curve is a curve that shows how much revenue the firm will gain by raising output by one unit at every level of output. The marginal revenue curve and the demand curve facing a competitive firm are identical. The horizontal line in figure 9 can be thought of as both the demand curve facing the firm and its marginal revenue curve,

Comparing Costs and Revenues to Maximize Profit

The discussion in the next few paragraphs conveys one of the most important concepts in all of economics. As we pursue our analysis, remember that we are working under two assumptions: (1) that the industry we are examining is perfectly competitive and (2) that firms choose the level of output that yields the maximum total profit.

The Profit Maximizing Level of Output

Look carefully at the diagrams in Figure 10. Once again we have the whole market, or industry, on the left and a single typical small firm on the right and again the current market price is P*.

First, the firm observes market price (Figure 10a) and knows that it can sell all that it wants to for P* per unit. Next, it must decide how much to produce. It might seem reasonable to pick the output level where marginal cost is at its minimum point – in this case, at q_1 in figure 10b. After all, at that point the difference between marginal revenue and marginal cost is the greatest.

But remember that the firm wants to maximize the difference between total revenue and total cost, not that between marginal revenue and marginal cost. The marginal figures tell the firm only about the costs and revenues associated with a single unit of output. At q_1 marginal revenue is P* and marginal cost is MC_1. As Figure 10b clearly shows,

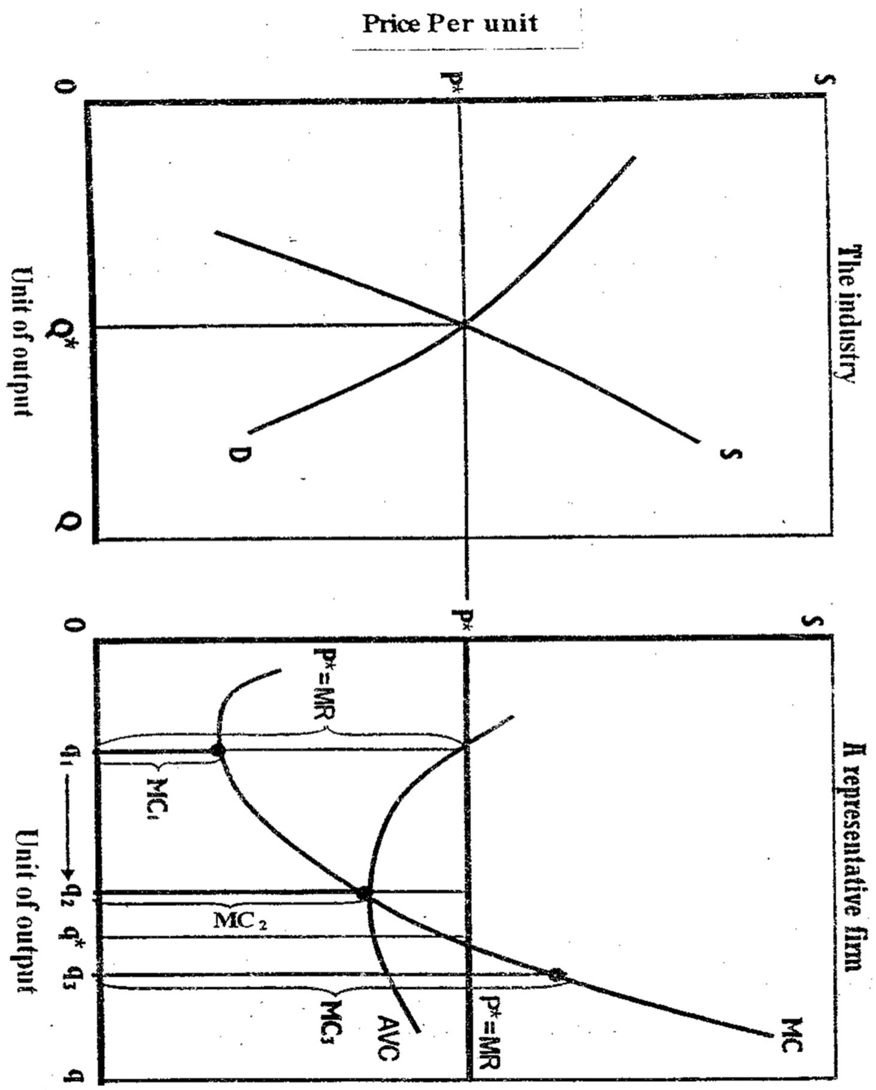


Figure10

The Profits-Maximizing level of output for a perfectly competitive firm

If price is above marginal cost, as it is at q_1 and q_2 , profits can be increased by raising output; each additional unit increases revenues by more than it costs to produce the additional output Beyond q*, however, added output will reduce profits. At q_3 , an additional unit of output costs more to produce than it will bring in revenue when sold on the market. Profit- maximizing output thus Q8, the point at which P*= MC

marginal revenue is greater than marginal cost at q_1. Think carefully about what this means, by increasing output by one more unit, the firm will take in more in additional revenue than it incurs in additional cost. Increasing output, then, means that total profits will rise because the next unit adds marginal profit. Clearly, a profit–maximizing firm would not stop producing at q_1. Instead, it would raise output.

So let us see what happens as the firm raises output to, say q_2. At q_2, and at a price of P*, average total cost is at a minimum but marginal revenue is still greater than marginal cost. Just as before, this means that the firm can earn higher profits by raising output even further. This leads us to conclude that:

As long as marginal revenue is greater than marginal cost, even though the difference between the two may be getting smaller added output means added profit when marginal revenue exceeds marginal cost the revenue gained by raising output one unit exceeds the cost incurred by doing so.

This logic eventually leads us to q*. At an output of q*, marginal cost increases to the point where it is equal to output price (P* = MR = MC). If the firm were to produce more than q* units, marginal cost would rise above marginal revenue, and profits would fall At q_3 units of output, for example, marginal revenue is still P*, but marginal cost has risen above P* toMC_3. It does not pay for the firm to increase output if marginal cost is greater than marginal revenue, because any additional output above the point at which P* = MR =MC adds more to total cost than it adds to total revenue. Such additional output actually reduces profits.

The inevitable conclusion, then, is that

A profit maximizing perfectly competitive firm will produce up to the point where the price of its output is just equal to short-run marginal cost – the point at which P = MC

Keep in mind, though, that all types of firms (not just those in perfectly competitive industries) are profit maximizers. Thus,

The profit maximizing output level for all firms is the output level where MR = MC

(Make sure you understand why this is so). In perfect competition, however, Mr = P. as shown above. Hence, for perfectly competitive firms we can rewrite our profit maximizing condition as P = MC

A numerical Example Table 6 presents some data for another hypothetical firm. Let's assume that the market has set a $20 unit price for the firm's product. Total revenue is the simple product of P x q (the numbers in column 1 times $20). The table derives total, marginal, and average costs exactly as Table 5 did. Here, however, we have included revenues, and we can calculate the profit, which is shown in column 8.

Column 8 shows that a profit maximizing firm would choose to produce either four or five units of output. At each of those levels, profits are $40; at all other output levels, they are lower. Now let's see if marginal reasoning leads us to the same conclusion.

First, should the firm produce at all? If it produces nothing, it suffers losses equal to $10. If it increases output to one unit, marginal revenue is $20 (remember that it sells each unit for $20), and marginal cost is $10. Thus, it gains $10, just enough to cover fixed costs and break even. But that is better than a $10 loss.

Should the firm increase output to two unit?

The marginal revenue from the second unit is again $20, but the marginal cost is only $5. Thus, by producing the second unit the firm increases its profits by $15. The third unit adds the same amount to profits. Again, marginal revenue is $20 and marginal cost is $5, an increase in profit of $15, for a total profit of $30.

The fourth unit offers still more profit. Price is above marginal cost, which means that producing that fourth unit will increase profits. Price, or marginal revenue, is $20, and marginal cost is just $10. Thus, the fourth unit adds $10 to profit. At unit number five, however, diminishing returns push marginal cost up unit it is just equal to price. The marginal revenue from producing the fifth unit, therefore, is just equal to the marginal cost incurred, and nothing is added to or subtracted from total profit

At unit number six, marginal cost rises above price, and added production reduces profits. The marginal cost of the sixth unit is $30, but producing and selling it will bring in only $20, a reduction in total profit of $10. Clearly, the firm will not produce the sixth unit.

The profit-maximizing level of output is thus four or five units. The firm produces up to the point at which price and marginal cost are equal.

The Short- Run Supply Curve

Consider how the typical firm described in Figure 10 would behave in response to an increase in price. In figure 11a, demand shifts, driving price from P0, a profit-maximizing firm will choose output level q_0. To produce any less, or to raise output above that level, would lead to a lower level of profit. At P_1 the same firm would increase output to q_1, but it would stop there. Similarly, at P_2, the firm would raise output to q_2 units of output.

Table 6

Profit analysis for a simple firm

(1) q	(2) TVC	(3) TVC	(4) MC	(5) P = MR	(6) TR (P x q)	(7) TC (TFC+TVC)	(8) profit (TR +TC)
0	$10	$0	$ —	$20	$0	$10	$−10
1	10	10	10	20	20	20	0
2	10	15	5	20	40	25	15
3	10	20	5	20	60	30	30
4	10	30	10	20	80	40	40
5	10	50	20	20	100	60	40
6	10	80	30	20	120	90	30

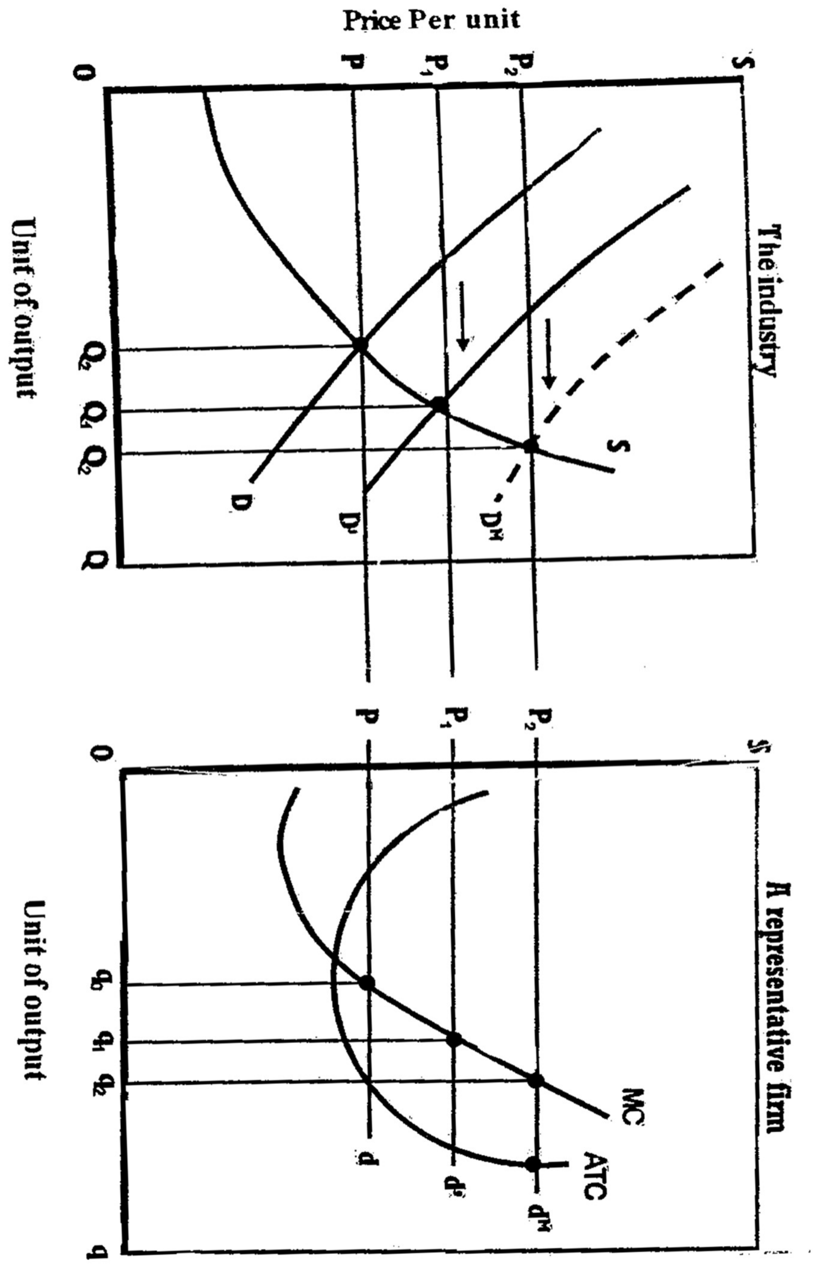


Figure 11

Marginal cost is the supply curve of a perfect competitive firm

At any market price* the marginal cost curve shows the output level that maximizes profit. Thus, the marginal cost curve of a perfectly competitive profit-maximizing firm is the firm's short-run supply cure.

Figure 11b shows a curve that relates prices and quantity supplied. At any market price, the marginal cost curve shows the output level that maximizes profit. A curve that shows how much output a profit maximizing firm will produce at every price also fits the definition of a supply curve (review chapter 4 if this point is not clear to you). It therefore follows that:

The marginal cost competitive firm is the firm's short – run supply curve.

As you will see, there is some price level below which the firm will shut down its operations and simply bear losses equal to fixed costs even if prices is above marginal cost.

Exercises

Chapter Four

Price and output determination perfect competition markets

Part A: True- false Questions

Circle whether the following statements are True (T) or false (F)

1- Perfect competition is an industry with many firms producing goods that differ somewhat.

2- In perfect competitive industry, there are many buyers and many sellers.

3- In perfect competition, the product of a single firm is sold to different customers at different prices.

4- In perfect competition, restrictions on entry into an industry do not exist.

5- In perfect competition, each firm can influence the price of the good

6- The price elasticity of demand for any particular perfectly competitive firm's output is infinite

7- The demand for wheat from farm A is perfectly elastic because wheat from farm A is a perfect substitute for wheat from farm B.

8- If firms exist an industry, the industry supply curve shifts rightward.

9- In a perfectly competitive industry, the industry supply curve is the sum of the supply curves of all the individual firms.

10- A perfectly competitive firm's supply curve is made up its marginal cost curve at all point above its minimum average total cost curve.

Part B multiple – choice questions

Circle the appropriate answer

1- The perfectly competitive model assumes that:

a- buyers and seller are price takers

b- there are no barriers to entry or exit

c-suppliers cannot behave strategically

d- all of the above

2- The demand curve that a price taker faces is:

a- perfectly inelastic b- unitary elastic

c- perfectly elastic d- has a negative slope

3- Perfect competition is an industry with

a- a few firms producing identical goods

b-many firms producing goods that differ somewhat

c- a few firms producing goods that differ somewhat in quality.

d- many firms producing identical goods

4- In perfect competition, restrictions on entry into an industry

a- do not exist

b- apply to labor but not to capital.

c- apply to both capital and labor

d- apply to capital but not to labor

5- In perfect competition, a firm that maximizes its economic profit will sell its good

a- below the market price

b- above the market price

c- below the market price if its supply curve is inelastic and above the market price if its supply curve is elastic.

d- at the market price.

6- In perfect competition, the marginal revenue of an individual firm

a- equals the price of the product

b- is positive but less than the price of the product

c- exceed the price of the product

d- is zero

According the following table answer the questions of (7) to (9)

Output	Total Revenue	Total Cost
0	$0	$25
1	$30	$49
2	$60	$69
3	$90	$91
4	$120	$117
5	$150	$147
6	$180	$180

7- In the above table, the price of the product is

a- $30 b-$150 c-$180 d- $30

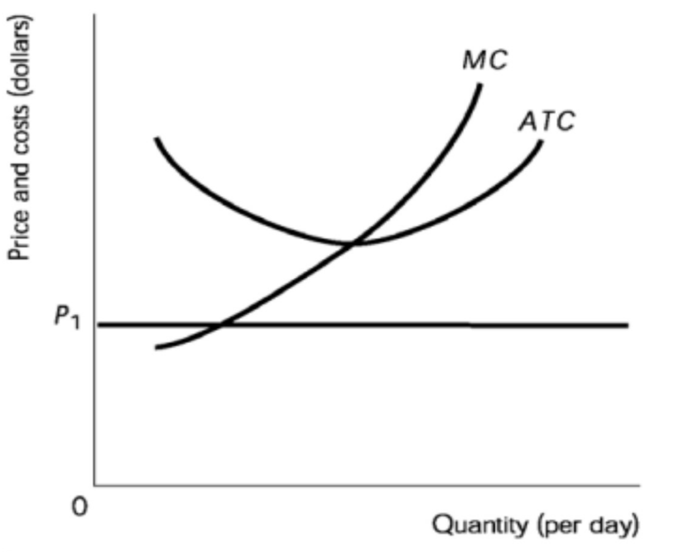
8-In the above table, the marginal revenue from the fourth unit of output is

a- $180 b- $147 c-$150 d- $30

9- In the above table, if the frim produces 2 units of output, it will make an economic

a- loss of $60 b- profit of $60 c- Loss of $9 d- profit $9

According to the following figure answer the questions of (10) to (12)



10- In the above figure, if the price is P1, the firm is

a- earning a normal profit.

b- incurring an economic loss

c- earning enough revenue to pay all of its opportunity costs

d- making an economic profit

11- Suppose the cost curve in the above figure apply to all firms in the industry. Then, if the initial price is P1, in the long run the market

a- supply will decrease b- supply will increase

c- demand will decrease d- demand will increase

12- Suppose the cost curves in the above figure apply to all firms in the industry, if the initial price is P1, firms are

a- making an economic profit and some firms will leave the industry

b- incurring an economic loss and some firms will leave the industry

c- making an economic profit and some firms will enter the industry.

d- incurring an economic loss and some firms will enter the industry

13- New reports indicate that eating turnips helps people remain healthy. The news shifts the demand curve for turnips rightward. In response, new farms enter the turnip industry. During the period in which the new farms are entering, the price of a turnip and the profits of each existing firm

a- falls; rises b- rises; falls c- rises; rises d- falls; falls

14- As firms leave an industry because they are incurring an economic loss, the economic loss of each remaining firm

a- increases and the price of the product rises

b- decreases and the price of the product falls

c- decreases and the price of the product

d- increases and the price of the product falls

15- In a perfectly competitive industry, a permanent decrease in demand initially brings a lower price, economic.

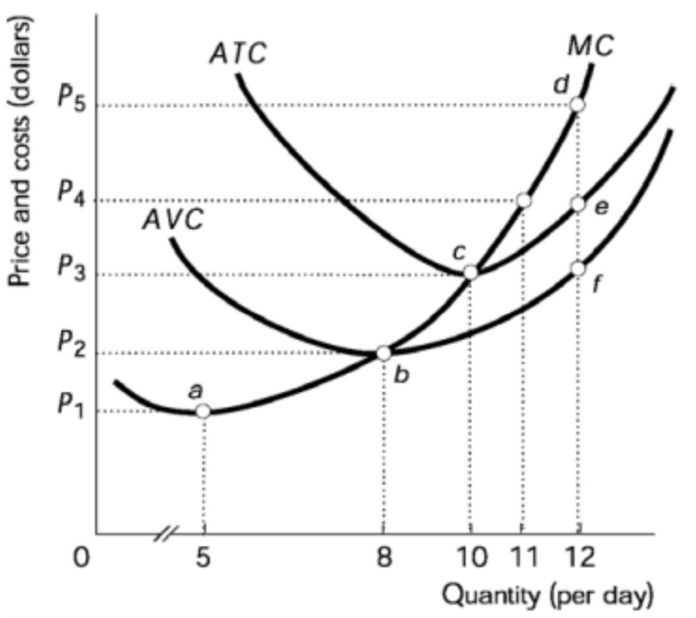
a- profit, and entry into the industry.

b- profit, and exit from the industry

c- loss, and entry into the industry

d- loss, and exist from the industry

According to the following figure answer the questions of (16) to (19)



16- The figure represents a firm in a perfectly competitive market. The firm will shut down it price falls below

a- P2 b- P1 c- P3 d-P4

17- The figure represents a firm in a perfectly competitive market. If the firm does not shut down, the least amount of output that it will produce is

a- 10 units. b- 8 units c- 5 unit d- less than 5 units

18- The figure represents a firm in a perfectly competitive market. If the price rises from P3 to P4 then output will increase by

a- 3 units b- 0 units c- 1 unit d- 2 units.

19- The figure above represents a firm in a perfectly competitive market. The firm's supply curve is the curved line linking

a- point c to point e and continuing on past point e along the ATC curve.

b- point b to point f and stopping at point f

c- point a to point c and stopping at point c.

d- point b to point d and continuing on past point d along the MC curve.

According to the following figure answer the questions of (20) to (26):

20- In the above figure, if the price is P1, the firm will produce

a- where ATC equals P1 b- where MC equal P1

c- nothing d- where MC equals ATC.

21- In the above figure, if the price is P1, the firm maximizes its profit by producing

a- where ATC equal P1 b- nothing

c- where MC equals P1 d- where MC equals ATC.

22- In the above figure, if the firm increases its output from Q1 to Q2, it will

a- increase its profit
b- reduce its marginal revenue
c- decrease its profit
d- increase its marginal revenue

23- In the above figure, if the firm increases its output from Q2 to Q3, it will

a- reduce its marginal revenue
b- increase its profit
c- increase its marginal revenue
d- decrease its profit.

24- In the above figure, if the price is P1, the firm is

a- incurring an economic loss
b- shut down
c- breaking even
d- making an economic profit

25- In the above figure, if the firm produced Q1, the firm's economic profit is………than if it produced Q2 and…..than if it produced Q3

a- more; less
b- less; more
c- more; more
d- less; less

26- in the above figure, if the firm produced Q3, the firm's economic profit is…….. than if it produced Q1 and…….than if it produces Q2

a- more; less
b- more; more
c- less; more
d- less; less

Problems

Problem 1:

The following information about industry operating in perfect competition

Q_d = 256 – P

Q_s = 6P – 24

And TC = 100 + 4Q + Q^2

<u>Required:</u>

1- Determine the price and total production that maximize profit at industry level

2- Write the firm's supply function

3- Compute the number of firms that serve in the market

4- Compute profit or loss at firm level and show that by graphically.

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Chapter Five

Price and Output Determination in Pure Monopoly Markets

Chapter Five

Price and output determination in pure monopoly markets

The main goal of this chapter is to understand

- Marginal revenue and market demand.

- Marginal revenue and elasticity.

- Marginal revenue and total revenue and elasticity.

- Price and output choice for a profit- maximizing monopolist.

- The absence of a supply curve in monopoly.

- Exercises.

Chapter Five

Price and Output Determination in Pure Monopoly Markets

Basic Assumptions

A pure monopoly market, we learned earlier, is one in which a single firm produces a product for which there are no close substitutes. For purposes of analyzing monopoly behavior, we make two basic assumptions (1) that entry to the market I strictly blocked, and (2) that firms act to maximize profits.

Initially, we also assume that our pure monopolist buys in competitive input markets. Even though the firm is the only one producing for its product markets, it is only one among many firms buying factors of production in input markets. The local telephone company, for example, must hire labor like another firm, and to attract workers it must pay the market wage; to buy fiber-optic cable, it must pay the going price. In these input markets, therefore, the monopolistic firm is a price –taker.

On the cost side of the profit equation, then a pure monopolist does not differ one bit from a perfect competitor. Both choose the technology that minimizes the cost of production. The cost curve of each represents he minimum cost of producing each level of output. The different arises on the revenue, or demand, side of the equation, and this is where we begin our analysis.

Demand in Monopoly Markets

A competitive firm, you will recall, face a fixed, market determined price, and we assume that it can sell all that it wants to sell at that price; it is constrained only by its current capacity in the short run. The demand curve facing a competitive firm is thus a horizontal line (see Figure.2) raising the price of its product means losing all demand, because perfect substitutes are available. On the other hand, the competitive firm has no incentive to charge a lower price either.

Because a competitive firm can charge only one price regardless of the output level chosen, its marginal revenue– that is ,the additional revenue that it earns by raising output by one unit is simply the price of the output or P*. Remember that marginal revenue is important because a profit maximizing firm will increase output as long as marginal revenue exceeds marginal cost.

The most important distinction between competition and monopoly is that:

With only one firm in a monopoly market, there is no distinction between the firm and the industry– the firm is the industry the market demand curve is thus the demand curve facing the firm and the total quantity supplied in the market is what the firm decides to produce.

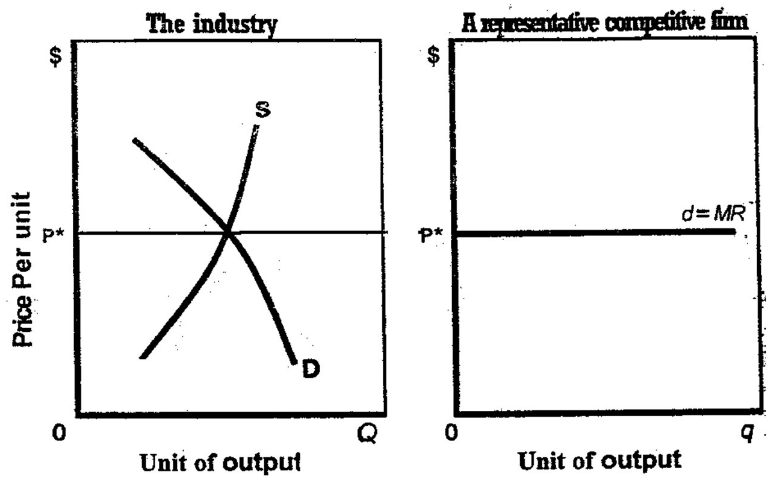


Figure 2

The demand curve facing a perfectly competitive firm is perfectly firm elastic

Perfect competitive firms are price takers: they are small relative to the size of the market and thus cannot influence market price the implication, as we saw, is that the demand curve facing a perfect competitive firm is perfectly elastic. If the firm raises its price, it sells nothing. There is no reason for the firm to lower its prices if it can sell all it wants at P*

Before we proceed any further, we need to make a few more basic assumptions. First, we assume that a monopolistic firm cannot price discriminate. That is, it sells its product to all demanders at the same price. (Price discrimination means selling to different consumers or groups of consumers at different prices.)

We also assume that the monopoly faces a known demand curve. That is, we assume that the firm has enough information to predict how household swill reacts to different prices. (In actuality, many firms use sophisticated statistical methods to estimate the elasticity of demand for their products. Other firms may use less formal methods, including trial and error, sometimes called price searching. All firms with market power must have some sense of how consumers are likely to react to various prices however). Knowing the demand curve it faces, the firm must simultaneously choose both the quantity of output to supply and the price of that output. Once the firm chooses a price, the market determines how much will be sold. Stated somewhat differently, the firm chooses the ingle point on the market demand curve where it wants to be.

Marginal Revenue and Market Demand Just like a competitor, a profit-maximizing monopolist will continue to produce output as long as marginal revenue exceeds marginal cost. When a monopolistic firm faces a downward-sloping demand curve, however, the nature of marginal revenue changes:

For a monopolist, an increase in output involves not just producing more and selling it, but also reducing the price of its output in order to sell it.

Consider the hypothetical demand schedule in table (1). The third column of the table gives figures for the total revenue that the firm would take in a different

Table.1.

Marginal Revenue Facing a Monopolist

Quantity	Price	Total Revenue	Marginal Revenue
0	$11	$0	$−
1	10	10	10
2	9	18	8
3	8	24	6
4	7	28	4
5	6	30	2
6	5	30	0
7	4	28	−2
8	3	24	−4
9	2	18	−6
10	1	10	−8

Levels of output. If he firm were to produce one unit, that unit would sell for 10, and total revenue would be $10. Two units would sell for $9 each, in which case total revenue would be $18. As the fourth column shows, marginal revenue from the second unit would thus be $8 ($18 minus $10). Notice that the marginal revenue from increasing output from one unit to two units ($8) is less than the price of the second unit ($9).

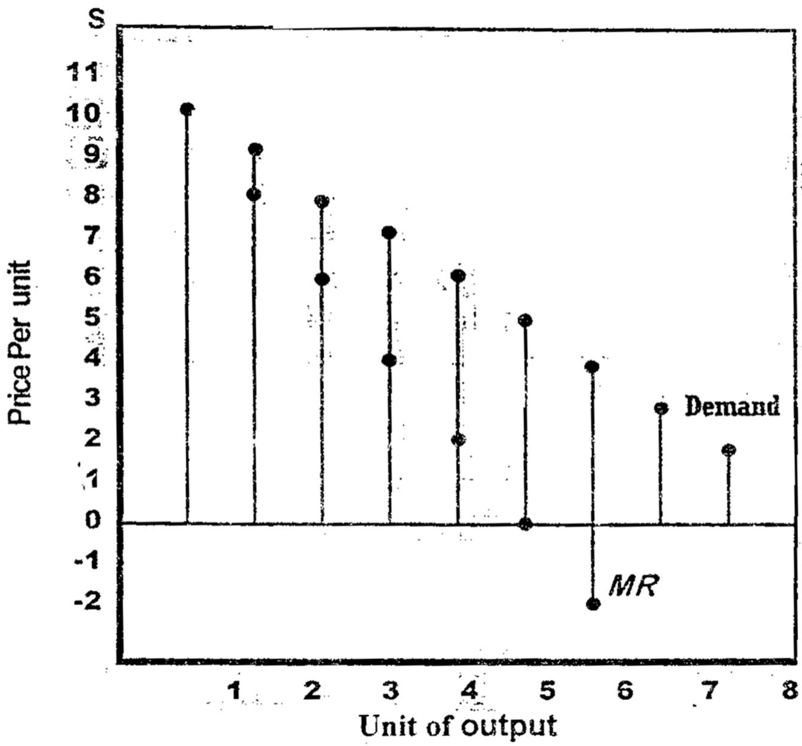
Now consider what happens when the firm considers setting production at four units rather than three. The fourth unit would sell for $7, but because the firm can't price discriminate, it must sell all four units for $7 each. Had the firm chosen to produce only three units, it could have sold those three units for $8 each. Thus offsetting the revenue gain of $7 is a revenue loss of $3 – that is, $1 for each of the three units that would have sold at the higher price. The marginal revenue of the fourth unit is thus $ minus $3, or $4, which is considerably below the price of 47. (Remember, unlike a monopolistic firm, a perfectly competitive firm does not have to charge a lower price to sell more; thus P – MR in competition).

Marginal revenue can also be derived simply by looking at the change in total revenue. At three unit of output, total revenue is $24; at four units of output, total revenue is $28. Marginal revenue is the difference, or $4.

Moving from ix units of output to seven units of output actually reduces total revenue for the firm; at seven units of output, marginal revenue is negative. While it is true that the seventh unit will sell for a positive price ($4). The firm must sell all seven units for 44 each (for total revenue of $28). If output had been restricted to six units, each would have sold for $5. Thus, offsetting the revenue gain of $4 is a revenue loss of $6- that is, $1 for each of the six units that the firm would have sold at the higher price. Thus increasing output from six o seven units actually decreases revenue by $2. Figure.3 graphs the marginal revenue schedule derived in Table 1. Notice that at every level of output except one uit, marginal revenues is below price. Marginal revenue turns from positive to negative after six units of output. When the demand curve is a straight line, the marginal revenue curve bisects the quantity axis between the origin and where the demand curve it's the quantity axis (see figure 4).

Notice that

> **A monopoly's marginal revenue curve shows the change in total revenue those results as the firm moves along the segment of the demand curve that lies directly above it.**



Figuer3.

Marginal Revenue curve facing a Monopolist

At every level of output except one unit, a monopolist's marginal revenue is below price. This is so because (1) we assume that the monopolist must sell all its product at a single price (no price discrimination) and (2) to raise output and sell it, the firm must lower the price it changes. Selling the additional output will raise revenue, but this increase is offset somewhat by lower price charged for all units sold. Therefore, the increase in revenue from increasing output by one (the marginal revenue) is less than price.

Marginal Revenue and Elasticity Whether an increase in output increases or decreases total revenue in a monopolistic industry depends on the elasticity of demand. Since total revenue is the product of price and quantity sold (PXQ), the impact of an increase in quantity depends on how great a price decrease accompanies it. That price elasticity of demand is the ratio of the percentage change in quantity demanded to the percentage change in price as the firm moves between two points along a demand curve.

If demand is elastic, the percentage increase in quantity demanded will be bigger I than the percentage decrease in price. Total revenue will thus increase if output is raised, and marginal revenue will be positive:

Effect of output
Increase on Total revenue $\%\Delta Q > -\%\Delta P \downarrow PQ \uparrow = TR \uparrow$
If demand is elastic:

If demand is inelastic, the percentage increase in quantity demanded will be smaller than the percentage decrease in price. Total revenue will thus fall if output is increased, and marginal revenue will be negative:

Effect of output
Increase on Total revenue $\%\Delta Q < -\%\Delta P \downarrow PQ \uparrow = TR \uparrow$
Revenue If demand is elastic:

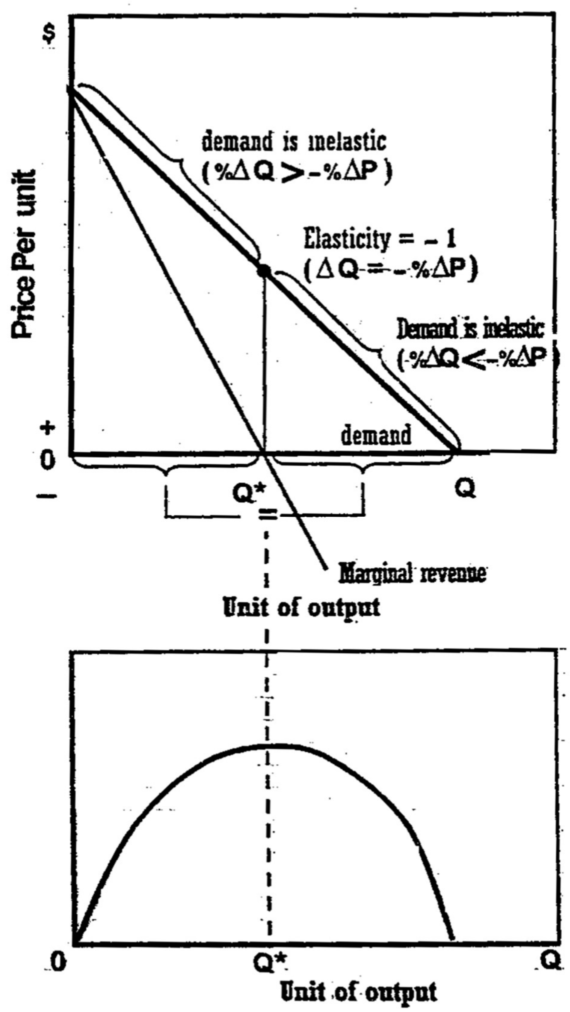


Figure 13.4

Marginal Revenue, Total revenue, and Elasticity

As you learned that, elasticity changes along a straight-line demand curve. Marginal revenue depends on elasticity of demand. When demand is elastic, increasing output increases total revenue (MR is positive): when demand is inelastic, increasing output reduces total revenue (MR is negative).

Figure 4, graphs the relationship between marginal revenue and elasticity. Output is increasing as we move along the quantity axis .at first; demand is elastic as output increases. This means that the percentage increase in quantity demanded is greater than the percentage decrease in price at all points up to Q*. You can see in the lower part of the diagram that total revenue increases when output increases between the origin (Q =0) and Q*. Thus marginal revenue is positive between 0 and Q*. Once we move beyond Q*, however, the demand curve becomes inelastic. this means that the percentage increase in quantity demanded is less than the percentage decrease in price at all points past Q*. you can see in the lower part of the diagram that total revenue decreases when output increases to the right of Q*. Thus, marginal revenue is negative to the right of Q*.

The Monopolists Profit- Maximizing Price and Output

We have spent much time in defining and explaining marginal revenue because it is an important factor in the monopolist's choice of profit maximizing price and output. Figure 5. Superimposes a demand curve and the marginal revenue curve derived from it over a set of cost curves. In determining price and output, a monopolistic firm must go.

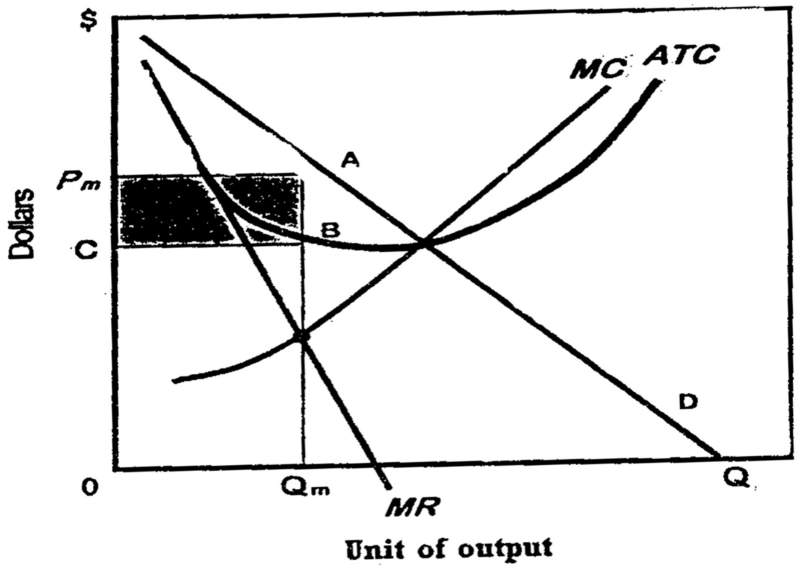


Figure 5

Price and Output Choice for a Profit Maximizing Monopolist

A profit maximizing monopolist will raise output as long as marginal revenue exceeds marginal cost. Maximum profit is achieved at an output of Q_m and a price of P_m. to the right of Q_m. MC is greater than marginal revenue; increasing output beyond Q_m would reduce profit.

Through the same basic decision process that a competitive firm goes through. As you know, any profit maximizing firm will raise its production as long as the added revenue from the increase outweighs the added cost. In more specific terms, we can say that:

All firms, including monopolies, find it profitable to raise output as long as marginal revenue is greater than marginal cost. any positive difference between marginal revenue and marginal cost can be thought of as marginal profit.

The optimal price/output combination for the monopolist in Figure 5. is Q_m and P_m , the point at which the marginal revenue curve and the marginal cost curve intersect. At any output below Q_m marginal revenue is greater than marginal cost. At any output above Q_m increasing output would reduce profits, because marginal cost exceeds marginal revenue. This leads us to conclude that

The profit maximizing level of output for a monopolist is the one at which marginal revenue equals marginal cost: MR = MC

Because marginal revenue for a monopoly lies below the demand curve, the final price chosen by the monopolist will be above marginal cost (P_m > MC). At Q_m price will be fixed at P_m (point A on the demand curve), and total revenue will be P_m x Q_m or the area of rectangle P_m AQ_m 0.Total cost is the product of average total cost and Q_m or the area of rectangle CBQ_m0. Total profit is the difference between total revenue and total cost, or the area of P_mABC.

Among competitive firms, the presence of economic profits provides an incentive for new firms to enter the industry, thus shifting supply to the right, driving down price, and eliminating profits. Remember, however, that for monopolies we assume that barriers to entry have been erected and that profits are protected.

The Absence of a Supply Curve in Monopoly

In perfect competition, the supply curve of a firm in the short run is the same as the portion of the firm's marginal cost curve that lies above the average variable cost curve. As the price of the good produced by firm changes, the perfectly competitive firm simply moves up or down its marginal cost curve in choosing how much output to produce.

As you can see, however, figure.5 contains nothing that we can point to and call a supply curve. The amount of output that a monopolist produces depends on its marginal cost curve and on the shape of the demand curve that it faces. In other words, the amount of output that a monopolist supplies is not independent of the shape of the demand curve thus.

A monopoly firm has no supply curve that is independent of the demand curve for its product

To see why this is so, consider what a firm's supply curve means. A supply curve shows, for each price, the quantity of output the firm is willing to supply. If we ask a monopolist how much output she is willing to supply at a given price, the monopolist will say that her supply behavior depends not just on marginal cost, but also on the marginal revenue associated with that price. and, to know what that marginal revenue would be, the monopolist must know what her demand curve looks like.

In sum: in perfect competition, we can draw a firm's supply curve without knowing anything more than the firm's marginal cost curve. The situation for a monopolist is more complicated:

A monopolist sets both price and quantity, and the amount of output that it supplies depends on both its marginal cost curve and the demand curve that it faces.

Monopoly in The Long and Short Run one of the key distinctions we made in our analysis of perfectly competitive markets was the distinction between the long run and the short run. In the short run, you will recall, all firms face some fixed factor of production and no entry into or exit from the industry is possible. The assumption of a fixed factor of production is the primary reason that marginal cost increases with output in the short run. That is, the short –run marginal cost curve of a typical competitive firm slopes upward and to the right because of the limitations imposed by the fixed factor. In the long run, however, firms can enter and exit the industry. Long run equilibrium is established when the entry and exit of firms drives profits in the industry to zero.

The distribution between the long and short runs is somewhat less important in monopoly markets in the short run, monopolists are limited by a fixed factor of production, just as competitive firms are the cost curve in figure 5. Reflect the diminishing returns to the monopoly's fixed factor of production (for example, plant size).

What will happen to the monopoly in the long run? If the monopoly is earning economic profits (profits over and above a normal return to capital) nothing will happen. In competition, profits lead to expansion and entry. But in monopoly, entry is blocked. In addition, because we assume that the monopoly is a profit–maximizing firm, it will operate at the most efficient scale of production, and it will neither expand nor contract in the long run. Thus, Figure 5. will not change in the long run.

It is possible for a monopoly to find itself suffering economic losses (profits below normal). A monopoly that finds itself unable to cover total costs is illustrated in Figure 6. The best that the firm can do is produce Q_m units of output (the point at which MR = MC) and charge P_m for its output (point E on the demand curve). But at Q_m total revenue (represented by rectangle $P_m E Q_m 0$ is not sufficient to cover total costs (rectangle FD$Q_m 0$), and the firm suffers losses equal to the shaded area (rectangle FDEP_m). notice, however, that total revenue is sufficient to cover variable costs (rectangle GH$Q_m 0$). Thus, operating in the short run generates a profit on operation (total revenue minus total variable costs is greater than zero) that can be used to cover some of the firm's short–run fixed costs. The basis of the monopolist's decision is thus exactly the same as that for a competitive firm:

If a firm can reduce its losses by operating in the short run, it will do so.

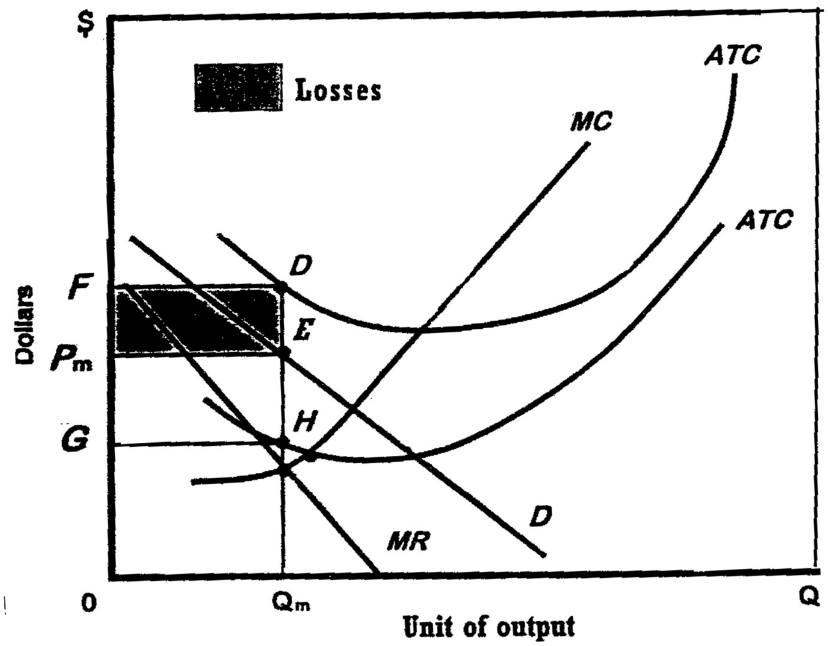


Figure6.

Price and output choice for a monopolist suffering losses in the short run

It is possible for a profit-maximizing monopolist to suffer short-run losses. At Q_m (the point at which MR – MC), total revenue is sufficient to cover variable cost but not to cover total cost. Thus, the firm will operate in the short run but go out of business in the long run.

Similarly, in the long run, a firm that cannot generate enough revenue to cover total costs will go out of business, whether it is competitive or monopolistic. Since the demand curve in Figure 6. Lies completely below the average total cost curve, the monopoly will go out of business in the long run, and its product will not be produced because it is simply not worth the cost of production to buyers.

Perfect Competition and Monopoly Compared

One way to understand monopoly is to compare equilibrium output and price in a perfectly competitive industry with the output and price that would be chosen if the same industry were organized as a monopoly. To make this comparison meaningful, let us exclude from consideration any technological advantage that a single large firm might enjoy.

We begin our comparison, then with a competitive industry made up of a large number of firms operating with a production technology that exhibits constant returns to scale in the long run. (Recall that constant returns to scale means that average cost is the same whether the firm operates one large plant or many small plants). Figure7. Shows a perfectly competitive industry at long –run equilibrium. A condition in which price is equal to long-run average costs and in which there are no economic profits.

Now suppose that the industry was to fall under the control of a single private monopolist. The monopolist now owns one firm with many plants. But technology has not changed; only the locus of decision-marking power has. To analyze the monopolist's decisions, we must derive the consolidated cost curves now facing the monopoly. Figure8. Shows average and marginal costs for a three – plant firm.

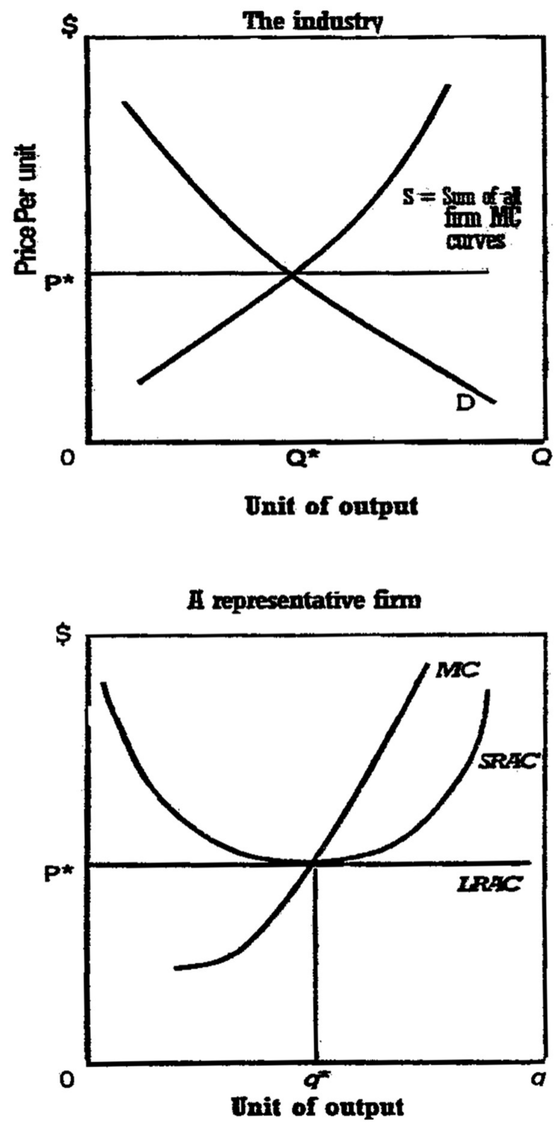
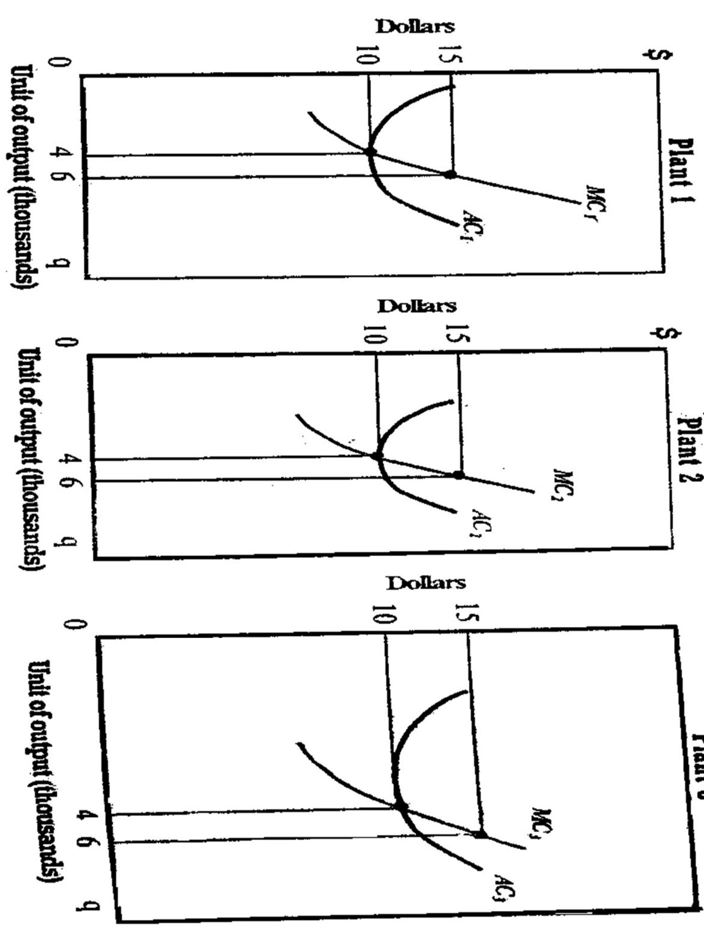


Figure 13.7

A perfectly competitive industry in long Run Equilibrium

In a perfectly competitive industry in the long run, price will be equal to long−run average cost. The market supply curve is the sum of all the short−run marginal cost curves of the firms in the industry. Here we assume that firms are using a technology that exhibits constant returns to scale: LRAC in flat. Big firms enjoy no cost advantage.

Think carefully about the cost curves facing the consolidated multiplant firm. First consider marginal costs. What is the marginal cost of the 16,000 the unit of output for the new monopoly? If the firm distributes production among the three plants as shown in figure. 8, the marginal cost of the 16,000th unit is $10. The firm will assign plant 1 the task of producing 4,000 units; plant 2 a production level of 5,000 units; and plant 3 a production level of 7,000 units, for a grand total of 16,000 units. At these output levels, marginal cost of production is $10 in each of the three plants. The marginal cost of the 16,000th unit is thus $10.



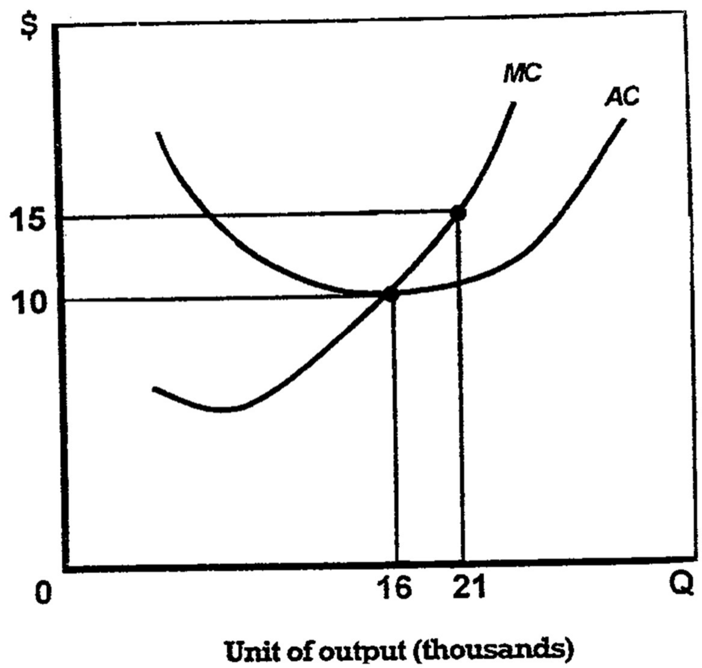


Figure 13.8

Cost carves for a consolidated Multiplant Firm

The cost curves of a single consolidated multiplant firm are simply the sum of the cost curves of the individual plants. This is easy to see in the case where there are just three plants.

Using similar reasoning, we can calculate the marginal cost of the 21,000th unit of output. A production level of 6,000 units will be assigned to plant 1, pushing marginal cost up from $10 to $15; plant 2 will also be assigned 6,000 units, pushing its marginal cost to $15; and 9,000 units will be assigned to plant 3, where marginal cost also rises to $15. The marginal cost of the 21,000th unit of output produced by the monopoly is thus $15.

Based on these calculations, you should be able to see that the marginal cost curve facing the consolidated firm (the monopoly) is equal to the sum of the marginal cost curves of the former small firms that are now small plants. This means that the marginal cost curve of the new firm is exactly the same curve as the supply curve in the industry when it was competitively organized. (Recall that the industry supply curve in a perfectly competitive industry is the sum of the marginal cost curves (above average variable cost) of all the individual firms in that industry).

Figure 9, superimposes the cost curves of the consolidated monopoly industry on the diagram of the competitive industry in Figure 7. If the industry were competitively organized, total industry output would have been Q and price would have been P, (which is the same as P* in Figure 7). These price and output decisions are determined by the intersection of the competitive supply curve, Sc, and the market demand curve.

No longer faced with a price that it cannot influence, however, the monopolist can choose any price/quantity combination along the demand curve. The output level that maximizes profits to the monopolist is Q – the point at which marginal revenue intersects marginal cost. Output will be priced at P_m. To increase output beyond Q_m or to charge a price below P_m (which represents the amount consumers are willing to pay) would reduce profit. The final result is that:

Relative to a competitively organized industry a monopolist restricts output, charges higher prices, and earns economic profit.

And remember, all we did was to transfer decision-making power from the individual small firms to a consolidated owner. The new firm gains nothing at all technologically from being big.

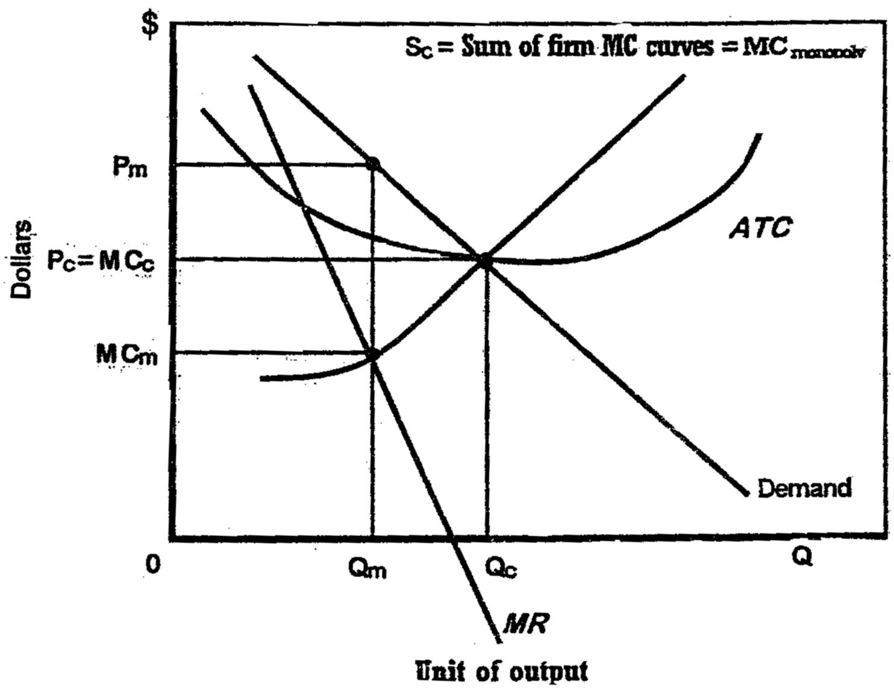


Figure 13.9

Comparison of monopoly and perfect competitive outcomes for firm with constant returns to Scale.

In the newly organized monopoly, the marginal cost curve is exactly the same as the supply curve that represented the behavior of all the independent firms when the industry was organized competitively. This enables us to compare the monopoly outcome with the competitive outcome. Quantity produced by the monopoly will be less than the competitive level of output and the monopoly price will be higher than the price under competition.

Collusion and Monopoly Compared

Suppose now that the industry discussed above was not nationalized and no monopoly thus created. Instead, the individual firm owners simply decide to work together an effort to limit competition and increase joint profits, a behavior called collusion. In this case, the outcome would be exactly the same as the outcome of a monopoly in the industry. Firms certainly have an incentive to collude. When they act independently, they compete away whatever profits they can find. But, we saw, when price increases to P_m across the industry; the monopolistic firm earns economic profits.

Despite the fact that collusion is illegal, it has taken place in some industries. In one significant case in the 1960s, a number of executives of well-known electrical equipment manufacturers were successfully prosecuted for meeting secretly to fix prices and divide up markets. In January 1987, a judge moved to end a pricing agreement between milk producers in New York City that had existed since the 1930s. As a result, the wholesale price of milk dropped between $30 and $71 per gallon in one week!

Exercises

Chapter Five

Monopoly

1- Assume that a monopolist Sells a product with a total cost function TC = $1200 + 0.5Q^2$. The market demand curve given by the Equation

$$P = 300 - Q.$$

a- Find the profit-maximizing output and price for this monopolist, is the monopolist profitable?

b- Calculate the price elasticity of demand at the monopolist's profit maximizing price. Also calculate the marginal cost at the monopolist's profit-maximizing output verify that the IEPR hold.

2- A monopolist faces a demand curve P = $210 - 4Q$ and initially faces a constant marginal cost Mc = 10.

a- Calculate the profit maximizing monopolist quantity and compute the monopolist's total revenue at the optimal prices.

b- Suppose that the monopolist's marginal cost increase to MC = 20 verify that the monopolist's total revenue goes down prices.

c- Suppose that all firms marginal cost increased to MC = 20 verify that the increase in marginal cost cause total industry revenue to go up.

Exercises

Chapter five

Price and output determination in pure monopoly markets

Part A: true false question

Circle whether the following statements are True (T) or False (F)

1- The marginal revenue curve for a monopoly lies below its demand curve

2- If the price elasticity of demand is greater than 1, a monopoly's total revenue decreases when the firm lowers its price

3- if the price elasticity of demand is greater than 1. A monopoly's total revenue decreases when the increases its price.

4- A monopoly firm expands its output and lowers its price. The firm finds that its total revenue falls. Hence, the firm is producing in the inelastic range of its demand curve.

5- If a monopoly is producing at an output level at which marginal revenue exceeds marginal cost, in order to increase its profit, it will raise its price and decrease its output.

6- A profit maximizing firm will increase output as long as marginal revenue exceed marginal cost.

7- With only one firm in a monopoly market, there is so distinction between the firm and the industry.

8- The demand curve the face monopolist is perfectly elastic

9- Monopolist maximize its profit at MR = MC

10- Consumer surplus is less in the case of a perfectly competitive industry than monopoly.

Part B: multiple choice questions

Circle the appropriate answer

1- If a single firm can produce industry output at a lower cost than any other number of firms, this is called:

a) an increasing cost industry b- a natural monopoly

c- the marginal output rule d- none of the above

2- Under monopoly in the long-run the firm will earn:

a- positive economic profit b- zero economic profit

c- negative economic profit d- cannot tell from information given

3- Equilibrium for a monopolist occurs when

a- price equals marginal cost

b- price equals marginal revenue

c- price is less than average cost

d- marginal revenue equals marginal cost

4- A firm's long run production situation occurs when

a- it is earning profits b- there are no fixed factors

c- total cost is minimized d- total revenue is maximized

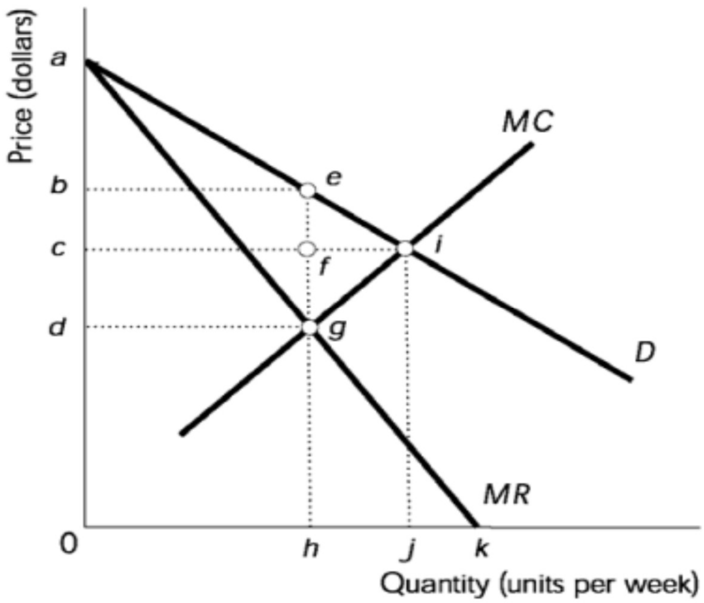
5- If a monopoly is producing at an output level at which marginal revenue exceeds marginal cost in order to increase its profit will

a- raise its price and decrease its output b– lower its price and increase its output

c– raise its price and increase its output

d– lower its price and decrease its output

According to the following figure answer the questions of (6) to (10)



6– In the figure above, monopoly will set price

a– a b– b c– c d– d

7– In the figure above, a monopoly will produce at output

a– k b– j c– h d– none of the above

8– In the figure above, the transfer of consumer surplus from consumers to the producer caused by production under a monopoly instead of perfect competition is the area of

a– trapezoid b – rectangle begd

c– rectangle befc d– triangle abe

9- In the figure above, consumer surplus at the price that maximizes the profit for a monopolist is the area of

a- triangle eig b- triangle abc

c- rectangle ohgd d- rectangle oheb

10- In the figure above the deadweight loss from production under a monopoly

a- triangle aic b- triangle aeb

c- triangle eig d- triangle eif

Problems

Problem 1

Suppose a monopolist has demand function P = 240 – 2Q and TC = 100 +Q

<u>Required</u>

- Calculate the optimal price y the following approaches

1- by using total revenue and total cost

2- by setting MR = MC

3- by Robert Weinberg function

4- Applying the inverse elasticity price rule **(IERR)**

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Chapter

A. ELASTICITY OF DEMAND AND SUPPLY

Second-graders, it is found know this: An increase in supply, because of an abundant harvest or for whatever reason, is Likely to depress price. So it is no surprise that Gregory King, the English writer of the seventeenth century, mentioned earlier should have remarked on this fact. But King also observed a fact perhaps less obvious. His statistical studies convinced him that farmers as a whole receive less total revenue when the harvest is good than when it is bad!

This fact, that high agricultural Q tends to be associated with low P x Q, is one that every American president and European chancellor has to reckon with in facing the farm problem. To understand it and to lay the groundwork for the discussion of farm problems, we must in this chapter consider and master a new and important economic concept, "elasticity of demand." Henry Ford, and any other business head tempted to cut price in order to sell more goods and make more profit, must also be interested in the concept of elasticity. And when a regulatory commission lets a public utility raise its prices in order to cut down on losses, the elasticity or demand concept has to be crucially involved.

Elasticity of Demand

Various goods differ in the degree to which the Q bought will respond to changes in each respective P. Wheat Q may go up much less than 1 per cent for each 1 per cent cut in wheat P; Henry Ford's Q may rise far more than 1 per cent for each I per cent reduction in its P. In between is the borderline case of a good whose Q exactly halves when P doubles–where percentage changes are just in balance.

Elasticity of demand is a concept devised to distinguish these three cases. Thus, the first case of weak percentage response of wheat Q to P is put in the category of "inelastic demand. The second case of great percentage response of Q to P is put in the category of "elastic demand." The borderline case is called "unitary elasticity of demand."

Here is how the economist goes about defining the three cases:

The crucial thing to concentrate on is the total dollar revenue that buyers pay to sellers. If consumers buy 5 units at $3 each, what is total revenue? Total revenue is always, by definition, price times quantity, or the $15 product P X Q , By arithmetic multiplication, total revenue can always be calculated for each point in a demand schedule or diagram.

Elasticity of demand is important primarily as an indicator of how total revenue changes when a fall in P induces a rise in Q along the same dd demand curve.

Definition of elasticity of demand: This is a concept devised to indicate the degree of responsiveness of Q demanded to changes in market P. It depends primarily upon percentage changes and is independent of the units used to measure Q and P. Elasticity ends up qualitatively in one of three alternative categories:

1. When a cut in P raises Q so much as to increase total revenue P x Q, we speak of elastic demand−or of demand elasticity greater than unity. The percentage change in Q exceeds the percentage change in P. E_d >1.

2. When a percentage cut in P results in an exactly compensating percentage rise in Q so as to leave total revenue P x Q exactly unchanged, we speak of unitary elasticity of demand−or of demand elasticity numerically equal to unity. E_d = 1.

3. When a percentage cut in P evokes so small a percentage increase in Q as to make total revenue P x Q fall, we speak of inelastic demand−or elasticity that is less than unity (but not less than zero). E_d <1.

Graphical Depiction Figure 1 gives a graphic example of the three cases. In each case, P is shown halved from A to B (but we could as well have used any small percentage change in P). Perhaps at a first glance, it will be easiest to begin with the borderline case of unitary elasticity of demand.

In Fig. 1 (b), the doubling of Q exactly matches the halving of P, with the result that the total revenue collected remains unchanged at $1,000. This can be shown graphically by comparing certain rectangular areas. How? Price and quantity can be easily read off the curve at any point. But how do we read off total revenue, which is their arithmetic product P x Q? When we recall that the area of a rectangle is always equal to the product of its base times its altitude, the answer is easy and goes pretty much as follows:

Total revenue at any point is always as shown by the area of the rectangle which that point makes with the two axes. (Check that the shaded rectangle at A does have a base equal to Q and an altitude equal to P.) Hence, if our eye watches how the area of each point's rectangle changes as we cut price and move down the demand curve, we can know in which of the three categories of elasticity such a movement happens to fall.

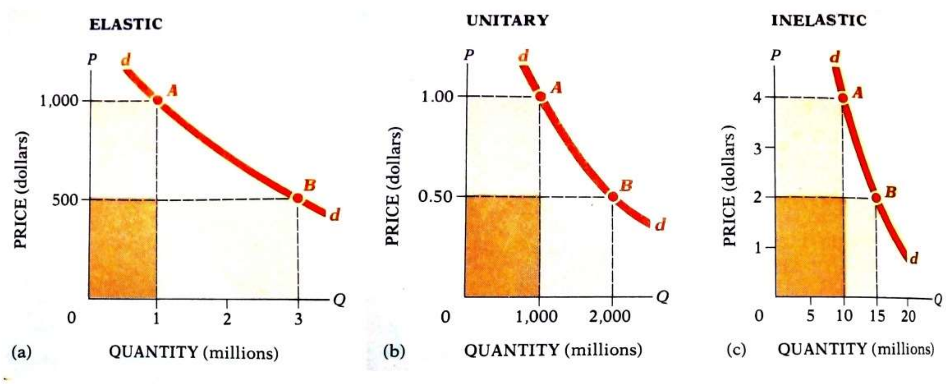

Figure. 1

Elasticity of demand comes in three cases, depending on how total revenue moves

in cutting P from A to B, we raise, leave unchanged, or lower the rectangle of total revenue, depending on whether demand is eastic, unitary elastic, or inelastic. That is, elasticity of demand at any point depends on percentage response of Q there to sach percentage change in P.

Clearly, in the middle diagram, the shaded revenue areas are remaining exactly the same because of offsetting changes in the Q bases and P altitudes of the rectangles. Consequently, this is a case neither of elastic nor of inelastic demand; rather, it is the borderline case of unitary elasticity of demand.

The reader can now verify that Fig. 1 (a) does correspond to elastic demand. Here total revenue goes up when P is cut; hence, elasticity is greater than unity.

Figure 1 (c) corresponds to the opposite case of inelastic demand. Here, total revenue falls when P is cut because elasticity is less than unity.

Which diagram represents the Gregory King finding that smaller harvests meant higher total revenues for farmers? Which represents Henry Ford's belief that if only he could reduce his car's price, he would meet a great increase in cars sold? Surely, 1 (c) and 1 (a), respectively.)

Numerical Measurement of Elasticity: A Digression'[7]

The general notion is now clear. Elastic, inelastic, and unitary elastic are terms that indicate the percentage responsiveness of quantity to price and also how total revenue changes when P and Q change. But some readers will be curious to know how these qualitative cases can be given exact numerical measurement by economists. What does it mean to say that the elasticity of demand is 1.0? 2.3? 5? To answer this question, we give the following numerical definition for a coefficient of demand elasticity, E_g, between two different price points on a demand curve:

Elasticity coefficient $\boldsymbol{E_d = \frac{per\ cent\ Q\ rises}{per\ cent\ cut\ in\ P}}$

Note that the movements of P and Q are in opposite directions because of the law of downward-sloping demand. Note, too, the use of

[7] In a short course, the next two sections may be skipped.

percentages, bringing in the nice property that the units of a good or money–bushels or pecks, dollars or cents or francs–don't affect elasticity.[8]

Do not get bogged down in numerical details of E_d calculation. After mastering the general idea of elastic, inelastic, and unitary–elastic demand, you can tackle numerical examples.

Always there is a slight ambiguity about percentage changes. Suppose a grocer buys bread for 60 cents and sells for 90. Is that the 50 per cent markup that comes from relating the change of 30 to the lower base 60? Or is it the $33\frac{1}{3}$ per cent change that comes from relating 30 to the higher base 90? No one answer can be said to be right, and no one answer can be said to be definitely wrong.

Fortunately, when it comes to very small percentage changes, as from 100 to 99 or from 100 to 101, the difference between $\frac{1}{100}$ and $\frac{1}{99}$ becomes hardly worth talking about. For small changes, it matters little

[8] Units will affect the slope of the demand diagram, just as the drafting expert can make a curve look steep or flat in slope by changing the scale of one of the axes. So the purpose of the next section is to help you avoid confusing slope and elasticity. As Fig 1(b)'s curve with E_d =1 shows, it is not a straight line with constant slope that corresponds to a curve of constant elasticity, but rather, one whose slope varies in order to keep the percentage changes in the same ratio.(Mathematicians call the unitary–elastic curve ["rectangular"] hyperbola and know that it plots as a straight line on double–log paper)

how you calculate the percentage change. But for larger ones, it may make quite a difference, and no single answer can be declared to be the right one.

9

What is a good rule to use? As good a rule as any is to relate the price change to neither the higher nor the lower of the two Ps, but to their average. Thus is a cut from 101 to 99 a change of $\frac{2}{99}$ or $\frac{2}{101}$? By our convention, it is neither: we call it a change of $\frac{2}{100}$ because the average of 99 and 101 is (99+101)/2 = 200/2 = 100.

NUMERICAL CALCULATION OF ELASTICITY COEFFICIENT

Q	ΔQ	P	$-\Delta P$	$\frac{Q_1 + Q_2}{2}$	$\frac{P_1 + P_2}{2}$	$E_d = \frac{\Delta Q}{(Q_1 + Q_2)/2} \div \frac{-\Delta P}{(P_1 + P_2)/2}$
0		6				
	10		2	5	5	$\frac{10}{5} \div \frac{2}{5} = 5 > 1$
10		4				
	10		2	15	3	$\frac{10}{15} \div \frac{2}{3} = 1$
20		2				
	10		2	25	1	$\frac{10}{25} \div \frac{2}{1} = .2 < 1$
30		0				

TABLE 1
Dividing percentage price cut into percentage quantity rise gives numerical elasticity
Each P cut, $-\Delta P$, is related to the average P, namely, $(P_1 + P_2)/2$; each Q rise, ΔQ, to the average Q, namely, $(Q_1 + Q_2)/2$; the resulting ratio gives numerical E_d, a measure expressed in percentage (dimensionless) units, not in absolute slope units. [Test: Show that a cut in P raises total revenue when $E_d > 1$: thus, $4 \times 10 > 6 \times 0$. How does PQ change when P is cut from 4 to 2 and $E_d = 1$? When $E_d < 1$ and P is cut below 2?]

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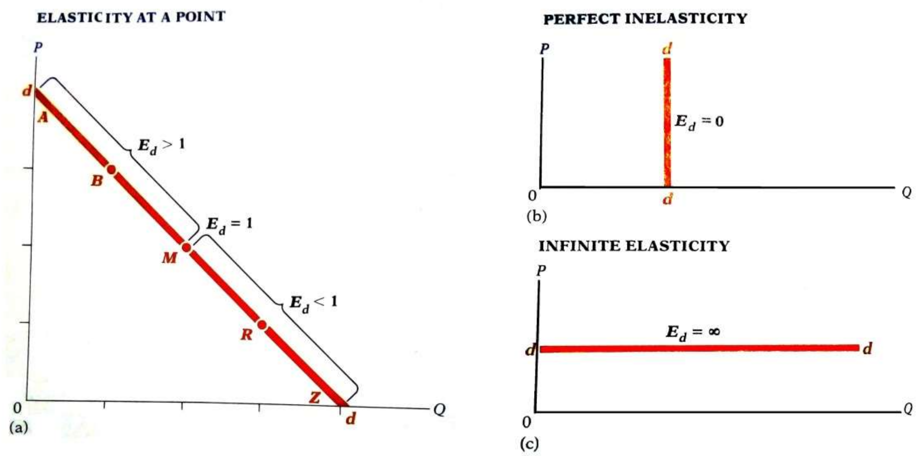

FIG. 2

Absolute slope and percentage elasticity are not the same thing

All points on dd's straight-line demand in (a) have same absolute slope: but above the midpoint price, demand is elasic: below it, demand is inelastc; at it, demand is unitary elastic. Only in the case of perfectly vertical or perfecily horizonal curves, as in (b) and (c), can you infer inelasticity and elasticity from slope alone.

Table 1 is self-explanatory: it shows how to calculate E_d, for three movements along a dd curve. We shall be seeing that most dd curves start out elastic at high P and end up inelastic at low P, passing through unitary elasticity at an intermediate position where total revenue P X Q is at its maximum. Table 1 illustrates this.

Graphical Measurement of Elasticity: A Digression

Students tend to make a simple mistake. They often confuse the slope of a curve with its elasticity. They think a steep slope on dd must mean inelastic demand, and a flat slope must mean elastic demand. This is not quite true. Why not? Because slope of dd depends upon absolute change in P and Q, whereas elasticity was seen to depend upon percentage changes.

The straight line dd in Fig 2(a) illustrates the fallacy of confusing slope and elasticity. Everywhere it has the same absolute slope. But toward the top of the line, P is high with is percentage change therefore low, and O is very low with its percentage change therefore almost infinitely great. So our numerical formula for E_d gives a very great E_d when you are high on the dd curve.

Thus, above the midpoint M of any straight line, demand is elastic, with $E_d>1$. At the midpoint, demand is of unitary elasticity, with $E_d=1$. Below the midpoint, demand is inelastic, with $E_d < 1$.[10]

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[10] Intermediate books tell how to calculate E_d at any one point on a straight line: $E_d$equals the length of the line segment the point divided by the length of line segment above it. Since M is halfway, the formula there gives $E_d = 1$, unitary elasticity. At B, it gives $3/1 = 3.0$; at R, E_d, = $1/3$= 33.

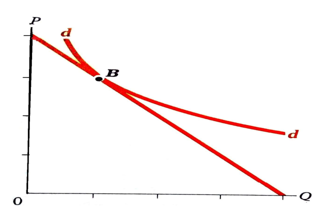

Figure 3

Knowing how to calculate E_d for a straight line enables you to calculate it for any point along a curved dd. (l) Draw with a ruler the straight line tangent to the curve at your point (e.g., at B in Fig 3); (2) calculate the E_d for the straight line at that point (e.g, E_d at B =3/1); (3) identity your resulting as the correct elasticity for the dd curve at your chosen point. Question 6,exercises, proves the truth of the geometrical rule for calculating E_d

Note: E_d at a point can be shown to be mathematically equivalent to the following calculus limit:

$$-\frac{\Delta Q}{Q}+\frac{\Delta P}{P}=-\frac{P\Delta Q}{Q\Delta P}\rightarrow\frac{P\,dQ}{Q\,dP}$$

as ΔP goes to zero, taking ΔQ with it and making it immaterial which of the Ps and Qs or their averages we use to compute percentage changes. Intermediate texts show that, when you
Put dd on double-log paper, it becomes correct to identify slope with elasticity–because double-log paper does measure percentage changes.

When many people make the same mistake, there is usually a reason. The limiting cases of completely vertical and completely horizontal demand curves,, shown in Fig. 2(b) and (c), do validly portray the limiting cases of completely inelastic and infinitely elastic demands.

But do not think that the in-between cases, where most of reality falls, can have their elasticities depicted by slope alone.

Now, we end our digressions and go back to the mainstream of demand and supply.

Elasticity of Supply

What we did for demand, we can do also for supply. Economists introduce the concept of "elasticity of supply" to give an indication of the "percentage increase in the amount of Q supplied" in response to "a given percentage rise in competitive P." (Note that in the case of a rising supply curve, we now speak of an increase in P–not of a decrease in P, as we had to do in the case of a downward-sloping demand curve.)

Suppose the amount supplied is perfectly fixed, as in the case of perishable fish brought to today's market for sale at whatever price it will fetch. Then we face the limiting case of perfectly inelastic, or vertical, supply.

Suppose, instead we have a horizontal supply curve (the "constant-cost" case.) Now the slightest cut in P will cause Q to become zero and the slightest rise in P will coax out an indefinitely large supply, now we find ourselves at the other extreme of infinitely elastic supply.

Between Such extremes, we call supply elastic or inelastic depending upon whether the percentage rise Q is respectively greater than or less than the percentage rise in P bringing it about.[11]

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11 A numerical coefficient of supply elasticity E, is defined thus: E_s = (percentage rise in Q)/(percentage rise in P). Figure 4 shows three straight-line supply curves: at A the line going through the origin has elasticity of exactly 1.0; the steeper curve with

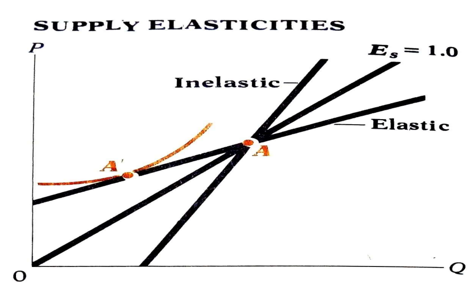

FIG. 4

intercept on the Q axis is inelastic, with elasticity coefficient less than 1; and the flatter curve is elastic, with elasticity coefficient greater than 1. Verify that supply is elastic at A'. (If–as we shall see can happen–the supply curve actually bends up backward, elasticity of supply as here defined could actually become negative.)

Also, for a supply curve with curvature, one can reckon its elasticity at a point A' by drawing a straight line with a tangential ruler and seeing which line of Fig. 4 it resembles. or plot it on double-log paper and study its slope at A', in comparison with that of a 45° line.

Supply elasticity is a useful concept but not quite so useful a one as demand elasticity, for the reason that elasticity of demand has the major additional function of telling us what is happening to total revenue.

There is, however, an important fact that supply elasticity can help describe. A given change in price usually tends to have greater and greater effects on amount supplied as we move from the momentary situation to a short-run period of time, and then to the long-run period. This means:

Elasticity of supply tends to be greater in the long run, when all adjustments to the higher price have been made, than in shorter periods of time.

Let us see why.

Momentary, Short-Run, and Long-Run Equilibrium

Alfred Marshall, Cambridge University's great economist at the turn of the century, helped forge these tools of supply and demand. We can review our understanding of equilibrium and at the same time advance our knowledge if we survey Marshall's important emphasis on the time element involved in competitive price equilibrium. He distinguishes at least three time periods:

1. momentary equilibrium, when supply is fixed

2. short-run equilibrium, when firms can produce more within given plants

3. long-run equilibrium (or "normal price).

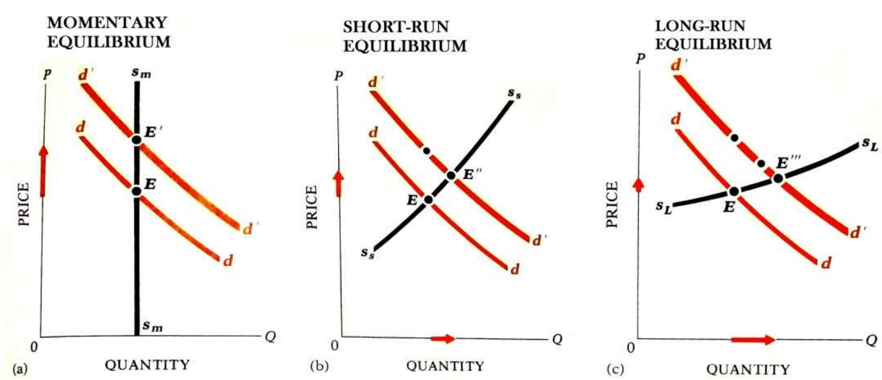

FIG 5

Effect of increase in demand on price varies in Marshall's three time periods

We distinguish between periods in which Supply elements have time to make (a) no adjustments (momentary equillbrium), (b) some adjustments of labor and variable factors (short-run equilibrium), (c) full adjustment of all factors, fixed as well as varying (long-run equilibrium). The longer the time for adjustment, the greater the elasticity of supply response and the less the rise in price.

when firms can abandon old plants or build new ones and when new firms can enter the industry or old ones leave it.

Consider the demand for a perishable good, such as fish that cannot be preserved. Let demand increase from dd to d'd'. With the amount of fish supplied unchanged, the stronger demand will sharply bid up the momentary price of fish. This is shown in Fig 5(a), where the fixed supply curve $S_m S_m$ runs up to the new demand curve d'd' to determine the new, sharply higher momentary equilibrium price shown at E'. The price has had to rise so much in order to ration the limited supply of fish among the now more eager demanders.[12]

But with so high a price prevailing in the market, skippers of the fishing boats will soon be motivated to hire more hands and to use more nets. Even if they do not have the time to get new boats built, they will in the short run begin to bring to the market a greater supply of fish than they did at the old momentary equilibrium. Figure 5(b) shows the new $s_s s_s$, short–run supply schedule. See how it intersects the new demand curve at E", the point of short–run equilibrium. Note that this equilibrium price is a little lower than the momentary E' price. Why? Because of the extra supply of fish induced in the short run by more intensive use of the same number of boats.

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[12] If the short–nun stock of goods could be carried over into the future without perishing the $S_m S_m$. curve would not need to be perfectly vertical. Marshall points out that at temporarily low present p_s, people might want to reserve some of their supply for the future. This gives the the $S_m S_m$curve some positive slope.(some present OPEC oil can be reserved tor future sale.)

Figure 5(c) shows the final long-run equilibrium, or "normal, price. The higher prices that long prevailed have coaxed out more shipbuilding and attracted more trained sailors into the industry. Where the long-run supply curve $s_L s_L$, intersects the demand curve d'd' at E" is the final equilibrium reached after all economic conditions (including number of ships and shipyards) have adjusted to the new level of demand.

Note that the long-run equilibrium price is not so high as the short-run equilibrium price, and not nearly so high as the momentary equilibrium price. Yet it is a little bit higher than the price that prevailed previously when demand was lower. Marshall would call this a case of increasing cost." He would regard it as the normal one to be met in most sizable competitive industries.

Why normal? Because, when a large industry (which has already achieved economies of large- scale production) expands, it must coax workers, ships, nets, and other productive inputs away from other industries by bidding up their prices and thus its own cost. So the long-run supply curve $s_L s_L$, wil usually be sloping gently upward as in Fig 5(c). Only if the industry is small compared with the total of all other users of its factors will Marshall's $s_L s_L$ curve in Fig, 5(c) be horizontal-which is called the case of "constant cost.

Readers can test their understanding of all the foregoing discussion by now assuming a downward shift in the demand curve back to dd. Show what happens in the new momentary run, in the short run, and in the long run.

The Appendix to this chapter presents various cases of supply and demand.

B. APPLIOATIONS AND QUALIFICATIONS OF SUPPLY AND DEMAND

Other things being equal, as economists are fond of saying there is a unique schedule of supply or demand in any period of time. But other things will not remain equal.

The demand for oil is rising over the years because of growth in population and auto ownership. The supply schedule for computers is shifting because technological progress permits more to be produced at the same cost. As costs and tastes change, as incomes Vary, as the prices of substitute products (coffee in relation to tea) or of cooperating products (sugar in relation to tea) change, our schedules will shift. What are the effects on consumption, production, and price? That we now study.

All beginners in the field of economics must beware of a common error. They must take care not to confuse an increase in demand–by which is meant a shift of the whole curve to the right and upward, as more is now bought at each same price–with an increase in the quantity demanded as a result of moving to a lower price on the same demand curve.

By "demand" is meant the whole demand curve; by "supply is meant the whole supply curve by an "increase in demand or supply is meant a shift of the whole curve in question to the right, To indicate a single point on a demand curve, we speak of the "quantity bought or the "quantity demanded at a particular price. A movement along the same curve is "a change in the quantity demanded as a result of a price change." It does not represent any change in the demand schedule.

The need for this warning will become apparent in a moment.

Incidence of a Tax

We can illustrate the case of a shift in the entire curve by referring to supply and demand schedules for a good like wheat. Figure 3 shows an equilibrium price at E of $3 before the imposition of a tax.

Let us now introduce a new factor, which will disturb this equilibrium. In particular, assume that the government imposes a sales tax on wheat. On each and every sale, the producer is required to pay a tax of $1 per bushel of wheat.

What is the final effect, or what economists call the "incidence," of the tax? Is its burden shifted back completely onto the producer, who must pay it legally in the first instance? Or may it be shifted forward in part to the consumers? The answer can be determined only from our supply and demand curves.

There is no reason for the demand curve of the consumers to have changed at all. At $3, consumers will still be willing to buy only 12 (million) bushels; they neither know nor care that the producers must pay a tax.

But the whole supply curve is shifted upward and leftward: leftward because at each market price the producers will now supply less as a result of the tax; upward because, to get the producers to bring any given quantity to market, say, 12 (million units, we must give them a higher market price than before−$4 rather than $3, which is higher by the exact amount of the $1 tax the producer must pay.

Here in Fig. 6, the demand curve dd is unchanged, but the supply curve SS has been shifted up everywhere by $\$1$ to a new vertically parallel supply curve s's'.

Where will the new equilibrium price be? The answer is found at the intersection of the new demand and supply curves, or at E', where s's' and dd meet. Because supply has decreased, the price is higher. Also, the amount bought and the amount sold are less. If we read the graph carefully, we find that the new equilibrium price has risen from $\$3$ to about $\$3\frac{2}{3}$. The new equilibrium output, at which purchases and sales are in equilibrium, has fallen from 12 (million) per month to about 10.6 (million) bushels.

Who pays the tax? Well, the wheat farmers do in part, because now they receive only $\$2\frac{2}{3}$, $\$3\frac{2}{3} - \$1)$, rather than $\$3$. But the consumer also shares in the burden. Why? Because the price received by the producer has not fallen by as much as the tax. To the consumer, the wheat now costs $\$2\frac{2}{3}$ plus the $\$1$ tax, or $\$3\frac{2}{3}$ in all. Because consumers want wheat so badly, they pay $\frac{2}{3}$ of the tax, and producers pay $\frac{1}{3}$ of the tax.[13]

[13] There is another and equivalent way to handle this tax problem. If consumers were thought of as paying the tax in the first instance, you could subtract $\$1$ everywhere from their dd curve. This new d'd' will intersect ss at the same new Q, and the same $\$2\frac{2}{3}$ and $\$3\frac{2}{3}$ prices will prevail. It goes without saying that all these figures are hypothetical.

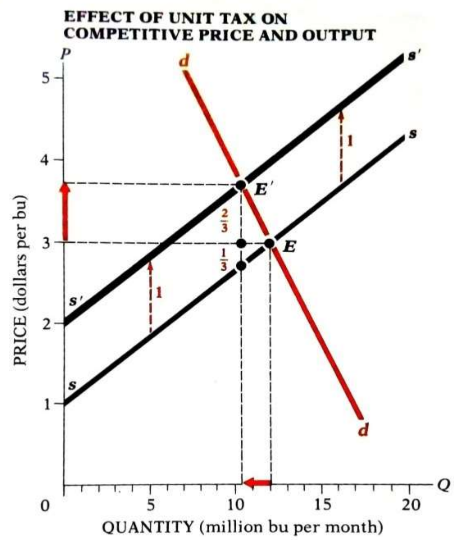

FIG.6

Wheat tax falls on both consumer and producer

A $1 tax shifts ss up $1 everywhere to give parallel s's'. This intersects dd in new equilibrium at E', where price to consumer has risen $ $\frac{2}{3}$ above old E equilibrium and where price to producer has fallen by $ $\frac{1}{3}$. The orange arrows show change in P and Q. (Had dd been very elastic and flat relative to ss, most of the $1 tax would have fallen on the producer. Had ss been completely horizontal, the whole $1 tax would have been shifted forward onto the consumer.)

To check your understanding of the above reasoning, consider the case of an opposite shift in supply. Let the government pay producers a subsidy of $1 per bushel instead of taxing them this amount. Shift ss down to the new curve s"s" Where is E", its intersection with dd? What is the new price? The new quantity? How much of the benefit goes to the producer? How much to the consumer?

Summary: A sales tax on a good will raise its price most and reduce its quantity least when the demand curve is most inelastic. When the supply curve is most inelastic, Q and P to the consumer will change least, while P to thee producer falls most.

The tax is shifted forward onto the consumer when dd is very inelastic. It is shifted backward onto the producer when ss is relatively the more inelastic.

Only with the apparatus of supply and demand can one analyze the incidence of various different taxes–gasoline taxes, import tariffs, cigarette and liquor excises, payroll and corporation taxes, etc.

A Common Fallacy

By now you have mastered supply and demand. Or have you? You know that a tax will have the effect of raising the price that the consumer will have to pay. Or do you know this? What about the following argument of a kind often seen in the press and heard from the platform:

The effect of a tax on a commodity might seem at first sight to be an advance in price to the consumer. But an advance in price will diminish the demand. And a reduced demand will send the price down again. Therefore it is not certain, after all, that the tax will really raise P.

What about it? Will the tax raise the price or not? According to the editor's written word and the senator's oratory, the answer is, No.

We have here an example of the treachery of words. One of the four sentences in the quotation is false because the word "demand" is being used in the wrong sense. The student has already been warned against confusing a movement along an unchanged curve with a shift in the curve. Actually, the only correct answer would have to be formulated more or less as follows:

A tax will raise the price to consumers and lower the price received by producers, the difference going to government. At the higher price a smaller quantity will be bought by consumers.

This is as it should be, because producers are also supplying a smaller quantity at the lower price which they receive. Thus the amounts willingly bought and sold balance out where the new supply and demand schedules intersect, and there will be no further change in Price.

Is the Law of supply and Demand immutable?

Competitive price and quantity are determined by supply and demand. But does not price depend on other factors, such as the amount of money created by government or whether inflation is going on?

Actually, price does depend on many such factors. However, they are not in addition to supply and demand, but are included in the numerous forces which determine or act through supply and demand. Thus, if government's printing of currency gives everyone a higher income, that will raise demand curves and raise prices. But it is still true that competitive price is determined by supply and demand.

At this point a thoughtful reader might protest. Little has been said about competitive price as being determined by cost of production. Should not this be listed as a third factor in addition to Supply and demand? Our answer is firmly, No.

Competitive price is affected by the cost of production only to the extent that such cost affects supply.

If God sends nutritious manna from heaven without cost but in limited supply, then its price will not be zero: its P will be given by the intersection of the demand and supply curves. On the other hand, if it would cost $50,000 to print the national anthem on the head of a pin, but there is no demand for such a commodity, it simply will not be produced and would not command $50,000 if it were produced. (What the market price of something nonexistent should be called is left to the reader's pleasure.)

This does not mean that cost of production is unimportant for price determination. Under competition it is especially important. But its importance shows itself through its effects upon supply.

Businesses produce for profit. If they cannot get a price high enough to cover their past costs, then they will not like it. Nevertheless, once the crop is in, so to speak, there is not much they can do about it under competition. They have no choice but to minimize their short-term losses. But they will not continue in the future to supply goods at prices that fail to cover the extra costs incurred to produce these goods.

Thus supply does depend critically on cost, especially on what will call "extra" or "marginal cost. And so price also must depend on cost–through cost's effects on SS.

WARNING: To say that "price equals cost" does not in itself tell us which is the cause of which. In many cases where an industry uses a productive factor highly specialized to itself (e.g. baseball players, opera singers, vineyard land), price determines cost rather than vice versa. Grain land is dear because the price of grain is high. Apartment buildings sell for high prices because the rents they can command are high.

This type of relationship is overlooked by the farmers who petition for a higher milk price "because the price of cows is high." If their request were granted, they would soon observe the price of cows chasing the milk price upward.[14]

Useful Categories Thus, supply and demand are not ultimate explanations of price. They are merely useful catchall categories for analyzing and describing the multitude of forces, causes, and factors impinging on price. Rather than final answers, supply and demand simply represent initial questions. Our work is not over but just begun.

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[14] Where a factor of production is inelastic in supply, as in all these cases mentioned here, its cost is price-determined nether than price-determining and its return is then called a pure economic rent. For more on this concept of pure economic rent.

This should help to debunk the tendency of neophytes to utter sagely, "You can't repeal the law of supply and demand. King Canute knew he could not command the ocean tide to retreat from his throne on the seashore. Likewise, no government or cartel can get around, or interfere with, the workings of supply and demand.

It would be better not to have learned any economics than be left with this opinion. Of course the government can affect price. It can do so by affecting supply or demand, or both. We shall examine how government programs for restricting farm production can raise price and income by cutting down on supply.

Similar programs by government cartels have been pursued all over the world. The Organization of Petroleum Exporting Countries (OPEC) forced oil prices up tenfold in the 1970s! Brazil used to burn coffee to raise its price. Britain during the1920s tried artificially controlling the price of rubber. Sugar and cocoa are still under international control.

These governments have not violated the law of supply and demand. They have worked (not always to good purpose) through the law of supply and demand. The state has no secret economic weapons or tricks. What is true for the state is also true for individuals. Anyone can affect the price of wheat who has either sufficient money to throw on the market or wheat to hold off the market.

Trade unions often influence wages, or try to, by directly or indirectly affecting the supply of labor. Any firm with a somewhat distinctive commodity may try by advertising to increase the demand for its product and, by restricting supply, to raise the price above its extra costs of production.

It should be emphasized, however, that as soon as individual producers grow in size and become important enough to affect the price of the things they sell, they cease to be perfect competitors in the strict sense. Then their behavior has to be analyzed in terms of a blend of monopoly and competition, i.e., in terms of imperfect or monopolistic competition.

Prices Fixed by Law

There is one genuine interference with supply and demand whose effects we must analyze. The government sometimes sets by law a maximum price or a minimum wage. In war or in peace, wage and price controls may be legislated by government–as, for example, in the Nixon Phase I and Phase II programs of the early 1970s. Thus, in the1980s, a floor above $4 in the form of a minimum hourly wage will soon apply to most workers.

These interferences by law are quite different from government actions, previously described, which work through supply and demand

Price Celling's and Rationing Consider, say the market for gasoline, which has ordinary curves of supply and demand such as we have repeatedly met in this chapter. Suppose that the government, through an office of energy price control, establishes an order prohibiting gasoline from rising above $1 a gallon. Now, because of geologic depletion or OPEC cartels, let demand be so high and supply so small that the equilibrium price would have been $2 a gallon if the government had not intervened This high price would have contributed to "profiteering in the industry; it would have represented a rather heavy "tax on the poor who could ill afford it; and it would only have added fuel to an inflationary spiral in the cost of living, with all sorts of inflationary reactions on workers wage demands. So go the arguments of price fixers.

Therefore, the government, through its energy office, opts to hold the line on prices. It passes a law putting a maximum price on gasoline at the old level of $1 a gallon. The ceiling-price line CJK in Fig. 7 represents the legal price ceiling. Now what will happen?

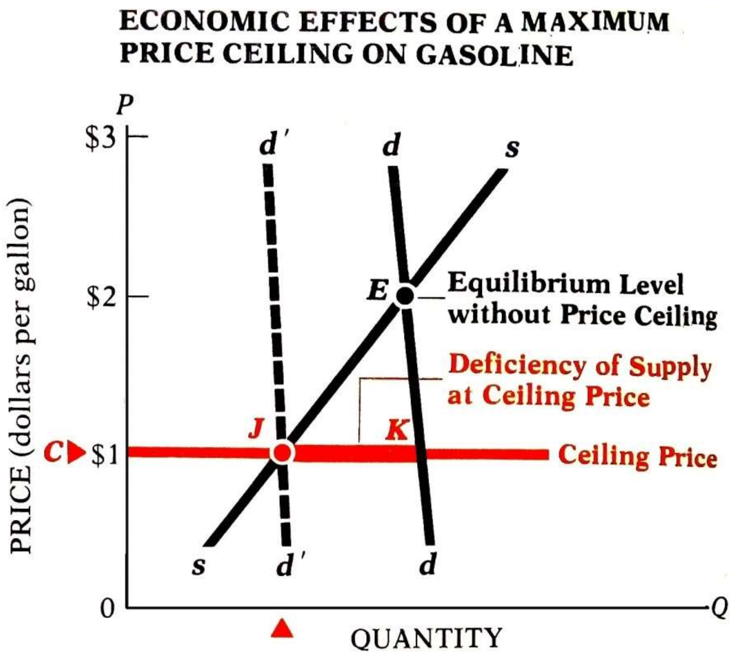

FIG. 7

A legal maximum price, without rationing, leaves a gap between demand and supply

Without a legal price ceiling, price would rise to E. At the artificial ceiling price, supply and demand do not balance and some method of rationing, formal or informal, is needed to allocate the short supply and bring the effective demand down to d'd'.

At the legal ceiling price, supply and demand do not match. Consumers want thousands of gallons of gasoline in excess of what producers are willing to supply. This is shown by the gap between J and K. This gap is so large that there will not long be enough fuel in dealers' pumps or warehouse tanks to make up the difference. Somebody will have to go without. If it were not for the maximum-price law, this somebody would gladly bid the price up to $1.50 or $1.75 or more, rather than do without gas. We could have shown this by putting an upward-pointing arrow perpendicular to JK. Such an arrow would not stop pointing up till P had been bid up to the equilibrium level of $2.

But it is against the law for the consumer to bid a higher price. Even if the consumer should be so unpatriotic, the seller could not legally take the higher price. There follows a period of frustration and shortage-a game of musical chairs in which somebody is left without a seat when the music stops playing. The inadequate supply of gasoline must somehow be rationed. At first, this may be done by "first come, first served," with or without limited sales to each customer. Lines form, and much time has to be spent foraging for fuel. But this is no solution, since somebody must be left at the end of the line when the gasoline is gone.

The price mechanism is stymied and blocked. Nonmonetary considerations must determine who is the lucky buyer and who the unlucky one: the customer's previous standing at the station in question, the amount of other things the customer is willing to buy, or the accident of being on the spot when the pumps are opened.

Nobody is happy, least of all the harassed dealer. Were it not for the community s elementary sense of fair play, the situation might soon become in- tolerable. Patriotism is more effective in motivating people to brief acts of intense heroism than to putting up day after day with an uncomfortable situation. It is no wonder that black markets occasionally develop; the really surprising thing is that they do not occur sooner.

If for political or social reasons market price is not to be permitted to rise high enough to bring quantity demanded down to the level of quantity supplied, the ultimate solution may require outright allocation or consumer rationing.

Once rationing is adopted and tickets are handed out according to family size and occupational need, many people heave a sigh of relief, because now sellers need not turn people away and now buyers can count upon getting their fair quota of the limited supplies. Of course, there are always some cranky customers, longer on intuition than brains, who blame their troubles on the mechanism of rationing itself rather than on the shortage. "If only the government could print more ration tickets, they sigh. Such people are like the ignorant ancient kings who used to slay the messengers bringing them bad news.

Just how do ration coupons work out in terms of supply and demand P Clearly, one must try to issue just enough of them to lower the demand curve to d'd', where supply and the new demand balance at the ceiling price. If too many coupons are issued, demand is still too far to the right and we encounter the old difficulties, but in lesser degree. If too few coupons are issued, stocks of fuel will pile up and P will fall below the ceiling price. This is the signal for liberalizing the gasoline ration.

One goes to a psychiatric ward to learn to appreciate normal human behavior. So, too, the breakdown of the price mechanism during war, or abnormal times, gives us a new understanding of its efficiency in normal times.

Goods are always scarce, in the sense that there is never enough to give everyone all he wishes. Price itself is always rationing scarce supplies: rising to choke off excessive consumption and in order to expand production; falling to encourage consumption, discourage production, and work off excessive inventories.

Minimum Floors and Maximum Ceilings When there arises any kind of emergency or state of general shortage and inflation, political pressures develop for wage and price freezes. Experience has taught most economists, whether they be liberals or conservatives, that such emergency measures work very well in short emergencies. But they tend to create more and more distortions the longer they are in effect. Economists therefore generally recommend that such direct fiats be reserved for emergency periods and not be squandered on minor peacetime situations.

Nevertheless, as Adam Smith well knew when he protested against the devices of the mercantilist advisers to the earlier kings, most economic systems are plagued by inefficiencies stemming from well-intentioned inexpert interferences with the mechanisms of supply and demand. A few such interferences are shown in Fig. 5.

1. Minimum wage rates. These often hurt those they are designed to help. What good does it do unskilled black youths to know that an employer must pay them $4.00 per hour if that fact is what keeps them from getting jobs?[15]

[15] See P. A. Samuelson, Readings in Economics (McGraw-Hill, New York, 1973, 7th ed.), for arguments by Milton Friedman against minimum-wage legislation, and other appraisals of the minimum wage pro an con also Chapter 22's Appendix for graphical analysis of economic inefficiency of controls and rationing

2. Rent and price ceilings. Everyone hates a landlord and loves a farmer. Even in peacetime, maximum rentals are often fixed by law. These fiats may do short-run good; but they may also do long-run harm. Thus, France had practically no residential construction from 1914

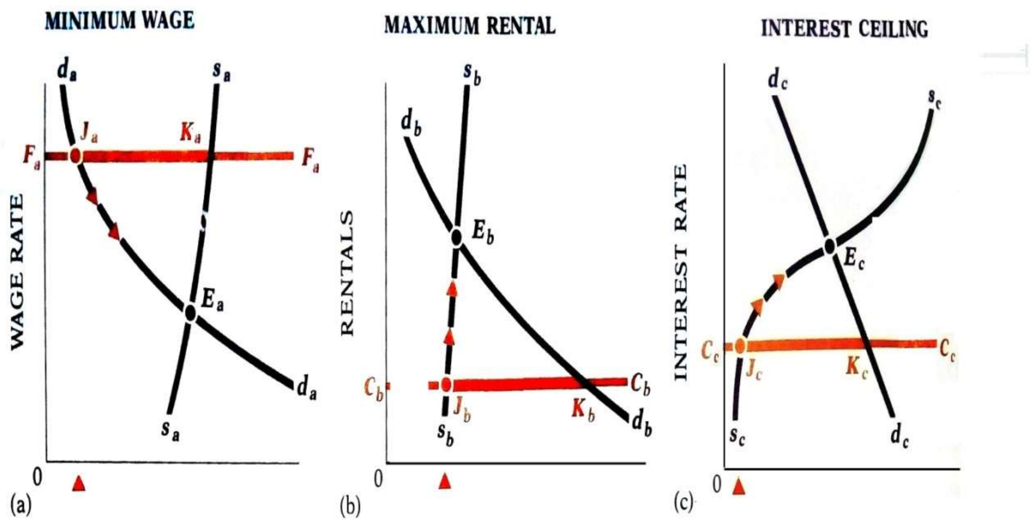

FIG. 8

when government by fiat sets maximum or minimum prices, troublesome gaps may arise

(a) Setting minimum-wage floor at F_aF_a, high above free-market equilibrium rate E_a, results in forced equilibrium at J_a. The too-high floor freezes workers into unemployment from j_a to K_a. Lowering the minimum wage moves us down along dd, as shown by orange arrows, raising employment. (If dd is elastic, total wage payrolls rise though hourly rate falls!)

(b) Setting maximum rental celling at C_b C_b far below free market equilibrium at E_b, causes fringe of unsatisfied renters between forced equilibrium at J_b and K_b. Raising the celling rate moves the system up S_bS_b. as shown by orange arrows: new construction provides more living space and old quarters are used more efficiently.

(c) Setting maximuminterest rates at C_cC_c, far below free-market equilibrium rate E_c, results in drying up of availables funds. Desperate borrowers between J_c and K_c turn to loan sharks. Raising interest celling moves system toward more

to 1948 because of rent controls. If new construction had been subjected to such controls after World War II, the vigorous boom in French residential building since1950 would never have taken place. New York City rent controls favored those lucky enough to have found a cheap apartment but inhibited new private building of low-cost housing. They discouraged economies of space utilization that high rents tend to induce. When housing was needed most, rent controls speeded up the abandonment of tens of thousands of dwellings each year.

3. Usury laws. Interest rates have always been an object of suspicion. No longer is lending at interest a crime, but in most places a maximum rate is set by law. Unfortunately, the ceiling is often far below what would be set by the competitive supply- and demand market, after account is taken of riskiness and administrative expense connected with small loans. The result? Funds dry up.

The cheap money you can't get does you little good. Veterans who tried to get mortgages learned this in the 1950s. College students trying to get tuition loans from the banks learned this in the 1960s and the 1970s. Federal Reserve ceilings on bank-deposit interest (so-called "Regulations Q") periodically cause massive withdrawals of deposits needed by the banks and S&L's to finance house mortgages (the so-called "disintermediation".

Exercises

DETERMINATION OF PRICE BY SUPPLY AND DEMAND

The concept of elasticity was devised to indicate the degree to which quantity demanded (or supplied) would respond to any price change. Compare the two demand curves D_1 and D_2: (drawn to the same scale) in Fig 1. Both curves satisfy the ordinary "law of demand": any price reduction would yield an increase in quantity bought. But D_2 is the more elastic of the two: if price were to fall from p_a to p_b, the increase in buying would be greater in the D_2 case. If price were to rise from p_a to p_b the reduction in purchases would be greater in the D_2 case.

1. a. Thus, if we say that "demand in this situation is highly elastic with respect to price, "we mean that any price reduction would produce a

(large / small) (decrease / increase) in purchases, and that a price rise would yield a (large / small) (decrease/ increase) in buying

b. Although the elasticity idea is more commonly used concerning demand, it can be used also as to the responsiveness of supply. To describe supply as "decidedly inelastic with respect to price" would mean that any price increase would call out a (large / small) (increase / decrease) in quantity offered for sale, and that any price reduction would produce a (large / small) (increase / decrease).

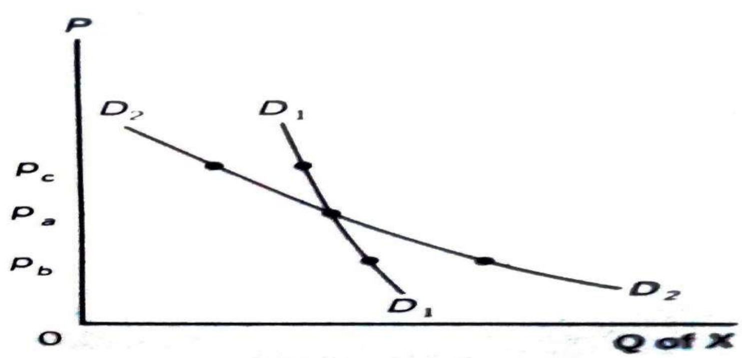

Fig 1

2. Such terms as "highly elastic" or "decidedly inelastic" are imprecise. The task now is to give a more exact meaning to elasticity.

The table below shows demand for some commodity at prices from $10 to $1. (Disregard for the moment the "Revenue column.) Use these figures to draw a demand curve in the upper part of Fig. 2.

Price	Quantity	Revenue	Price	Quantity	Revenue
$10	0	______	$5	20	______
9	4	______	4	24	______
8	8	______	3	28	______
7	12	______	2	32	______
6	16	______	1	36	______

Associated with each possible quaintly bought (and hence with each possible price) will be a certain amount of revenue received by sellers (i.e., expenditure by buyers). If price is $9, so that 4 units are bought, revenue will be $36. Show the proper revenue amounts in the 10 blanks above. They complete the lower part of Fig 2 to show the quantity revenue relation (e.g., with quantity 4, revenue is $36, etc).

3. a. Notice the interesting behavior of revenue as we move down the length of this straight–line demand curve, As price falls, revenue (or expenditures):

(1) Remains the same at all quantities purchased.

(2) Falls throughout the entire price range.

(3) First rises, reaches a peak, and then falls.

(4) First falls, reaches a minimum, then rises.

b. If price falls from \$7 to \$6, buyer expenditure (i.e., seller revenue) (rises / stays constant / falls). Any price fall brings with it a reduced-expenditure tendency, since the quantity that was bought at the higher price can now be had for less money. If price falls from \$7 to \$6, the 12 units which formerly cost \$84 can now be bought for \$72. But the price fall also produces a countertendency: a disposition to buy more. The rise in this case (from 12 to 16) (is / is not) sufficiently great to more than offset the reduced-expenditure tendency.

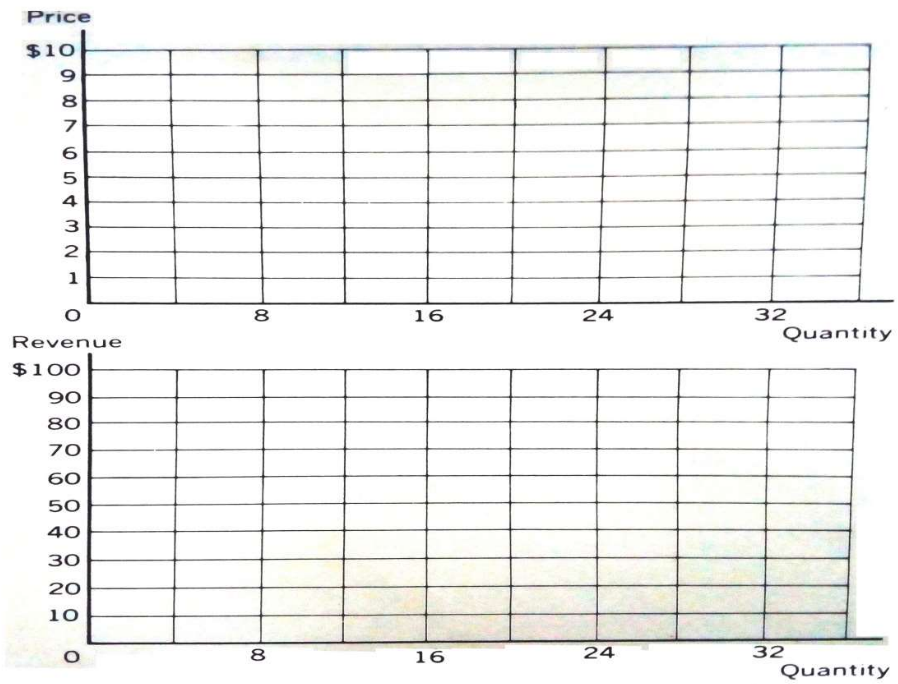

Fig 2

c. If price falls from $4 to $3, the increased-expenditure tendency (again wins over / loses to) the reduced-expenditure tendency.

4. "Price elasticity" means the responsiveness or "stretch" of quantity for any given price change. We can reach a more explicit statement of what demand elasticity means with respect to price just by using the phenomenon noted in question 3-that revenue may, for a given price change, go up, go down, or remain constant.

If there is enough "stretch in quantity demanded when price goes down to cause revenue to go up, then we designate this section of the demand curve as elastic (or as price-elastic). If revenue stays constant, it is unit-elastic. If revenue falls, it is inelastic. This means the demand curve of question 2 is elastic for prices from $_______ to $_______, and inelastic for prices from $_______ to $_______.

It happens that this demand curve does not conveniently illustrate unit elasticity. But the curve would be unit-elastic between prices $5 and $4 it the quantity associated with price $4, instead of being 24, were_______ .

5. If we say this demand curve is elastic between prices of $10 and $5, we speak of that segment of the demand curve, not just of one-way movements down the curve. As we go down the curve in this region, revenue increases. If we go up it from price $5 to price $10, revenue decreases. The degree of stretch (in this case, contraction) in quantity is here sufficiently powerful to cause revenue to decrease with any increase in price.

An elasticity definition must be a two-way street. If demand is elastic because the revenue associated with price $8 is $64 and that with price $7 is $84, then we must say it is elastic if either:

A price decrease brings a revenue increase, or

A price increase brings a revenue decrease.

The same applies to unit–elastic and inelastic sections of the demand curve. (A quick rule is: Demand is inelastic if price and revenue go in the same directions.)

Put E (elastic), U (unit–elastic), or I (inelastic) in each space below, as appropriate to each demand situation:

(1) Price falls from $6 to $5, and consumer expenditure falls from $60 to $55……………………….. (   )

(2) When price falls from S6 to $5, consumer expenditure on this commodity remains the same…………………………………… (   )

(3) Price rises from $5 to $6, and quantity purchased falls from 80 (@ $5) to 60 (@ $6…………………………………………………………..( )

4) Price drops from $6 to $5, and there is no increase in quantity purchased at all…………………………………………………………..( )

(5) Price rises from $5 to $6, and there is no decrease in quantity purchased at all…………………………………………………………..( )

(6) As the result of a certain price increase, revenue received by suppliers goes up from $2,000 weekly to $2,010………………….. (   )

(7) Because of a price increase from $5 to $5.10, buyers stop buying the commodity entirely…………………………………………………( )

6. Instructors in economics always illustrate "inelastic demand" on the blackboard by means of a steeply sloping (near-vertical) line. There is no recorded instance in history to the contrary. There seems to be no convenient alternative means of illustration. Yet, strictly speaking, this method is deceptive. For one thing, you can make the very same demand curve appear "very steep," or else "almost flat," just by manipulating the horizontal-axis scale.

For another thing, any straight-line demand curve, as question 2 illustrates, does not have uniform elasticity, It is true that the question 2 demand curve always reports the same "responsiveness" to each $1 price change: an increase (or decrease) of 4 in quantity demanded. But in percentage terms, the drop in price from $10 to $9 is (far more / much less) drastic than the drop from $2 to $1, for the latter reduction cuts the price in half. That is why the elasticity of this demand curve is different in different regions.

This means that if you take any straight-line demand curve, no matter how steep its slope, you can always find a section that is elastic with respect to price if you move (up / down) it to sufficiently (high / low) prices. (Exception: A perfectly vertical line. On this, see question 8b.)

7. Whether or not demand is elastic, unit-elastic, or inelastic with respect to a price change depends on the response in quantity. But as the preceding questions indicate, a uniform quantity response to a series of price changes which are uniform in the sense of being the same in absolute amount does not mean a uniform (constant) elasticity. To repeat question 6, the $1 price cut from $10 to $9 is in percentage terms much smaller than the cut from $2 to $1. Similarly, if the various 4-unit quantity responses are expressed as percentages of total quantity demanded, they are no longer uniform.

This means we can develop a more precise measure of elasticity than the three-way division of question 4. We can get a quantitative demand-elasticity measure by (1) putting the quantity change in percentage terms, (2) putting the price change in percentage terms, and then (3) making these two percentage figures the two halves of a fraction or ratio in order to compare them.

The result is the elasticity coefficient: per cent change in quantity divided by per cent change in price. (Note that we put quantity first; we make it the numerator in the fraction, because the bigger the percentage quantity response, the higher the elasticity coefficient should be.)

a. Using question 1 data, compute price-elasticity coefficients between the prices indicated below. [To figure the base for percentage change in quantity, use the average of the two Q's. Thus for the price change from \$7 to \$6 (which raises Q from 12 to 16), use 14 as the base, or 100 per cent. The 4-unit Q-increase is about 28.6 per cent of 14. Similarly, use the average of the two P's. A fall of \$1 in price is about 15.4 per cent of \$6.50 (the average of \$7 and \$6).]

(1) Between price \$8 and price \$7________________________

(2) Between price \$5 and price \$4________________________

(3) Between price \$3 and price \$2________________________

b. This elasticity-coefficient idea is just an extension of the three-way system of division outlined in question 4. For example, in the unit-elastic case, the two percentage changes just cancel one another out-they are equal. This makes the elasticity-coefficient figure (1/ greater than 1 / less than 1). In the price-elastic case, that figure must be (1 / greater than 1 / less than 1) In the inelastic case, it must be (1/ greater than 1 / less than 1)

8. a. A perfectly elastic demand curve is illustrated as a horizontal line. Such a line illustrates the ultimate in elasticity (i.e., "infinite elasticity") because it means (pick one):

(1) No matter what the change in price might be, within the range of prices indicated by length of this line, there would be no response in quantity purchased.

(2) The slightest increase in price above the level at which this horizontal line runs would cause purchases to respond–i.e., to decrease–to the point of falling to zero.

b. Perfectly inelastic demand signifies a vertical line, or zero elasticity. Which alternative above correctly indicates why such a demand curve would represent the ultimate in inelasticity?................................ (1 / 2 / neither)

Notice that the two extreme cases of perfectly elastic and perfectly inelastic demand constitute exceptions to the point made in question 6. When a demand curve is illustrated as perfectly horizontal or perfectly vertical, the slope of that line does tell you what the elasticity of the demand curve is.

9. The idea of responsiveness to a price change applies just as much to supply as it does to demand. But in dealing with supply, we can't use question 4's three–way distinction (elastic, unit–elastic, inelastic), because the revenue asked for by suppliers almost never has the

either–way behavior of revenue (i.e., buyer spending) which questions 2 and 3 indicated is characteristic of demand. In terms of the conventional supply curve, a higher price means more revenue, period.

Nevertheless, we can use for supply exactly the same elasticity–coefficient ("responsiveness") measure already set out in question 7 for demand.

a. In this sense, "perfectly inelastic" supply would be represented by a (vertical / horizontal) line and "perfectly elastic" supply by a (vertical / horizontal) line.

b. Perfectly elastic supply appears as a (vertical/ horizontal) line because that indicates the "ultimate in responsiveness. It indicates simply a particular price; it says that any desired quantity is available at that price; it says that if price were to drop even slightly below this level, quantity supplied would (fall to zero / become infinitely large).

When you enter a supermarket and find you can buy as little or as much as you wish of any given item at its fixed price, in effect you are facing a perfectly elastic supply curve.

10. If there should be an increase in demand (a shift of the demand curve upward or to the right), price will rise, and suppliers will want to increase their supply offers. But the extent to which they can do so depends on the amount of time they are given in which to increase production. This is the basis for Alfred Marshall's distinction between time periods, on the supply side (see text).

a. It the demand increase is sudden and suppliers have no reserve inventories on hand, it may be that no greater quantity can be offered immediately, despite the price rise. If so, the supply curve must be shown as (perfectly elastic / perfectly inelastic). This is what the text refers to as the new (long- run / short-run / momentary) equilibrium.

b. Given a little time, suppliers can adjust to the demand increase by working their plant and equipment more fully (e.g., by adding an extra shift of workers). The result of this increase in supply quantity is the new (long-run / short-run / momentary) equilibrium.

c. If this demand increase is sustained and suppliers have still further time, enough to build new plant and equipment, there will be a still further increase in supply quantity offered. Finally, then, an equilibrium price that indicates (long-run / short-run / momentary) equilibrium may be reached.

d. Note carefully that all this is just a statement about price elasticity of supply. It says that the degree of responsiveness of supply to a price change will depend on the amount of adjustment time suppliers can have. The longer this time period, the (higher / lower) will be the price elasticity (or elasticity coefficient) of supply.

The second major topic in this chapter. To review the underlying idea in terms of demand: Price is one important factor influencing the quantity of good X that will be bought-but it is by no means the only influencing factor. Others include the level of consumer incomes, consumer tastes or preferences for X and the prices at which goods competing with X are selling.

The demand curve for X does not ignore these factors other than X's price-but it assumes them held constant. If any other such factor changes, then the demand curve must be redrawn in an appropriate new position. If consumer incomes rise, for example, it is likely that the demand curve for X will shift to the right (or upward), as in 3, at right above. This is just a particular way of saying that if consumers have more spendable income, they will want to buy more of X, at any given price, than they did previously. (For a review of such shifts in demand- and supply-curves.

Thus in the Fig. 3 case, quantity bought and sold rises from OA to OB; and price goes up.

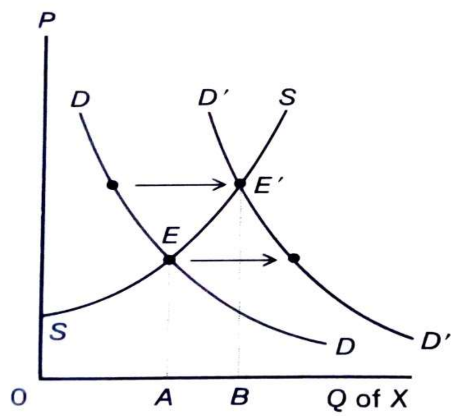

Fig.3

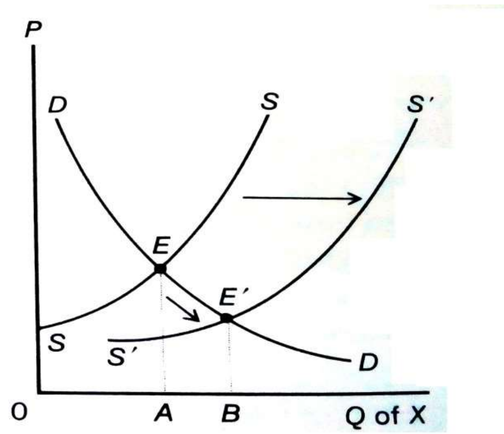

Fig -4

Now here is a point you must watch carefully. In Fig. 4, alongside Fig 3, there has also been a change in the equilibrium position. Purchases have again risen from OA to OB–but price has fallen, not risen. This change was initiated by a shift of the supply curve.

Figure 3 illustrates an "increase in demand"–a shift of the entire demand curve to a new position.

Figure 4 illustrates an "increase in quantity demanded"–a movement along a demand curve from one point thereon to another. The position of the demand curve does not change.

Thus the phrases increase in demand and increase in quantity demanded have significantly different meanings. An "increase in demand" (Fig. 3) occurs when some factor other than the price of good X changes, causing buyers to change their decisions; the entire demand curve shifts. An "increase in quantity demanded" (Fig. 4) occurs when more of X is bought because its price fell. (Price fell because some background factor caused the supply curve to shift in position.)

11. a. A "change in quantity demanded" means precisely (pick one):

(1) A shift in the schedule of quantities that producers will offer for sale at each and any possible price, due to some change in background conditions such as an increase in production costs.

(2) A shift in the particular quantity which producers offer for sale, due to a change in market price.

(3) A shift in the particular quantity which consumers buy, due to a change in market price.

(4) A shift in the schedule of quantities that consumers will buy at each and any possible market price, due to some change in background conditions such as a change in tastes or consumer incomes.

b. Which alternative properly describes a "change in supply"? (1 / 2 / 3 / 4)

c. Which alternative properly describes a "change in demand"? (1 / 2 / 3 / 4)

d. Which alternative properly describes a "change in quantity supplied? (1 / 2 / 3 / 4)

12. a. As already noted, Fig. 3 (the left-hand figure preceding) illustrates "an increase in demand." This figure illustrates also an ("increase in supply" / increase in quantity supplied").

Barring the exceptional case of a perfectly flat (perfectly elastic) supply curve, this increase in demand will (always / sometimes / never) set off a price increase.

Notice that the "increase in quantity supplied" in Fig. 3 does not bring about any price reduction. It is just the supplier response to a higher price. All we can say is that insofar as there is some elasticity to the supply curve (i.e., insofar as a higher price elicits a larger supply quantity), it makes the price increase set off by the increase in demand less than it would otherwise have been.

Thus an "increase in quantity supplied" will (always / sometimes / never) result in a price reduction.

b. In contrast, Fig. 4 (the right-hand figure) depicts an "increase in quantity demanded." This increase came about only because of an ("increase in supply" / increase in quantity supplied"). Such an increase in quantity demanded (will always / might / would never) be the reason for a price increase. It is simply the buyer response to a lower price.

This difference in the effect upon price in large part explains why all the tedious distinction between the two kinds of "increases" and of "decreases" is necessary.

c. An example framed in terms of quantity decrease: Production of good X is disrupted by lengthy strikes. The supply quantity available is much reduced, and price rises in consequence. This would be an instance of (a decrease / an increase) in (quantity supplied / supply), followed by (a decrease / an increase) in (quantity demanded / demand). The price rise was set off by the decrease in (demand / supply), and not by the decrease in quantity (demanded / supplied).

13. a. Record the following supply schedule in the upper part of Fig. 2 (question 2), using the Q_1 supply figures, (The Q_2 fill-in blanks are for part b of this question.)

P	$1.00	$2.00	$3.00	$4.00	$5.00
Q_1	0	12	20	24	26
Q_2	______	______	______	______	______
P	$6.00	$7.00	$8.00	$9.00	$10.00
Q_1	28	29	30	31	32
Q_2	______	______	______	______	______

With the demand curve previously drawn, the equilibrium price indicated is $(3 / 4 / 5 / 6).

b. A tax of $1 per unit sold is now levied on the suppliers of this commodity. (Note: Such a tax is an increase in cost per unit of $1; so the suppliers will now sell only at $5 the particular quantity they were formerly willing to sell at $4.) In the Q_2 line below, enter the new supply-schedule figures. Then record the new supply curve in Fig. 2.

Make it a broken or dotted line, to distinguish this supply schedule from the one previously drawn.

The new equilibrium price will be approximately $(3.00 / 3.10 / 3.60 / 4.00 / 4.50).

14. The text's discussion of the "incidence of a tax," a tax such as the one in question 13, is interesting because it shows how the greater part of a tax may be paid by buyers or by sellers. But the very first thing to recognize is that this case is simply a particular instance of a change in supply–in this instance, a decrease in supply. It is a reduction in the quantity that suppliers will offer for any given price, because of a change in a factor which affects suppliers–in this instance, a tax levied upon them for each unit sold.

Notice that the decrease in supply can be described either as a leftward or as an upward movement. In terms of the preceding paragraph, it is a leftward movement; in terms of question 13, an upward one.

a. In the case of such a per unit commodity tax, whether price to the consumer rises by approximately the full amount of the tax or by a much smaller amount depends on the shapes of the demand and supply curves. Which of the following (one or more) would make for a price rise very close to the amount of the tax (i.e., a tax whose incidence falls mainly on buyers)?

(1) Highly elastic demand.

(2) Highly inelastic demand.

(3) Highly elastic supply.

(4) Highly inelastic supply.

b. Which alternatives in part a (one or more) would make for a very small price rise, i.e., a tax borne mainly by suppliers? (1 / 2 / 3 / 4).

15. "The price of any commodity is determined by what it costs to produce that commodity." Circle all the following statements which seem to you correct observations with respect to this cost-of-production theory of price.

a. It is the most satisfactory explanation yet furnished as to how prices are determined.

b. It makes no allowance for the influence which demand–i.e., forces from the buying side–can exert on the level of price.

c. The level of production costs is one highly important factor influencing the position of the supply curve–i.e., quantity to be offered for sale at various prices–although not necessarily t only such factor at work.

d. As a theory of price determination, the cost–of–production View is unsatisfactory, since production costs are themselves prices–the prices of productive factors–and it fails to explain how these prices are determined.

e. The existing supply of a commodity will sell at a price below its production cost if demand is insufficient to generate any better price, even though suppliers will not continue to produce the commodity if it cannot be sold at a price above costs.

16. The supply–and–demand analysis of this chapter does two things. First, it makes the critical separation between the influence upon price of buyer behavior and the influence of seller behavior. This is the all–essential beginning point, no matter what the commodity or service involved may be.

Second, this analysis discusses equilibrium price. This idea has narrower application. Strictly speaking, it applies only to a competitive market (although many economists argue that such a price is still approximated in less–than–perfectly– competitive markets).

The text sums up all such deviations from the competitive equilibrium price in one word (or phrase). What is it?