

CM4: SUPPLY AND DEMAND (3/26/21)

(If you are a potential economics major, I can send you some optional material that explains why economists cannot prove that demand curves have negative slopes and why the supply curve is the marginal cost curve. You will not be examined on this material.)

THIS IS THE LONGEST AND MOST THEORETICAL COMMENTARY. IT IS IMPORTANT FOR YOU TO REALLY MASTER THE SUPPLY AND DEMAND MODEL BECAUSE WE WILL USE IT IN MANY OF THE LATER COMMENTARIES. JUST READ THROUGH SECTIONS 1-3, WHICH PROVIDE BACKGROUND MATERIAL. START PAYING CAREFUL ATTENTION AT SECTION 4 THEN USE THE SUGGESTED QUESTIONS TO DETERMINE WHAT YOU NEED TO KNOW IN THE SUBSEQUENT SECTIONS.

SOME, BUT NOT ALL, OF WHAT YOU NEED TO KNOW

1. How do economists define a demand curve?
2. Are demand curves positively or negatively sloped.
3. Why is the demand curve also a MB and WTP curve?
4. How do economists define a supply curve?
5. Why do economists assume that supply curves are positively sloped?
6. Why is the supply curve also the MC and WTA curve?
7. How do supply and demand determine price?
8. Why does $MB = MC$ at the market equilibrium?
9. What is the distinction between a movement along a supply or demand curve and a shift in a supply or demand curve?
10. What are the six determinants of supply and the six determinants of demand?
11. What is the only thing that is common to both lists?
12. What are the five demand shifters and which ways do they shift the demand curve?
13. What are the five supply shifters and which ways do they shift the supply curve?
14. How is a market supply curve or market demand curve derived from the individual curves?
15. How can we deduce whether the demand or supply curve caused a

particular change in price and quantity transacted?

1. PRICE DETERMINATION

1. What determines the allocation of resources in a market economy? You all know the answer – prices. What determines prices? You all know the answer – supply and demand. Thomas Carlyle, who hated economists because they refuted many of his pro-slave trade arguments, wrote that you could turn a parrot into an economist by teaching it to repeat: "Supply and demand! Supply and demand!" Economists' theory of supply and demand is an attempt to understand selling and buying – or exchange and trade in the broad sense used by economists. The supply and demand model is generally believed to be the most useful, and widely used, economic tool in the economist's tool kit. (The Old Sleeperson has been trying, with no success, to persuade the economics profession that it does not do a satisfactory job teaching supply and demand. I will try not to burden you with my prejudices.)

2. *Prices act as signals* to redirect economic activity between markets; *profits act as incentives* to respond to those signals. In the short run (to be defined later) relative scarcity (a shortage) is **assumed** to lead to increases in prices, and relative abundance (gluts) is *assumed* to lead to decreases in prices. Resources are reallocated to their more valuable uses and away from the less valuable ones; *under very special circumstances* the changes in prices that signal that reallocation will be advantageous to both buyers and sellers; *under very special circumstances* the market is ruled by incentives that channel the self-interest of the economic agents – buyers or consumers and sellers or firms – into actions that promote the welfare of society.

2. WHAT IS A PRICE?

In "A Night at the Opera" Groucho Marx says: "When I invite a woman to dinner, I expect her to look at my face. That's the price she has to pay."

(a) Nominal prices: the commonsense concept of a price. The "nominal" or money price of a commodity is the number of dollars that you must sacrifice to purchase a unit of the good or service.

(b) The "real" price of a good or service is used when we are making *comparisons over time* intervals in which inflation occurs – the real price removes inflation from the nominal prices. The real price is also called the constant dollar or deflated price.

For example: If the nominal price of crude oil has increased by 30% over the last five years, whereas the average price of goods and services (inflation) has increased by 15%, then crude oil has become relatively more expensive – but only by 15%. However, if the price level also increased by 30% in the five years, then the relative cost of oil has not changed; the value of goods and services that you sacrificed to buy a barrel of oil at the beginning of the five years was the same as the amount that you sacrificed at the end of the five years. If the rate of inflation was 50% over the five years, then oil has become 20% cheaper. If a nominal price falls, but the price level falls by even more, then the real price increases.

3. MODELS

1. Economists have a theory about how “markets” work. That theory has to be translated into a specific model, what we call the supply and demand model, which tries to predict what we should observe to happen when we look at the real economy. Because the supply and demand model is a *model* it is by definition a *simplification* of the real world situation. This is true of all models, including those in physics. It is not sensible to dismiss a model because it fails to take into account all of the features of the real-world situation; a model that took everything into account would be as complicated as the real-world system; it would be as helpful as a 1 to 1 scale map. The appropriate question to ask about a model is: does the model illuminate the question it was constructed to answer? It is reasonable to criticize a model because it is so simple that it fails to predict accurately.

2. Examples of models: Using a wooden wing in a wind tunnel, which reproduces the aerodynamic properties of real aircraft wings although it is quite different from an actual aircraft wing. A powered rowing boat that has controls that make the boat behave like an oil tanker – if you stop the engines and throw them into reverse then the boat will continue to move forward for the best part of half a mile – the rowing boat is quite unlike an oil tanker but it simulates its inertia well. A scale model of the U.S.S. Constitution, which looks like the frigate but doesn’t float.

3. The supply and demand model assumes that we are dealing with a specific type of market arrangement, what economists refer to as perfect competition. *In a perfectly competitive market*, there are large numbers of buyers whose individual purchases are too small to affect the market price – economists call them “price takers”; there are large numbers of small sellers whose individual outputs are too small to affect the market price – they are “price takers”. Price

taking means that buyers and sellers take the price as *given* (determined by market forces); *not* something they can change.

It is very important that you understand that *perfectly competitive markets are rare or even non-existent in the real world* – agricultural markets are probably closest to the economist’s concept of a “market”, which is the term we use when thinking about perfect competition and supply and demand.

The goods are identical (homogeneous) and every transactor knows the quality of the good or service. Surprisingly, crude oil markets seem to work very much like perfect markets although the producers are “relatively” few and certainly not small. This is probably because crude oil is homogeneous in the sense that Brent crude or Saudi light are the same oil wherever produced. World commodity markets (wheat, copper) and certain financial markets may approximate the requirement of price taking.

Economists use the term “market” quite promiscuously; applying it to “markets” that are far from the theoretical perfectly competitive markets we teach to economics students, for example, the supply and demand model could be used to analyze what will happen if Saudi Arabia and Russia cut their oil production in April 2021.

Beware of economists using the supply and demand model when it may not be appropriate to do so. This is particularly important when discussing labor markets.

When you and I think of a market we often envisage something like an oriental bazaar, where buyers and sellers haggle over the price of the good. Markets for used cars are probably the closest real-world approximation to this type of market. But the “markets” in which we participate on a daily basis are what are called fixed price markets. In our day to day economic activities retailers act as markets; they give provide a variety of different producers’ products for you to compare their prices. When you go to the grocery store you do not haggle about the price of carrots, when you go to buy sneakers you take the price as given. The seller is giving you a choice to buy at the stipulated price or not to buy at that price.

To an economist the term market means that she believes that the supply and demand model is adequate to analyze the situation.

4. When we construct a model, we make a set of assumptions. You cannot really understand the model unless you know what assumptions were made constructing it. As you will see the supply and demand model makes many

assumptions; I have not bothered with some of the more esoteric ones. The five that you need to remember are: demand curves have negative slopes; supply curves have positive slopes; prices increase if there is excess demand; prices decrease if there is excess supply; the market is perfectly competitive and so all actors are price takers. The first four claims are assumptions, economists cannot prove that they must be true.

4. THE DEMAND CURVE

I will assume, unless I state otherwise, that all *other* prices than the one we are interested in are held constant. Economists call this the *ceteris paribus* (Latin for other things (held) equal) assumption.

1. **Assumption:** *Buyers buy less of X if the price of X increases, and buy more of X if the price decreases.*

On the demand side there is an *inverse* relationship between price and the quantity bought and consumed, *price and quantity bought* move in *opposite* directions. Notice that *this is an assumption; even though some texts refer to this assumption as the "law" of demand.* Economists argue that the assumption seems to capture how buyers behave in the real world. You buy fewer units if the price is "high" and more units if the price is "low" an inverse is probably consistent with your own experience.

In the exams you must always assume that the demand curve is negatively sloped unless the question states otherwise.

2. **Assumption:** Individual consumers are price takers.

A "price taker" is any economic agent that has to accept the given market price (the price determined by buyers and sellers collectively at the *market* level); no *individual* buyer has control over the price; and no *individual* buyer can change the price by changing the amount she is willing to buy.

3. We will think in terms of X – a representative commodity, which could be a loaf of bread, a bag of oranges, a visit to the dentist, a bottle of wine, a two-week vacation, because we are doing theory and our theory is supposed to be sufficiently general to cover many different types of goods and services.

The demand curve shows the relationship between the price of X (P_X) and the quantity demanded of X (Q^d_X), where the quantity demanded of X is the amount that the consumer would be willing to purchase at a given price.

Figure 1 shows a demand curve. Do not stare at the demand diagram as if it were a picture. You must practice re-drawing the diagrams – don't just copy mine: start with a blank piece of paper, put in the axes, label them, draw the appropriate curve, ask yourself why it has the slope that you have chosen, then choose points on the X axis and use the curve to take you to the corresponding points on the Y axis. Then choose points on the Y axis and use the curve to take you to the corresponding points on the X axis. Ask yourself why some points are above or below (to the right of or to the left of) the curve.

This is not geometry, you must think in economic terms; what is the economic reason that a change in price causes the quantity demanded to change in the way it does; economists have used diagrams to explain economic theory for 130 years because, much as you may disagree, economists believe that diagrams help you to think correctly about topics like supply and demand

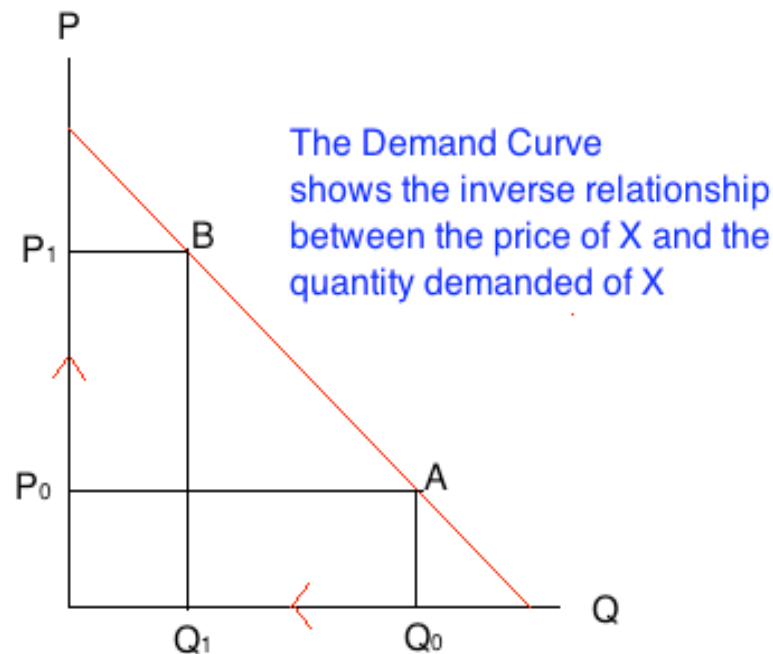


Figure 1

The increase in price, from P_0 to P_1 , causes the quantity demanded of X to fall from Q^d_0 to Q^d_1 . (My diagram has Q not Q^d on the horizontal axis because I use a very primitive program called Paintbrush to draw my diagrams – I am IT challenged.) When the price of X is the *only thing that changes* then we say that we move *along* the demand curve – from A to B.

My diagram illustrates that the demand curve has a negative slope; it slopes

down to the right – as the price falls purchases of X increase and as price rises purchases of X decrease. Because we do not know what X represents, I have drawn the demand curve as a straight line; in any case it is only the slope, not the curvature, of the demand curve that is important to the analysis.

5. The quantity demanded does *not* represent the amount of X that we "need" or "desire"; only the amount that we will be willing to purchase *if we have the ability to pay the price*.

To an economist *demand has meaning only if it is backed by ability to pay*. Ability to pay (ATP) depends on *income, wealth and access to credit*. I have no effective demand *at realistic prices* for a condo overlooking Central Park, a town house in London, a villa in Tuscany, an apartment in Paris, or a small (let's not be greedy) Greek island because, although I need them desperately, I cannot purchase them since I do not have the income or wealth or access to credit to be able to do so. This is very different from my unwillingness to fly first class, even though I would like to, because I do not value first class airline tickets as highly as other items I can purchase with the money.

The homeless may desperately need shelter but they have no demand for it if they have no money or credit with which to purchase it at realistic prices. (Technically, the homeless have demands for housing, but their demands are ineffective since they do not have the financial means to make the purchase at any realistic price.)

Markets are not democratic; when it comes to deciding what should be produced people with large incomes (and wealth) have more votes than those who have smaller incomes and wealth. The fact that demand depends on income is given prominence in all microeconomic discussions. However, economists seldom discuss how the distribution of income (and wealth) effect demand in undergraduate courses. (We will return to this issue in CM 13 and CM21.)

5. THE DEMAND CURVE IS A MARGINAL BENEFIT CURVE

You may be puzzled by the fact that economists put P (the independent variable) on the vertical axis, and Q^d (the dependent variable) on the horizontal axis. This violates the usual mathematical convention that the independent variable is plotted on the horizontal axis and the dependent variable on the vertical axis.

Economists draw their diagrams in this way because they want to have their cake

and eat it. We have started at the vertical – price – axis and then read the quantity demanded from the horizontal – quantity – axis. But economists also reverse this procedure and start on the horizontal – quantity – axis and determine from the demand curve where we are on the vertical – price – axis. In Figure 1 if Q^d_0 is the last (marginal) unit purchased, then a "rational" consumer "must" value the Q^d_0 unit at P_0 dollars (or more) otherwise she would not purchase it; why would you pay \$5 for something that you believe will give you only \$4.99 of satisfaction? Economists say that the marginal benefit (MB) from consuming Q^d_0 is P_0 dollars, or that the consumer is willing to pay (WTP) no more than P_0 to consume the Q^d_0 unit. We might say that the consumer "values" Q^d_0 at P_0 dollars, but, as we have seen, there are problems with such an assertion. Economists therefore treat the demand curve as a marginal benefit (MB) curve and also as a Willingness to Pay (WTP) curve.

6. THE SUPPLY CURVE

Assumption: *Firms attempt to maximize profit.*¹

Profit, usually denoted by the Greek (capital) letter pi, Π , (pronounced pie) is defined as Total Revenue minus Total Cost, so $\Pi = TR - TC$.)

The standard definition of Total Revenue (TR) is: price times quantity sold ($TR = P \times Q$). However, as you remember from CM1, we should take into account all the benefits from a transaction and TR only represents the explicit benefits (EB) to the firm from its sales, the *money* it receives from selling its output. TR should also include any *implicit benefits* (IB) that are obtained from, for example, being your own boss, i.e. TR should be $EB + IB = P \times Q + IB$. But I will stick with the standard definition.

Total Cost (TC) is the sum of explicit costs (EC) and implicit costs (IC): $TC = EC + IC$. (IC might include the wear and tear on the truck you use to haul your tools to work or the rent that you could charge someone else for using your office.)

Assumption: *Firms are price taking perfectly competitive firms.*

Perfect competition requires that there are many firms, that they are all too small to be able to influence price by changing their output, and they produce a homogeneous good (Saudi Light crude oil or grade AA eggs). Services (legal, financial, personal) are more likely to be heterogeneous - there will be

¹ Economists tend to say that firms maximize profits or are assumed to maximize profit. But no one knows whether Apple, if it had operated differently, could have made another \$1,000 or even another \$1m or even another \$1b in addition to the \$60b plus it actually made in 2019.

differences between units supplied by different firms.

Assumption: *The firm produces only one good or service X.* (This is very rare in the real world – the Pilates studio I go to offers classes for people with different ages and experience and also individual lessons.)

Assumption: *Each unit of X is sold for the same price.* (Although this is not always true it is predominantly true of the goods and services we consume.)

Assumption: *The firms are operating in the short-run* – a period of time in which firms cannot change the amount of physical capital they employ (their plant and equipment) and so capital is a fixed input.

Assumption: *In the short-run firms face increasing marginal costs (MC).* An increase in output requires the firm to employ more variable inputs (labor/energy/raw materials) and – because the inputs are scarce and therefore not free – Total Cost *always* rises as output rises. (Economists assume that TC ultimately increases at an increasing rate and so the TC curve gets steeper as we produce more and more of X. Therefore MC (the slope of the TC curve – the change in TC when Q changes by one unit) is positive and ultimately increasing).² However, for our purposes it is acceptable to draw supply curves as straight lines.

In Figure 4³ the MC is both increasing with output and increasing at an increasing rate; it has a positive slope and the slope is increasing. Economists explain all of this by what we call diminishing returns – as you add more and more units of a variable input (labor) to a given amount of a fixed input (capital) ultimately the marginal product of the variable input (the additional output produced by the additional unit of input) will fall. As you study or exercise for longer and longer periods the additional benefit that you get from an extra five minutes activity falls. (It is your brain or muscles that is fixed in this case.)

Assumption: *In order to persuade firms to increase output (the quantity supplied) buyers have to offer higher prices to cover the firm's increased MC.*

The price of X (P_X) and the quantity supplied of X (Q^s_X) are positively related – prices and the quantity supplied rise and fall together and the supply curve slopes up to the right, Figure 5.

The quantity supplied (Q^s_X) is the number of units the firm would be willing to

² Although this may not be true of some products, especially in the IT field, it seems a reasonable assumption for most goods and services.

³ I have cut a lot of material and what is labelled Figure 4 is really Figure 2, etc.

sell at a given price if it was maximizing its profit.

The **supply curve** shows for each price the number of units that a profit-maximizing firm will be willing to supply at that price, it shows the relationship between the given price and the quantity supplied. Larger quantities will only be supplied if we provide the firm with a positive incentive to increase output, (collectively) we “bribe” the firm with higher prices to increase production; if the price falls then firms will cut back their production.

In an economy where every industry is perfectly competitive the MC curve reflects the opportunity cost of using the resources/inputs to produce the marginal unit of output; it is the value (at the margin) of what society must give up (in terms of alternative uses of the inputs) to produce an extra unit of X.

You may argue, correctly, that in some industries, for example computer software, the MC to the firm of an additional download is negligible, essentially zero, and so the MCs of those firms would be horizontal and close to zero. In these industries TC is dominated by startup costs. (We will return to this issue when we discuss the theory of the firm (CM22)). For now, we will make the standard assumption of increasing MC and draw the MC and supply curves with positive slopes.

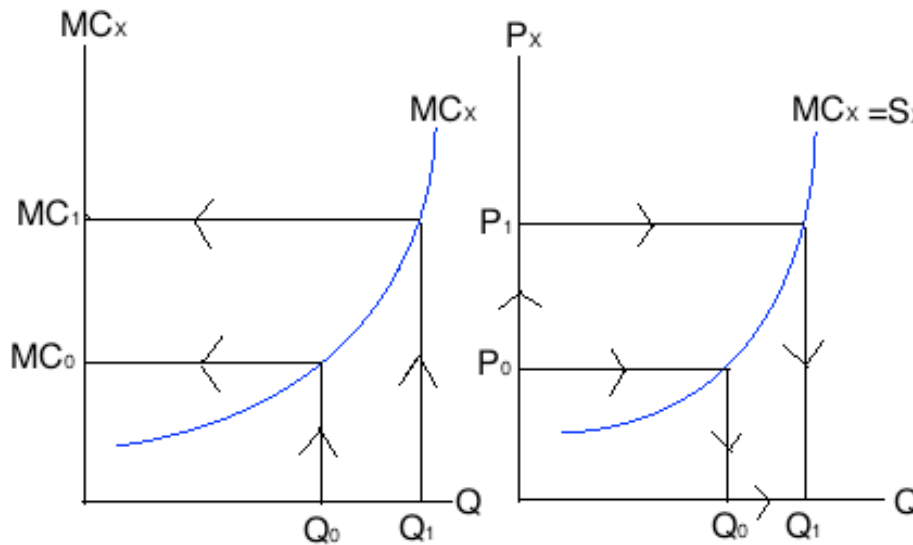


Figure 4

Figure 5

The short-run supply curve is the firm's MC curve (at least above something called minimum average variable cost – see CM22).

Notice that in Figure 5 the causation goes from P to Q. You should read Figure 5 as follows: If the price is P_1 then the firm will maximize its profit where the price

(the firm's marginal benefit) is equal to its MC, which means that it will produce the Q_1 unit but will not produce more units unless the price rises.

7. SUPPLY AND DEMAND DETERMINE PRICE

Figure 6 puts the demand curve and the supply curve together so that we may determine the price of X . *Price determination requires both a demand curve and a supply curve.*

At the "high" price P_H the quantity supplied (Q^s_H) is larger than quantity demanded (Q^d_H); the high price of X means that it is more profitable for firms to produce X and the high price discourages consumers from buying this relatively expensive good or service. Because Q^s is greater than Q^d at P_H we say there is *excess supply*, $ES = Q^s(P_H) - Q^d(P_H)$ at P_H .

Assumption: *When there is excess supply the price of X will fall.*

Textbooks and economics professors routinely use the following argument when discussing excess supply. At P_H firms would not be able to sell their output and so some of them would be willing to lower prices, which means that all of the firms have to lower prices because every transactor is assumed to have access to exactly the same information and so every buyer will want to buy at the lower price and the other sellers will be forced to lower their prices too. (Remember that the good is assumed to be homogeneous so every firm produces exactly the same good as every other firm.)

The price of X will continue to fall so long as there is excess supply, and so P will fall to P^e . There is a movement down the demand curve and down the supply curve causing the excess supply to decrease as the price falls, ultimately disappearing altogether, a very nice property for a market to possess.

The argument is intuitively plausible and seems to correspond to what we observe in the real world but it is not technically incorrect because supply and demand model is always in equilibrium by assumption and no firm or household can alter the price in a perfectly competitive market. They don't tell you that in standard ECON 206 courses, and probably not in ECON 306 and probably not in ECON 406 or even in most graduate microeconomics courses!

Assumption: *When there is excess demand the price of X will increase.*

If we start with the "low" price P_L then the quantity demanded is greater than the quantity supplied and we have *excess demand*, where $ED = Q^d(P_L) - Q^s(P_L)$: at P_L buyers wish to buy large quantities of the relatively inexpensive good or

service X but it is not profitable for firms to produce so much X (see Figure 7).

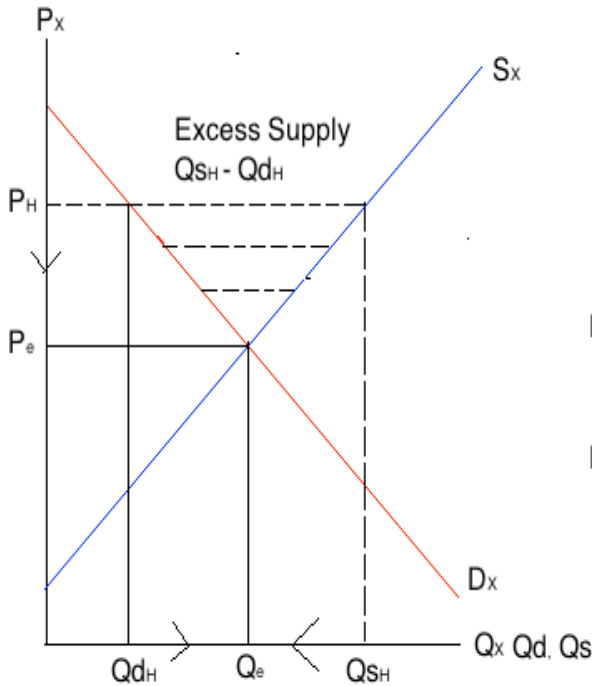


Figure 6

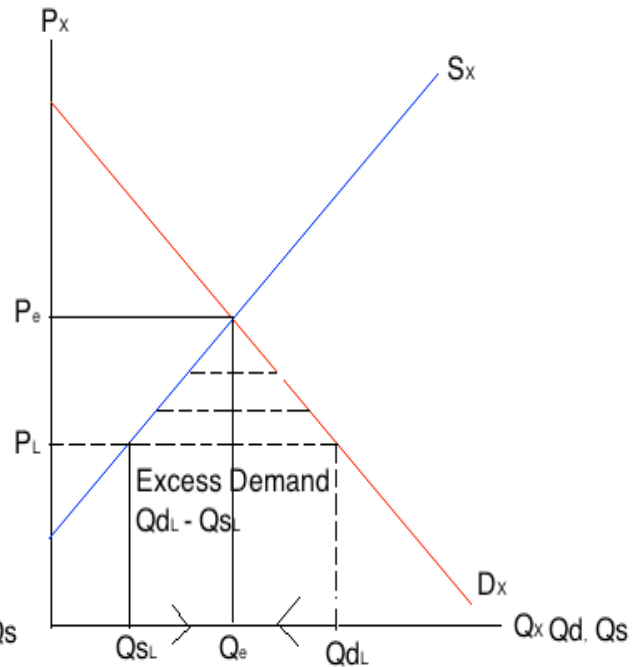


Figure 7

The price of X will continue to increase so long as there is excess demand, and so the price of X must rise to P^e . There will be upward movements *along* both the supply and demand curves until the market arrives at equilibrium at (P^e, Q^e) .

Because every price above P^e is characterized by excess supply, and every price below P^e is characterized by excess demand, there is only one P_x for which the market is in *equilibrium*. A *market equilibrium* is a situation where buyer who wishes to buy at the going price can find a seller and every seller can find a buyer at the going price; a market equilibrium is a situation in which there are no forces driving the price up or down; it is a situation where Q^d is equal to Q^s . So, P^e "clears the market".⁴ The price of X will remain at P^e and the quantity transacted (the quantity bought and sold) will remain at Q^e until something changes – the *ceteris paribus* assumption is violated.)

A market is in equilibrium if, and only if, the quantity demanded is equal to the quantity supplied, $Q^d = Q^s$.

Notice that because the demand curve is a MB curve and the supply curve is a

⁴ At P^e excess demand and excess supply are both zero: $E^d(P^e) = Q^d(P^e) - Q^s(P^e) = 0$ which means that $Q^d(P^e) = Q^s(P^e)$.

MC curve in equilibrium $MB = MC$. This is one of the reasons that economists tend to favor markets as ways to allocate scarce resources. The market generates a resource allocation at which the benefit of consuming the last unit purchased is exactly equal to the opportunity cost to society of producing that last unit of output. However, as we will see there are serious limitations to this argument.

9. MOVEMENTS ALONG THE DEMAND AND/OR SUPPLY CURVE VERSUS SHIFTS IN THE DEMAND OR SUPPLY CURVE

1. You *must* be able to distinguish between *movements along demand curves and supply curves*, and *shifts in demand or the supply curves*.⁵
2. A *movement along* a demand curve or supply curve means that the **only** thing that has changed is **the price of X**.
3. A **shift** in the demand curve or supply curve is the consequence of **something other than the price of X changing**.
4. A **shift** of the demand or supply curve means that **the whole curve** moves to the right (an increase in demand or supply) or to the left (a decrease in demand or supply).
5. If the *only* thing that changes is *the price of X* then the demand and supply curves do *not* shift, instead there is a movement along the demand and supply curves. This is because the demand curve and supply curve already show the relationship between the price of X (on the vertical axis) and the quantity demanded of X or the quantity supplied of X (on the horizontal axis).
6. The only determinant of demand that does *not* shift the demand curve is the *price of X* and the only determinant of supply of that does *not* shift the supply curve is a change in the *price of X*.

10. DETERMINANTS OF DEMAND AND SUPPLY

1. *Buyers and sellers are different sorts of agents and are motivated by different things*: buyers are assumed to maximize their welfare (satisfaction/well-being) subject to the constraints imposed by having a finite income and the fact that goods and services have positive prices; firms are assumed to maximize profits subject to the constraints imposed by a given technology and the fact that

⁵ In general (but see CM24) we will be shift either the demand curve or the supply curve but seldom both.

inputs are not free. You are not a firm and a firm, in general, is not a person. Therefore, *the factors that motivate households and those that motivate firms are different*; do not confuse the two sets of behavioral determinants.

2. *The demand for X is determined by:* (1) The price of X, (2) prices of substitutes for X⁶, (3) prices of complements to X, (4) (real disposable) income(s)), (5) tastes/preferences, and, at the market level, (6) the number of buyers. These six things are called **the determinants of demand**.

3. *The supply of X is determined by:* (1) the price of X, (2) the prices of inputs: wages/salaries/benefits paid to labor, interest owed to capital, "rents" – the term economists use for payments for raw materials and natural resources, (3) technology, (4) "weather" – growing conditions and the health of livestock (in the case of agricultural products), (5) a number of government variables (regulation/taxes/subsidies/tariffs and quotas) and, at the market level, (6) the number of sellers. These six things are called **the determinants of supply**.

4. *There is only one determinant that is in both lists: the price of X, P_x .*

The only determinant that appears in our diagrams is P_x – all other determinants are held constant (the *ceteris paribus*, "other things held constant", assumption) when we drew the demand curve and the supply curve. Therefore, *if any of the other determinants change (the ceteris paribus clause is violated), then we must redraw either the demand curve or the supply curve, depending on whether the determinant that changed was on the demand or the supply side of the market.* Because each determinant impacts *only* demand or supply, when a determinant changes *only one of the curves shifts: something that shifts the demand curve does not shift the supply curve and vice versa.* Make certain that you understand this paragraph.

5. *If the only thing that you know is that P_x has changed then you are dealing with a movement along a demand curve or a supply curve, or both.*

The term a change in demand is used for both a shift in the demand/supply curve and a movement along the demand/supply curve. This is a cause of great confusion. To make your lives easier I will adopt the following convention.

6. CONVENTION (Part A): I will use the phrases "*a change in the quantity demanded of X (Q^d)*" or "*a change in the quantity supplied of X (Q^s)*" to denote a movement **along** the demand curve or supply curve respectively. Such a movement along the curves is brought about by a change in P_x , *ceteris paribus*.

⁶ A substitute is something that the consumer believes meets the same need as X and a complement is something that is consumed jointly with X.

7. In Figure 8(a) when P_X decreases from P_H to P_L there is a movement along the demand curve from A to B and the quantity demanded, Q^d , increases from Q^{d_H} to Q^{d_L} .

In Figure 8(b) when P_X increases from P_L to P_H there is a movement along the supply curve from A to B and the quantity supplied, Q^s , increases from Q^{s_L} to Q^{s_H} .

8. CONVENTION (PART B): I will use the phrase "a change in demand/supply, or a shift in the demand/supply curve for X" to denote a rightward or leftward movement of the whole demand curve or supply curve brought about by a change in a demand shifter ((2)-(6) in the list of the determinants of demand) or a supply shifter ((2)-(6) in the list of the determinants of supply).

You must learn to distinguish between the two situations. In an exam I will signal what I want you to choose by the use of the phrases: "a change in the quantity demanded or supplied" versus "a change in demand or supply". This is just a convention, when watching TV or reading books, or magazines or newspapers, or in common conversation you will find that there is no distinction made between the two concepts, both are referred to as changes in demand and supply.

9. Figure 9(a) shows shifts in the demand curve, a new Q^d at each and every P , and Figure 9(b) shows shifts in the supply curve, a new Q^s at each and every P .

In real economies both the demand curves and the supply curves are usually shifting (and probably pivoting) simultaneously.

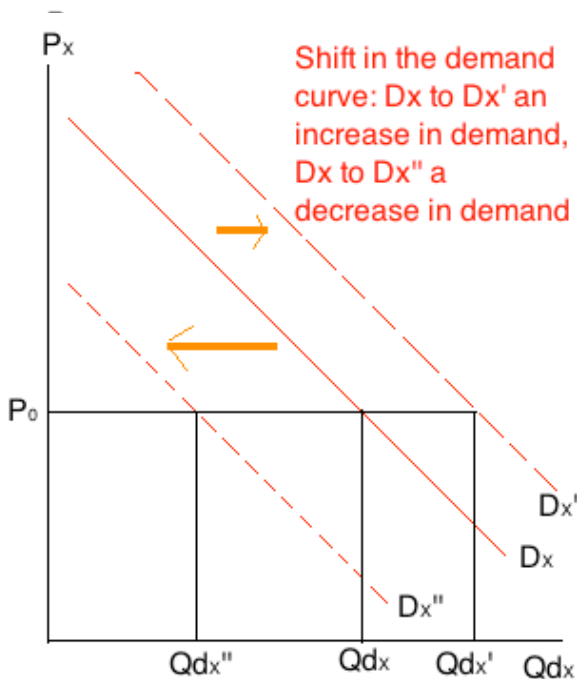


Figure 9a

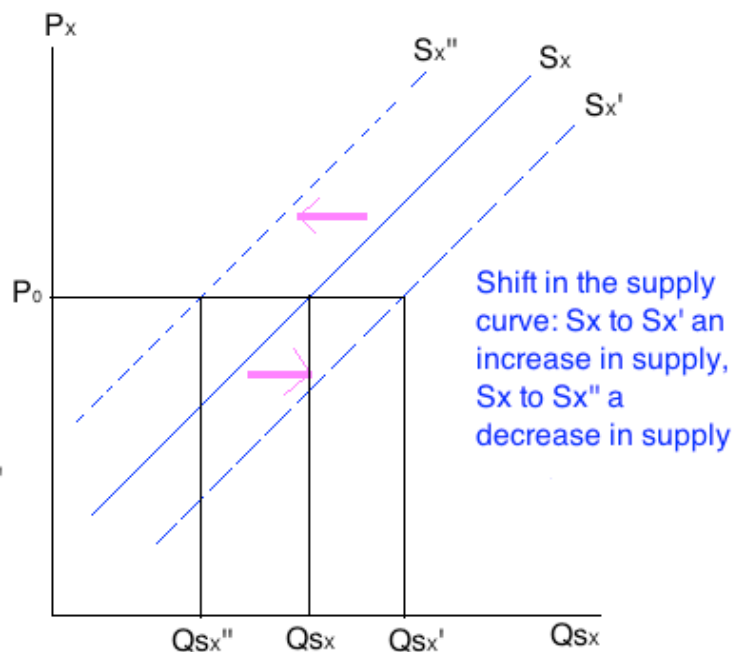


Figure 9b

10. Note that *when the curves shift there is a new quantity at every price*, not simply at P_0 .

11. DEMAND SHIFTERS

A *demand shifter* is any variable – *other than the price of X, P_X* – that is a determinant of demand. There are **five** demand shifters – none of them affect the supply curve – but there are *six determinants of demand*. The price of X, P_X , is a determinant of demand but it is **not** a demand shifter.

(1) *Prices of substitutes*: Y is a substitute for X if, in the opinion of the consumer, Y performs or satisfies the same need as (is to some degree interchangeable with) X. Some substitutes are very good and some are poor. Coke and Pepsi/beer and wine/scotch and gin/tea and coffee/water and lemonade/bottled water and tap water/ water and horse's blood, are *all* substitutes to some extent. *An increase in the price (P_Y) of a substitute Y causes the demand curve for X to shift to the right* because some people will switch from the relatively more expensive Y to the relatively cheaper X. (What happens when P_Y falls?)

(2) *Prices of complements*: Z is a complement to X if a consumer consumes them jointly. Examples: Eggs and bacon/toast and marmalade/coffee and cream/tea and sugar/potatoes and salt/cups and saucers/cars and gas. *An increase in the price (P_Z) of a complement Z causes the demand curve for X to shift to the left*. The joint commodity "X plus Z" is now more expensive and less will be consumed of both items. (What happens when P_Z decreases?)

(3) *Income*: (a) If the good or service is a **normal** good or service then an *increase* in income causes the demand curve for a normal good or service to shift to the **right**. We now have more spending power and will purchase more of the goods and services that we like. (b) If the good or service is an **inferior** good or service then an *increase* in income will cause the demand curve for X to shift to the **left**. Because X is inferior, we will, now that we can afford to, replace X with the more expensive but preferred substitute, Y.

Normal goods are called normal goods because most goods are normal. Education, entertainment, vacations, eating out are normal goods.

Inferior goods are peculiar. A good or service is inferior if it has a preferred but more expensive substitute. You only purchase the inferior good because you cannot afford the superior good.

My car is an inferior good compared with my son's car. Eating in the Viking

Commons is an inferior good compared with eating in a decent restaurant. A two-week vacation in Ferndale is an inferior good compared with a week's vacation almost anywhere else.

(4) *Tastes or Preferences*: Our tastes or preferences are determined by our genes, by the choices made by our parents, relatives, friends, peer groups, by our religion, ethnicity, age, by the region we live in, our education, by advertising, marketing, fashion, information concerning the properties of the goods and services, convention and habit – among other things!

Firms can influence our purchases and change our tastes although economists routinely assume that our tastes are given in order to stop every change in price as a consequence of a change in price being “explained” by a change in tastes. However, economists sometimes seem to believe that tastes really are given in the sense that they cannot be altered by the actions of firms. Much advertising and marketing is a zero-sum game – what firm A gains is at the expense of firm B; the consumer simply shifts purchases between them.

A positive change in tastes shifts the demand curve to the right. If advertisements make you believe that eating frog spawn increases your libido then the demand curve for frog spawn will shift to the right. There has been a rightward shift in the demand for face masks, hand sanitizers, disinfectant, toilet rolls (!) because of the pandemic – these are increases in tastes.

A negative change in tastes shifts the demand curve to the left.

So, if it can be shown that drinking coffee is strongly linked to cancer of the larynx then the demand curve for coffee will shift to the left because some people will switch to other beverages to avoid the potential cancer risk from drinking coffee. There has been a change in the preference for coffee.

(5) *The number of consumers (at the market level)*: An increase in the number of consumers will shift the demand curve to the right, a decrease will shift the demand curve to the left. As the US population ages there are more people over eighty-years-of-age and the demand for retirement homes and walkers will shift to the right and the demand for mountain bikes will shift to the left. The demand for cars in the US in 2021 is larger than it was in 1921 partly because the US population is larger.

12. SUPPLY SHIFTERS

A supply shifter is any variable – *other than the price of X, P_X* – that is a determinant of supply. There are **six** determinants of supply but only **five** supply

shifters. The price of X, P_x , is a determinant of supply but it is **not** a supply shifter. None of the of demand shifters (that motivate consumers to buy more or less of X) that were discussed in section 11 caused the supply curve to shift because the demand shifters do not affect firms (who are producers trying to maximize profit). When thinking about supply shifters try to relate them to the firm's profits, specifically its costs of production – if a change in a variable increases the profitability of producing a unit of X then the firm will supply more of X at each and every price and the supply curve will shift to the right; something that makes producing X less profitable will shift the supply curve to the left.

(1) *The prices of inputs*: If wages, salaries, workers' benefits, interest payments on borrowed capital, or the prices paid to the owners of natural resources, etc. increase then the firm's costs will increase and its profits will fall. The supply curve will shift to the left – less will be supplied at each and every P_x .

(2) *Technology*: Technological change is a major factor in determining the firm's costs of production. A technological improvement that reduces costs will increase the profitability of the firm and cause the supply curve to shift to the right.

(3) *"Government"*: A catchall term that tries to capture the impact of the government's actions on the supply curve. These actions affect output through their impacts on total costs (TC) or total revenues (TR), which in turn impact the firm's profits. Taxes and tariffs reduce the amount of revenue that the firm retains and hence reduce profits and shift the supply curve to the left. A subsidy adds revenue to the firm and makes it more profitable and thus shifts the supply curve to the right. Increased government regulation will – at least initially – raise costs and lower profits so the supply curve shifts to the left.

(4) *"Weather"*: Another catchall term, which is short-hand for anything that affects agricultural output – natural phenomena that cause good or bad harvests and diseases that reduce the size of animal herds. Weather is assumed to influence the amount of agricultural production but *we deliberately ignore any impacts on the demand side*. Bad weather means poor harvests and good weather means good harvests. Bad weather shifts the supply curve of an agricultural product to the left; good weather causes the supply curve to shift to the right. An outbreak of "hoof and mouth disease" will shift the supply curve of cows to the left. The recent worldwide reduction in the number of bees, which pollinate while collecting honey, will affect many agricultural crops.

(5) *The number of firms (at the market level)*: An increase in the number of firms causes the supply curve to shift to the right, a decrease in the number of firms

causes the supply curve to shift to the left.

13. A COMMON ERROR

It is a common error to believe that because there has been an increase in demand for X that there must therefore be an increase in the supply of X. In our model this is clearly not the case because the two sets of “shifTERS” do not overlap – they have no members in common. The increase in demand for X causes an excess demand for X at the old equilibrium price P^e_0 (see Figure 10 where the excess demand is the distance B-A). The excess demand causes the price of X to rise from P^e_0 to P^e_1 , which causes *the quantity supplied* to increase from Q^s_0 to Q^s_1 (this is a movement along the unchanged supply curve from A to C), and P_x to increase as the demand curve moves up along the stationary supply curve. **We stop the analysis at this point**, we do not try to analyze the effect of the change in the price of X any further – that would require a more elaborate (mathematical) model; it would be too difficult to handle using graphs.

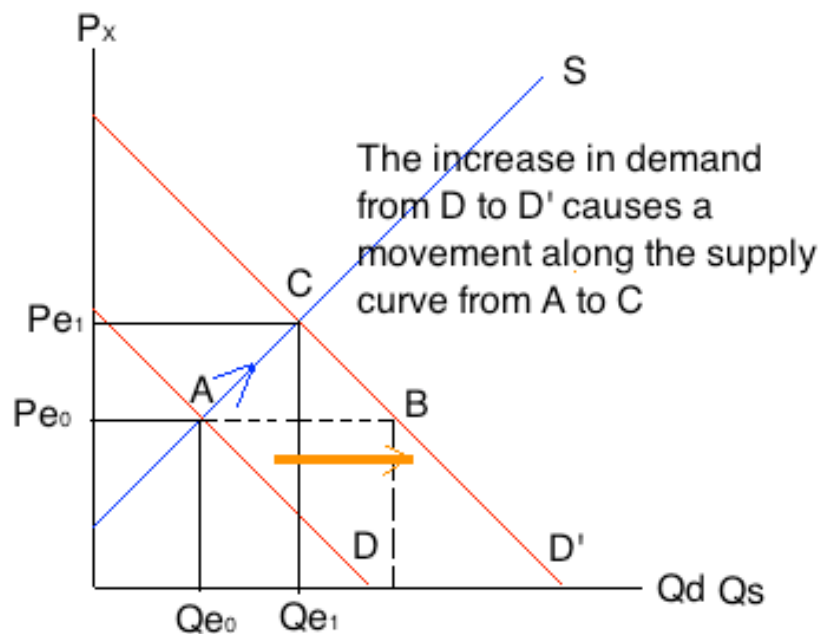


Figure 10

14. MARKET DEMAND AND SUPPLY CURVES

1. We are not interested in the demands of individuals or even households, or the supplies of individual firms. Our analysis needs to be conducted at the level of the relevant *market* – not my demand for gas but the demand for gas in

Bellingham, or the Pacific Northwest, or the West Coast, or the whole US, or all advanced industrialized countries, or the world demand. Textbooks routinely state that market, as opposed to individual, demand curves can be derived by summing the individual demand curves horizontally – that is, the market quantity demanded of X at any P_x is simply the sum of the individual quantities demanded of X at that P_x . This is not true except in unrealistic cases, as economists have known for the best part of fifty years. There are also difficulties with the idea that the market supply curve is simply the horizontal summation of the individual firms' supply curves.

Figure 11, which shows the demand for honey by the Three Bears, illustrates the standard textbook exposition. Each bear has a demand curve for honey: Daddy Bear's is DDB_x , Mommy Bear's is DMB_x , and Baby Bear's is DBB_x . Each demand curve shows the quantity demanded at each and every price.⁷ At each price we add together the demand for honey of each bear/individual to obtain the Market/Total quantity demanded of honey (TD_x) at that price. This is called a horizontal summation of the individual demand curves. If we do this for every possible price then we derive the Market/Total demand curve for honey.

If the price of honey is P_0 then the Market/Total quantity demanded is the sum of the individual quantities demanded: $Q^d_x = Q^dDB_x + Q^dMB_x + Q^dBB_x$. If at P_0

⁷ If the price is sufficiently high then the quantity demanded will be zero.

$Q^{dDB_x} = 15$ jars and $Q^{dMB_x} = 10$ jars and $Q^{dBB_x} = 2$ jars then the Q^d_x is 27 jars. We can do the same computation for each and every price and derive the

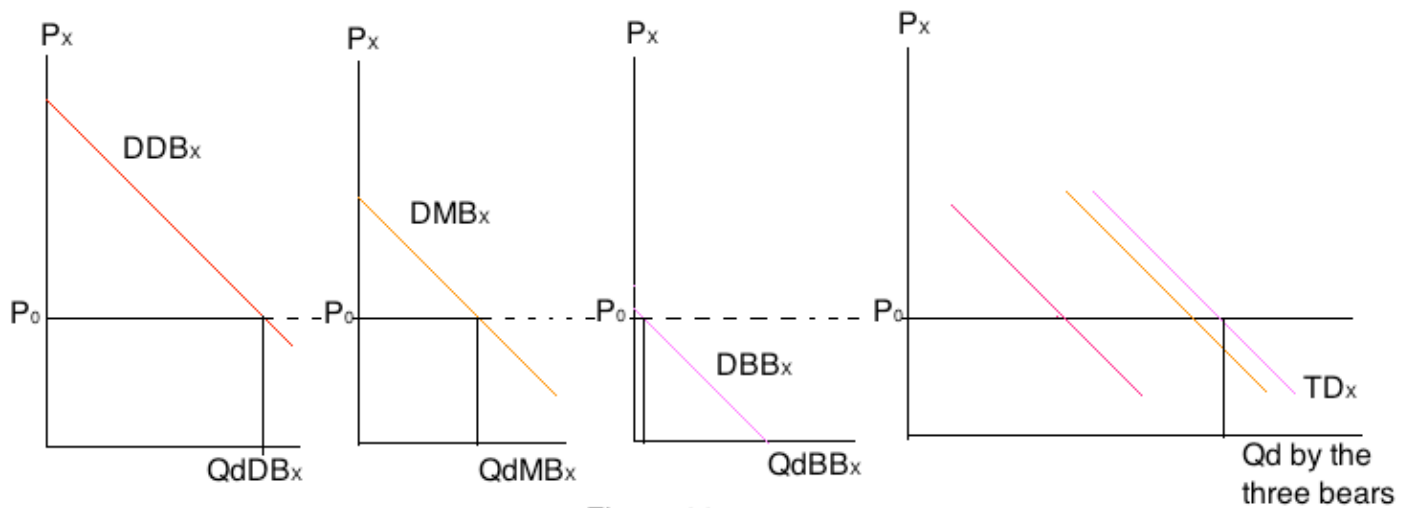


Figure 11

market demand curve.⁸

2. The problem with this procedure is that as prices change at the market level there will be changes in individual's incomes, which will cause the individual demand curves to shift. We will follow tradition. Having looked the problem squarely in the eye we will ignore it and assume that there exist market demand curves and market supply curves that have all the nice properties of their individual demand and supply curve counterparts, specifically that market demand curves slope down to the right and market supply curves slope up to the right.

15. SUPPLY AND DEMAND PREDICTIONS

1. What can we predict when we know that there has been a shift in the demand curve for X ? *Because the supply curve for X is upward sloping the price and quantity of X must move in the same direction; a movement along the supply curve must be accompanied by the price and quantity moving in the same direction. If there is an increase/decrease in demand for X , then the price of X , P_x , increases/decreases, and the quantity transacted of X , Q_x , increases/decreases.*

⁸ The market demand curve really has two kinks. Initially the market demand curve for honey is simply DDB . But as the price falls, we have to add DMB to DDB to obtain the market demand curve. Finally, the price drops sufficiently for BB to be able to purchase and then the market demand curve is $DDB + DMB + DBB$.

2. Because the demand curve slopes down to the right P_x and Q_x must move in opposite directions when there is a movement along the demand curve, therefore an increase in the supply of X will cause P_x to fall and Q_x to increase.

3. Therefore, if we know that **only one curve** has shifted, and that P_x and Q_x have both decreased, then it must be the case that the demand for X has fallen; if we know that P_x has decreased while Q_x has increased then the supply of X must have increased. (See Figure 12 below.)

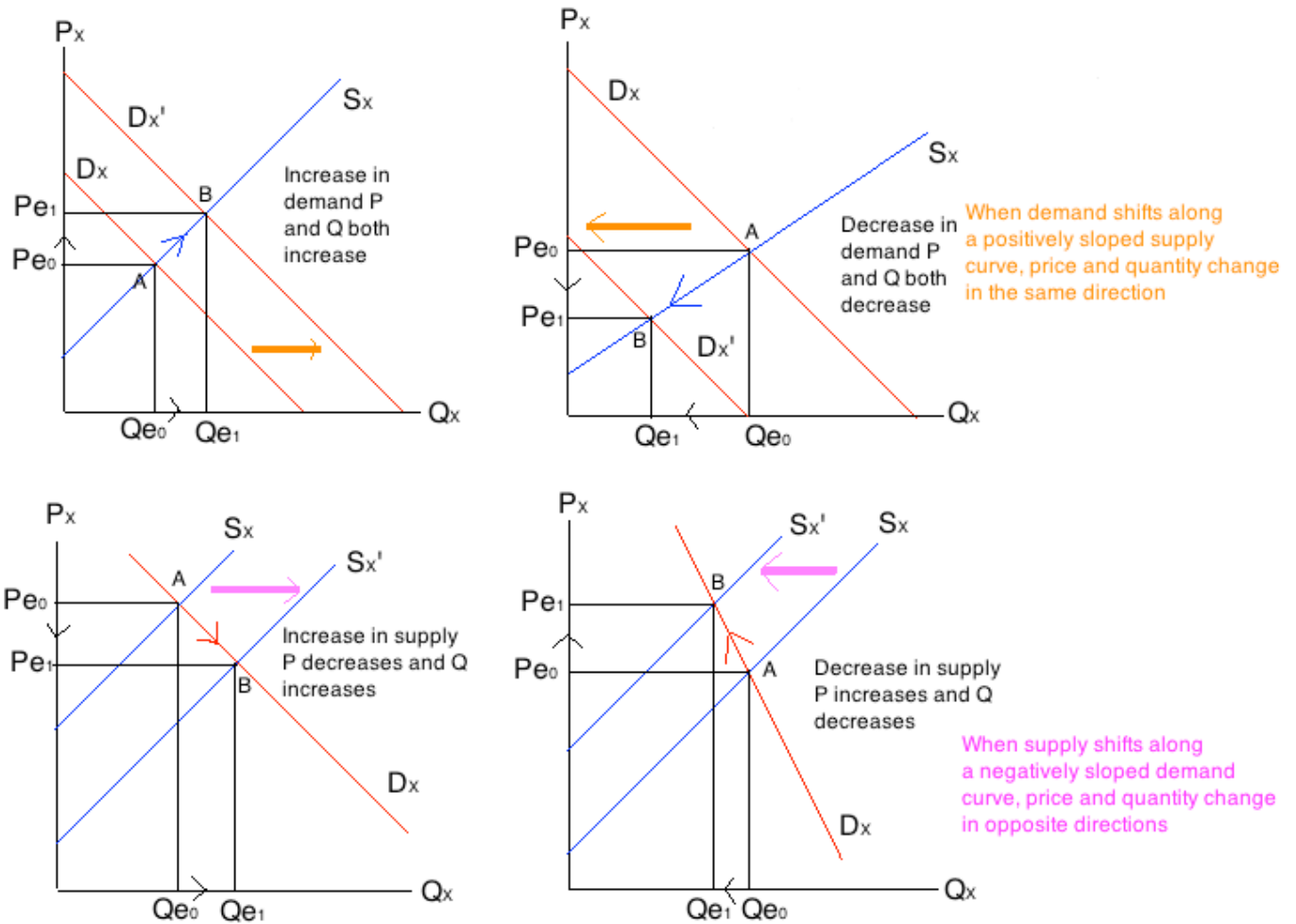


Figure 12

16. FINAL THOUGHTS

1. Economic analysis is purely qualitative; it predicts directions in which things change, but it does not specify the magnitudes of those changes. This is because we are doing theory – all theory, including physical theory – is qualitative.⁹
2. The sort of predictions the model makes are pretty vague. For example, if oil production increases because of “fracking”, then, at some time in the future, we would expect the price of oil to fall. Notice that our prediction is qualitative (it claims that oil prices will fall, but does not say by how much), and atemporal (it doesn’t say when the oil price will fall, or how long the fall will continue), and

⁹ The inverse law of gravitation states that the force acting between two masses is directly related to the product of their masses and inversely related to the square of the distance between the centers of those masses. Only when we attach numbers derived from observation and experiment to the masses and distances can we use the gravitational constant to determine the magnitude of the force.

that it is conditional (it assumes *ceteris paribus* – other things are held constant – for example, there is no large increase in the demand for oil during the time period).

3. Most economists spend most of their time analyzing data hoping to add numbers to their formulas in order to derive specific quantitative predictions from their models. This is very difficult to do and requires extensive training in econometrics – the special statistical techniques that must be used when analyzing economic data. However, even when economists do extensive empirical work on the market in question the model seldom yields good predictions about what will happen to price and quantity transacted.

4. As the Bob Solow epigraph to the Syllabus notes, “economists seem to be the only people who have any systematic way at all of thinking about certain problems”. For example, whenever gas prices rise (but seemingly never when they fall) politicians get upset and begin to think in terms of conspiracies by the oil companies to raise gas prices. The price of gas depends on the price of crude oil, which is determined in the world oil market. But the US is only part of the world oil market; therefore, the price of oil is not determined by demand and supply in the US. Increases in demand for oil in China or India will cause gas prices in the US to increase. (Changes in the price of gas reflect changes in the world oil price some weeks earlier, because refineries and distributors hold inventories of oil.)

Note that if the oil companies are colluding, rapacious, profit maximizers then they have already set the price that squeezes the last cent of profit out of us; they cannot make more profit by raising price if MC already equals MR. The profit maximizing gas price is primarily determined by the cost of crude oil – which the oil companies have to take as given. Ironically oil companies tend to be most profitable when oil prices are low because the companies can then raise their profit margins without us noticing; a 15c price increase is just as profitable when the base price is \$2.50 as when it is \$4.60, but we don't pay much attention to the first change, although we are outraged by the second one.

5. Remember that *the quantity demanded always means the quantity that you would purchase if, and only if, you have the means to make the payment*. Much of what economists say about the effectiveness of markets as allocative mechanisms depends crucially on this assumption, although most texts do not bother to point this out, and most “pundits” seem to be oblivious of this assumption.

6. Finally (really!) although I have been drawing supply and demand curves throughout this commentary, and although I believe that supply and demand analysis is a useful explanatory tool, the supply and demand model has little or no predictive power; another thing which conventional texts tend to ignore. Remember, supply and demand curves do not really exist!

HOW TO DO SUPPLY AND DEMAND QUESTION IN EXAMS

1. Treat these questions as a *game*. In an exam I am **not** interested in how ingenious you can be at thinking up strange supply or demand curve scenarios which violate the assumptions underlying the standard analysis, what I want to know is do you understand the standard analysis – what I say in class and what I write in the Commentary. (If there is ever a conflict between the two ask me about it.)

2. KISS: Keep things simple, do not start to concoct elaborate explanations that draw on your "common sense", common sense is not likely to help you answer test questions on supply and demand. Ask what yourself what did the Old Sleeperson write about this – that is what he wants to test me on. (8,798)

IF you are interested in the formal algebraic supply and demand model – and there is absolutely no reason why you should be, and it probably won't help on the exam – then click on MORE on the menu bar on the Sleemanomics site. Click on the blue Microeconomics box. Select PAPER 2: THE SIMPLE ANALYTICS OF THE SUPPLY AND DEMAND MODEL.

All of the other papers are on supply and demand. Much to my annoyance the general equilibrium paper, which I think is the least interesting one, has had almost 1,000 reads on ResearchGate but the last one has only had a about 50.