Macroeconomics: an Introduction

Supplement to Chapter 1

Review of the Principles of Microeconomics

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S.1 What is Microeconomics All About?

Microeconomics is the study of how decisions are made by consumers and suppliers, how these decisions determine the allocation of scarce resources in the marketplace, and how public policy can influence market outcomes for better or worse. A basic understanding of microeconomics is essential to the study of macroeconomics because "micro" provides the foundations upon which "macro" is built. It is pointless to try to explain, for example, the demand for money and how it affects interest rates in the economy without a grasp of how suppliers and buyers interact in a market. The objective of this supplement to *MACROECONOMICS: An Introduction, Third Edition* is to provide a relatively compact overview of microeconomics for use in a course where micro is not a prerequisite for macro, and for students who want to brush up on their micro.

Economists think of there being two sides to a market, the demand side and the supply side. The demand side consists of economic agents, households and sometimes firms, who come to the market to buy a specific good or service. The supply side consists of the suppliers of the good or service, generally firms that produce the item.

In markets for final goods, which are ready for consumption, the demanders are usually the consumers in the household sector; for example, someone buying a croissant. However, in the case of capital goods, it is a firm that is the buyer of the final good; for example, a bakery buying a new automated oven. There are also markets for intermediate goods where the buyers are firms purchasing a good or

service used in the production of another good or service, for example bakeries purchasing flour from millers, or millers purchasing wheat from farmers.

We study the demand and supply sides of a markets separately, because each involves a different groups of agents. Within each group there is a common goal but the two groups have very distinct goals. Buyers all come to the market with the same goal of getting as much satisfaction, or what economists call utility, as they can from their limited budget. Suppliers are maximizing profit by using the factors of production - land, labor, capital, and entrepreneurship, - as effectively as possible, given the costs of those factors and the price at which they can sell their product.

Let us start by studying the behavior of consumers in a market familiar to most of us, the market for audio compact discs (CDs).

S.2 The Law of Demand

Think for a moment about your plans to buy audio CDs over the next year. Do you expect to buy about 1 per month? or 2? or 5? What would cause you to change the number you plan to buy? Certainly, a change in the price of CDs or a change in your income would cause you to reconsider the number you buy. Think first about your response to price.

Suppose that CDs sell for $12 each, and you currently buy about 2 per month, on average. How many would you buy if the price were $20 instead? Certainly fewer, perhaps only 1. On the other hand, if the price fell to $4 each, you would surely buy more, maybe as many as 3 per month. In each case we assume that your income has not changed. We can summarize this information in a table as follows:

One Person's Demand for CDs

One Person's Demand for CDs

Price of a CD	Number of CDs you would buy per month at that price
$4	3
$12	2
$20	1

We have taken a one person marketing survey here to see how the quantity of the CDs you would buy, which economists call the quantity demanded, varies as a function of price, holding income and all other variables that might affect your decision constant. If we could ask this question of all CD buyers we could add up the quantity demanded by each and get the quantity demanded in the CD market by all consumers. The results might look like this:

All Consumers' Demand for CDs

Price of a CD	Quantity Demanded per Month
$4	150 million
$12	100 million
$20	50 million

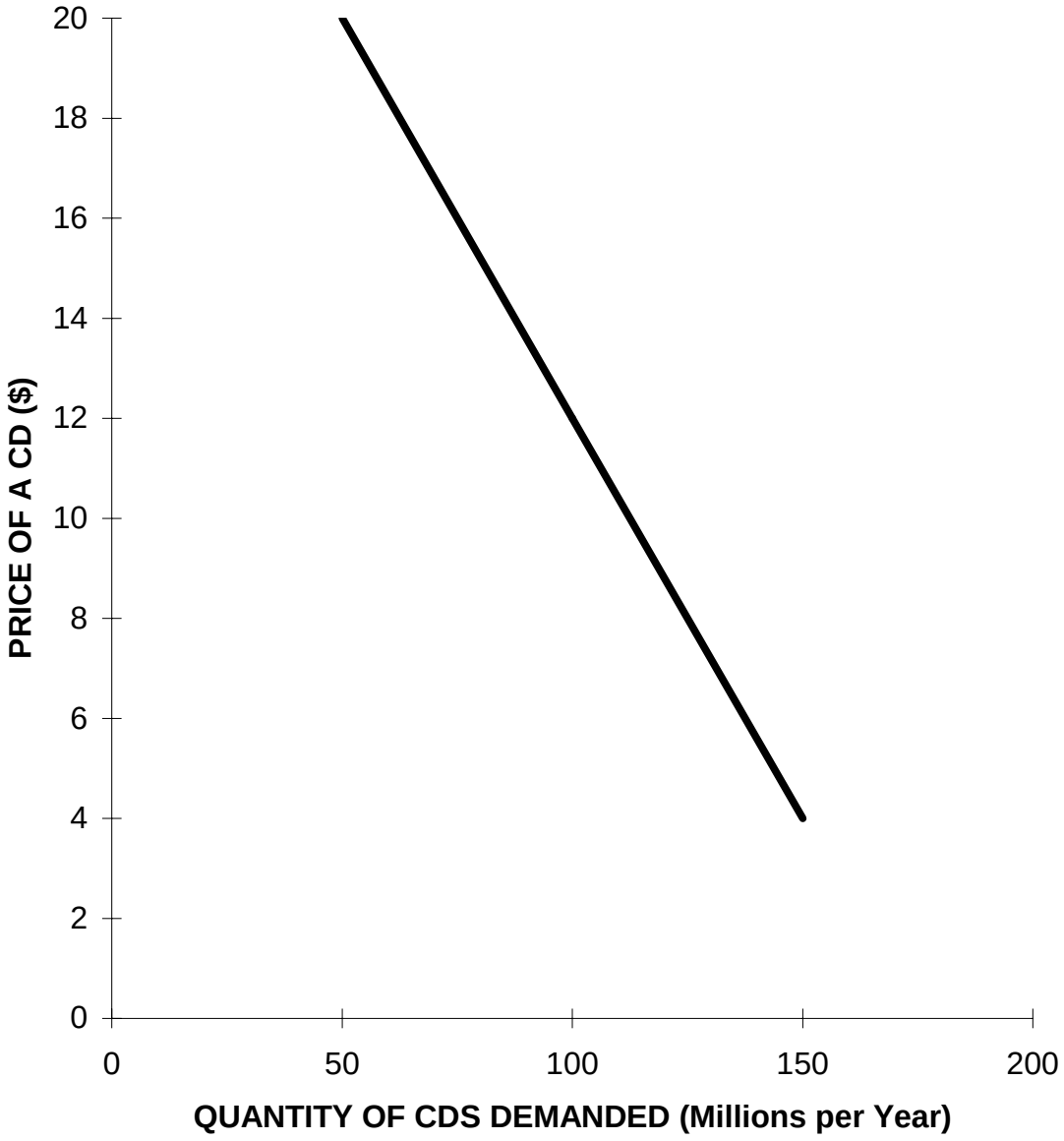
Economists call this the demand schedule. We can capture the same information in a graph such as Figure S.1.

Notice that price is measured on the "y axis" and quantity demanded on the "x axis." The prices and quantities in the above table are only three points on a line that tells us what the quantity demanded would be at any price in the range of $4 through $20. This line is called the demand curve. In practice, we would have data only at specific prices where we have made an observation of the quantity demanded, and the demand curve is based on interpolating between those points of observation.

Notice too that the demand curve slopes downward, meaning that people will buy less of the good at a higher price, and more of it at a lower price. The points on the demand curve tell us what quantity is demanded at each price. We can visualize the response of consumers to a change in price, then, as a move along the demand curve.

This inverse relationship between price and the quantity demanded is called the Law of Demand. It is one of the most firmly established principles in the social sciences and it is no exaggeration to say that it is the keystone of economics.

Figure S.1: The Demand Curve For CDs



Why are economists so convinced that there is an inverse relationship between price and quantity demanded?

First of all, we all see the law of demand at work in every day life. If Ford has too many trucks left over at the end of the model year it offers discounts to stimulate demand. What we call a "sale" is just the use of the law of demand to increase the quantity sold by cutting price. We saw that when personal computers became cheaper, the number of homes owning one increased rapidly. Traveling around the country one can see that in states where electricity is relatively cheap, the amount of electricity used per home is higher than in states where electricity is expensive.

Secondly, the way that price affects consumer choice is easily and well understood, and that analysis is compelling in its support of the law of demand. Here is a summary of the theory of how a consumer reacts to a change in price.

Suppose that you are a buyer of CDs and you find one day that the price has jumped up from the $12 to which you have been accustomed to $20. There are two very clear reasons to reduce the number of CDs you purchase.

One reason is that CDs have become more expensive *relative to* other forms of music or entertainment.

If there were an increase in the price of CDs, you and other consumers would surely think about buying other goods or services instead, those that yield some of the same kind of satisfaction but are now *relatively* less expensive. For example, a live concert is another source of music entertainment that you might be more likely to buy instead. At a price of $100 for a CD you might well give up buying them altogether and only attend concerts. The tendency to shift your demand away from a good or service when the price rises and toward other goods or services is called the substitution effect. The goods or services consumers tend to shift towards in a particular case are called substitutes. For example, live concerts, tapes, records and video tapes are all substitutes for CDs. The demand for jeans will probably not change a lot in reaction to a change in the price of CDs because jeans are not a good substitute for CDs.

Of course, we assume for the moment that the prices of everything else, including concert tickets, and your income, stay the same. Why do we make this assumption? You might think that it is unrealistic to assume that everything else except the price of a CD is the same, when in real life all prices and incomes are often changing at the same time. It is not that we assume that all other prices and your income *do* in fact remain constant, but rather we can isolate the effect of one variable, the price of CDs, on your behavior only by *temporarily* considering the effect of a change in that one price alone. We can only hope to understand the combined effect of several variables on behavior by understanding first

the effect of each, one variable at a time. This is the reason for the "others things held constant" or "ceteris paribus" assumption of economic analysis that students often find puzzling at first.

The *second* reason why a consumer will purchase less of a good when the price rises is that the consumer can no longer buy all of the same goods and services as before with the same amount of income. If CDs now cost $20 instead of $12, and your income hasn't changed, then you have to reduce your demand for *something* because you simply do not have enough dollars of income now to buy all the same quantities of everything you bought before. You can buy fewer CDs, fewer jeans, fewer espressos, or fewer things in the future by reducing your savings, but something has to give. This effect is just like what would happen if your income fell, so it is called the income effect. We use this term even though your dollar income has not changed. The higher price of CDs has made you poorer, and you must make the same kinds of adjustments to your budget that you would if your income had fallen.

To sum up, the law of demand says that the quantity of a good or service that is demanded varies inversely with changes in the price, holding other factors constant. This effect has two components, the substitution effect and the income effect. Both work in the direction of making the quantity demanded change in the opposite direction to a change in price.

S.3 What Happens to the Demand Curve When Consumers' Incomes Change?

Suppose that your main source of income as a college student is a part time job that has been paying $7 per hour but your boss is so impressed by the grade you got in Economics that now you get a raise to $9. What happens to your demand for CDs? Obviously you can now afford more of any of the goods and services you purchase, and it seems likely that you will use part of your increase in income to buy more CDs. Your demand schedule might change something like this:

How One Person's Demand for CDs Depends on Their Income

Price of a CD	Number of CDs you demand when you earn $7 per hour	Number of CDs you demand when you earn $9 per hour
$4	3	4
$12	2	3
$20	1	2

At any given price you will now buy an additional CD per month as compared with your previous demand schedule. The income change has

changed your demand schedule, the quantities demanded moving in the same direction as income.

Similarly, if many consumers experience a rise in income due to a booming economy, the demand schedule for all consumers will also shift. We would observe this if we compared the demand schedule for CDs during the recession of 1990-91 with the demand schedule during the boom in 1993:

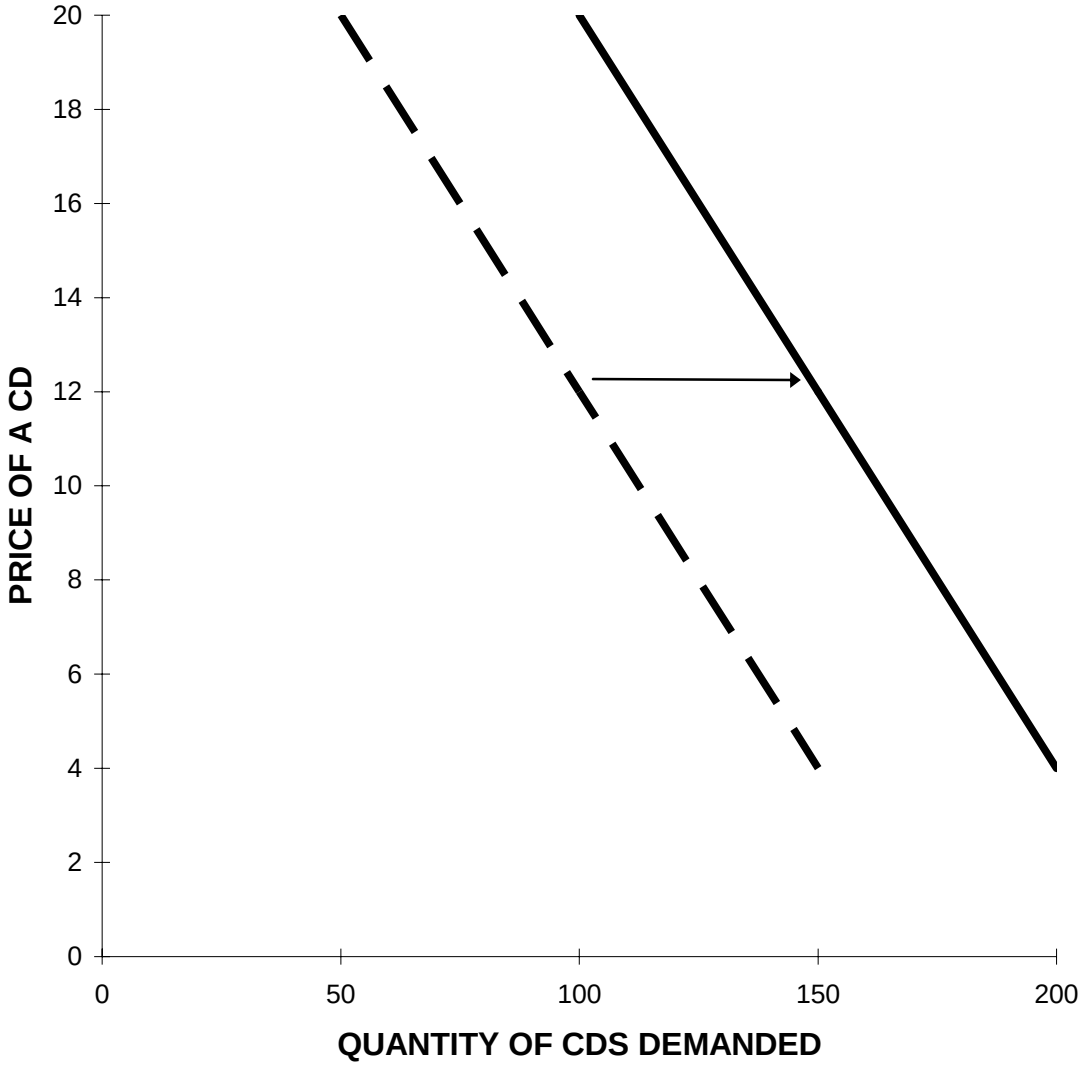
The Demand Schedules for CDs at Low and High Incomes

Price of a CD	Quantity Demanded During Recession	Quantity Demanded During Boom
$4	150	200
$12	100	150
$20	50	100

Notice, again, that an increase in income, this time as the economy recovers from a recession and households experience rising income, increases the quantity of CDs demanded at any given price. The entire demand schedule has changed, and we can see this clearly in a graph of the two corresponding demand curves in Figure S.2. At any price, the boom-time demand curve lies to the right of the recession-time demand curve. We think of this as a shift in the demand curve to the right as the economy makes the transition from recession to boom. If the economy were to fall again into recession, then the demand curve for CDs would shift back to the left and then consumers would demand fewer CDs at any given price.

To sum up, economists visualize the demand for a good or service as a curve that shows the quantity demanded at various prices, holding income and other variables (such as consumers' "tastes") constant. A change in price is seen as a move along the demand curve as discussed in the previous section. For example, a change in the price of a CD from $12 to $20 during the 1990-91 recession would have resulted in a move along the demand curve from a quantity demanded of 100 million per month to only 50 million. A change in income on the other hand, is visualized as a shift in the demand curv*e*. On this new demand curve, the quantity of CDs demanded at any given price has changed.

Figure S.2: The Demand Curve For CDs Before (Dash) And After (Solid) An Increase In Consumers' Incomes



S.4 How Other Variables Affect Demand

We have just seen that a change in consumers' incomes will shift the demand curve; to the right in the case of an increase in income and to the left in the case of a decrease in income. Many other variables will also shift the demand curve, and the most important of these are tastes and prices of substitute goods.

What economists mean by tastes is the set of preferences that people have for the various goods and services that they choose among. Tastes for specific goods are often derived from more basic motivations. The taste for CDs is derived from a taste for music, which, in turn, depends on past experience, education, and the stimulation we receive from advertising, conversation, and listening to music. Tastes can change and when that happens the demand for goods changes. Experiencing the clarity of a CD will induce many people to demand more CDs than before, without any change in price or income. We depict the impact of an increased taste for CDs by a shift in the demand curve to the right, just as in Figure S.2 for a change in income. Again, the ceteris paribus statement that demand increases, holding incomes and prices constant, does not mean that incomes and prices *are* constant, but rather it isolates the effect of a change in tastes on the demand.

Prices of substitutes, goods and services that provide similar satisfactions, will also affect the demand for CDs. An increase in the price of concert tickets will induce us to shift from consuming music live to consuming it electronically. That would cause a shift in the demand curve to the right, just as in the case of in increase in income or an increased taste for music. On the other hand, a fall in the cost of digital tapes, another substitute for CDs, would cause the demand curve to shift to the left, because people would be more inclined to buy digital tapes rather than CDs than they had been before.

Finally, the growth of population will, over time, tend to increase the demand for goods and services, shifting the demand curve to the right. The demographics of the population, the distribution of people across age groups, is also very important in shifting the demand for particular goods over time. For example, as the baby boomers, those born between roughly 1945 and 1965, have aged, the demand for sporty cars has diminished while the demand for cruise ship vacations has grown dramatically. Demographic trends are among the most important factors for marketing researchers to study.

S.5 The Law of Supply

The supply side of the market for CDs includes all of the firms that produce and market CDs. Each firm decides how many CDs it will produce and how many employees it hires. Over a longer time horizon, the firm must also decide how much plantto build, where by "plant" we

mean not only factories for manufacturing CDs but also warehouses, marketing programs, and contracts with performers. At the same time, each firm takes as given the price it can charge for a CD in any particular category. For example, today the price for a CD from a recognized band is, say, $12, although a new release hit might command $16. We will abstract from such gradations and talk about a standard CD selling for $12. That price is not something that the individual firm has any control over.

The decision facing Murky Music Corp. today is this: how many CDs do we crank out of the factory and distribute to stores next month? This is the firm's "short run" supply decision. Murky also has to decide whether to expand over the next several years by investing in new manufacturing facilities and warehouses, seeking new contracts with performers, and launching new advertising campaigns. These are "long run" decisions, meaning that they take effect over a long enough time horizon for the firm to alter its size by investing in new capacity. In this section we focus on the short run supply for a good, how much the firm will want to supply for the market over a short enough time horizon that we can take its capacity or plant size as fixed.

How do Murky and other firms decide what quantity to supply to the marketplace? Microeconomics assumes that the primary motive of firms is to maximize profit. What rate of output, then, will maximize Murky's profits?

Suppose that Murky is now producing CDs at a rate of 10 million per year and is considering raising output to 10.1 million per year. Profit will go up if the additional cost or marginal cost of producing that extra 0.1 million CDs is less than the additional revenue or marginal revenue of $1.2 million Murky that will receive by selling them. If Murky's management sees that marginal revenue exceeds marginal cost, the Murky will boost its production rate to 10.1 million CDs. If marginal cost is just balanced by marginal revenue, then there is no profit to be gained by raising production to 10.1 million units. In that case, we can also be quite certain that there is no point in considering production levels above 10.1 million units. That is because marginal cost would only increase more as Murky contemplates production levels above 10.1.

The general principle here is that *marginal cost increases as a function of output*. How can we be so sure that is true? Because the firm will always use its lowest cost resources first. For example, suppose Murky can produce 10 million CDs per year at its factory in California under normal conditions. If it wants to produce more than that it must either produce the additional units at its plant in Amsterdam and air ship them at considerable cost to markets in the U.S., or pay its workers in California overtime to work evenings and weekends. It would never make sense to use higher cost facilities first and leave lower cost facilities idle. Similarly, in agriculture the land that is best suited to growing wheat is already growing wheat. The land that would be put into production to

produce more wheat is land that requires more fertilizer, more tilling, or is farther from market.

Suppose, then, that Murky would produce 10 million CDs per year when the price is $12, because that is the production level that maximizes profit. Similarly, suppose that the industry in total would produce 100 million CDs per year. The way economists put it is that at a price of $12 the quantity supplied is 100 million units. What would happen to the quantity supplied if the price were $20 instead? Clearly, Murky and other producers would then bring higher cost facilities into production, air shipping CDs from Amsterdam and, say, Singapore. Perhaps Murky would supply as many as 15 million and the entire industry 150 million CDs to the U. S. market per year.

On the other hand, if the price were only $4 per CD, how many would be supplied? At such a low price, only the facilities with the lowest cost would be used. Certainly firms would not use expensive air shipment from abroad, they would not pay overtime, and some employees would be laid off as less efficient facilities were shut down. Murky might reduce output to, say, a 5 million rate and the industry in total to 50 million. We can summarize this supply schedule for Murky and the industry in the following table:

The Supply Schedules for Murky Music and the Industry

Price of a CD	Supplied by Murky	Supplied by the Industry
$4	5 million	50 million
$12	10 million	100 million
$20	15 million	150 million

The important attribute of a supply schedule is that *the quantity of the good supplied increases as the price increases*. This is called the Law of Supply. The positive relationship between price and quantity supplied is captured graphically in Figure S.3 where the curve represents the supply schedule for the CD industry.

We should think of this as the short run supply schedule for the industry because it takes as given the present size of the industry. In a later section we will think about what the supply schedule and supply curve look like over a long enough time period for the industry to alter its size, but first we need to consider the impact on the supply schedule of a change in cost structure.

S.6 The Supply Curve Shifts When Costs Change

Suppose that the wages and salaries of employees in the CD industry take an upward jump due to competition from other high tech industries for talented people with training in using computers. The immediate effect of higher labor costs is to raise the marginal cost of producing another CD. Thus, the price at which the industry would be willing to

supply, say, 100 million CDs might be $14 instead of $12. Similarly, it might take a price of $22 to elicit a supply of 150 million CDs per year, and the industry might require a price $6 instead of $4 to supply 50 million per year. The new supply schedule would be:

Industry Supply Schedule After a Wage Increase

Price of a CD	Quantity of CDs Supplied
$5	50 million
$13	100 million
$21	150 million

The old and new supply schedules are plotted in Figure S.4. Notice that the new schedule lies above the old one; the supply curve has shifted upward. What we see is that an increase in the marginal cost of production means that a correspondingly higher price is required to elicit the same supply as before.

Figure S.3: The Supply Curve For CDs

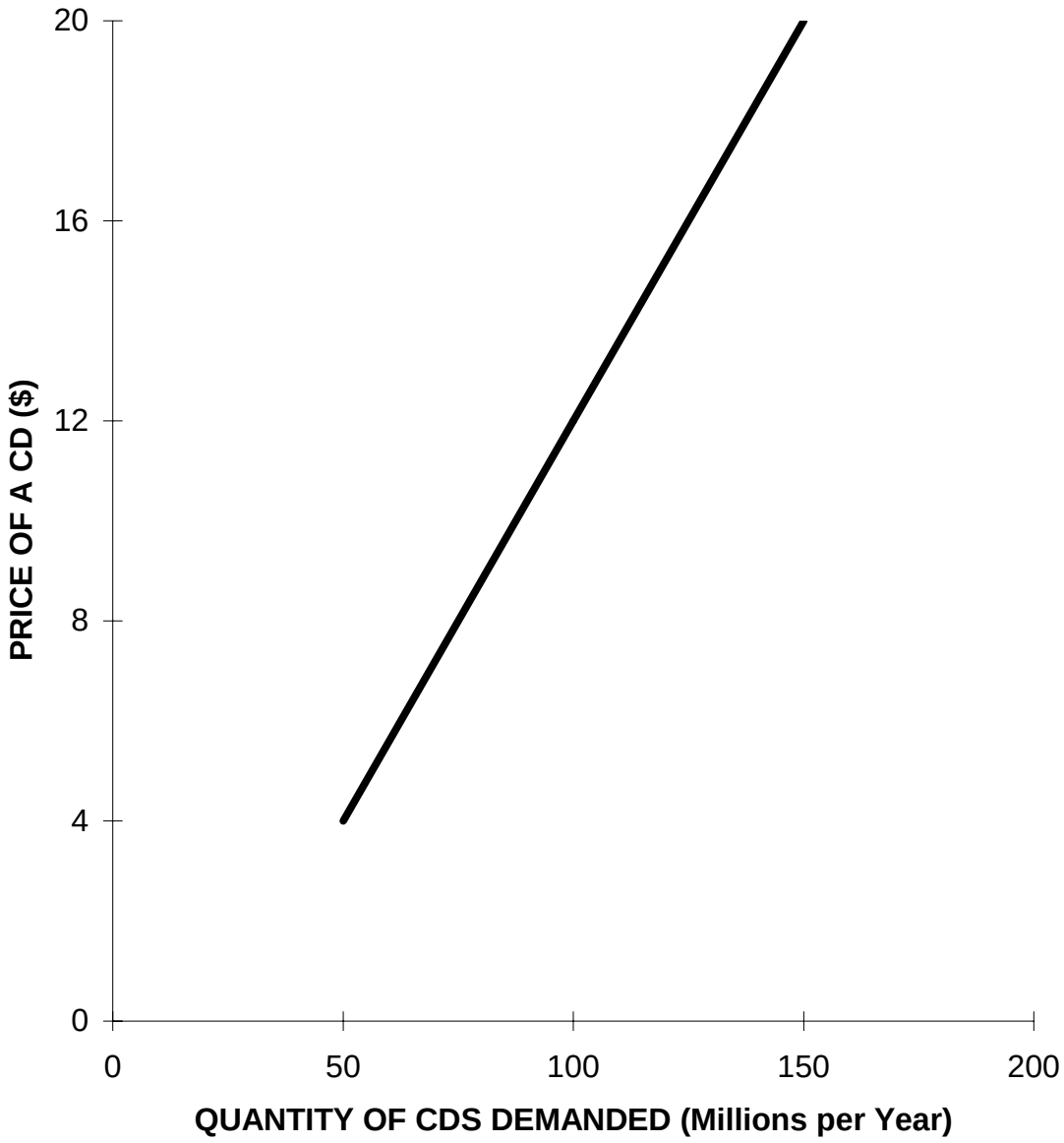
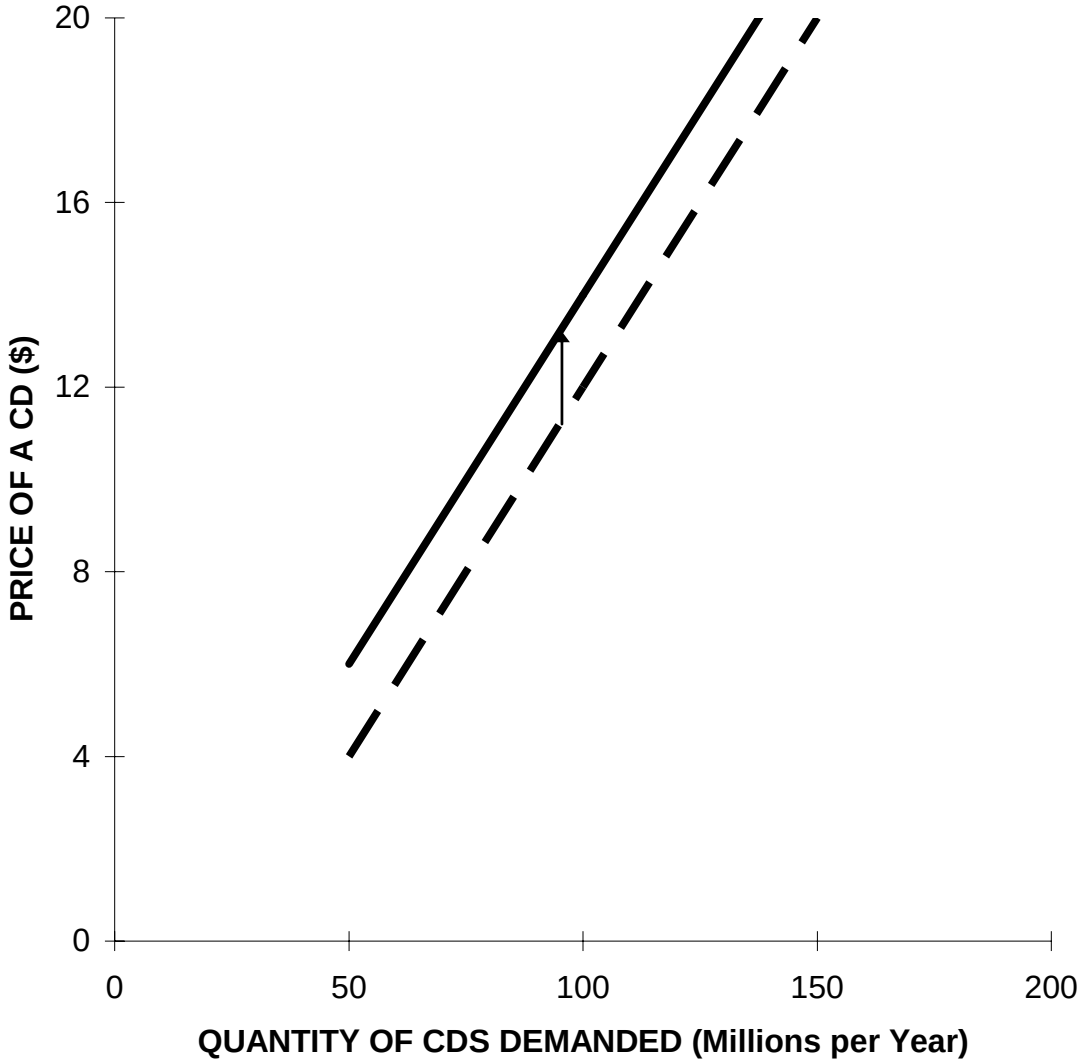


Figure S.4: The Supply Curve For CDs Before (Dash) And After (Solid) An Increase In The Marginal Cost Of Production



What would happen in response to a cost decrease? For example, suppose that new technology makes it cheaper to manufacture CDs by reducing the amount of lamination required. That implies a fall in marginal cost at every level of output and, therefore, a shift downward in the supply curve of the industry. After the cost reduction, it would not take as a high a price as before to elicit the same quantity of CDs to be supplied by the industry.

In general, technological change tends to reduce marginal cost and to shift supply curves downward. We might imagine that this new technology offsets the recent rise in labor costs, so that the supply curve in Figure S.4 shifts back down to its original position.

S7. How Supply and Demand Determine Price

It is a cliché that when someone expresses consternation at the high price of something, someone else says "hey, its all a matter of supply and demand." Unfortunately, many people who use that phrase do not have a very clear understanding of what it means. In this section we see how the supply schedule interacts with the demand schedule to determine the price, how changes in supply and demand cause the price to change, and how markets are affected by government policies.

When we combine the supply and demand schedules for CDs in one table (the original quantities, before we considered hypothetical changes affecting supply or demand) we have:

The Supply and Demand Schedules for CDs

Price	Quantity Demanded	Quantity Supplied	Excess Demand
$4	150 million	50 million	100 million
$12	100 million	100 million	zero
$20	50 million	150 million	-100 million

The fourth column is labeled "Excess Demand" and it is the key to understanding how price is determined in a market. The excess demand is the difference between the quantity demanded at any given price and the quantity supplied at that price. In this example, at a price of $4 the quantity demanded is 150 million while the quantity supplied is only 50 million; thus the excess demand at $4 is 100 million CDs per year. If the price were $4 per CD, the quantity demand by consumers would exceed the quantity supplied by the industry, and retailers would find that their shelves were bare and customers were clambering for more CDs. That is not a situation that we would expect to continue.

If the price were $20, then according to the table consumers would wish to buy only 50 million while the industry would be shipping 150 million to the stores. The excess demand at a price of $20 is *minus* 100 million. Another term for negative excess demand is excess supply; in

this case there is an excess supply of 100 million at a price of $20. In this situation, retailers would see inventories of CDs pile ever higher, and that clearly could not continue indefinitely.

But if the price were $12 we see that the quantity demanded is equal to the quantity supplied, so that excess demand is zero. At that price, retailers would find that shipments from the industry would be just adequate to meet demand from customers, allowing them to keep their inventories in control.

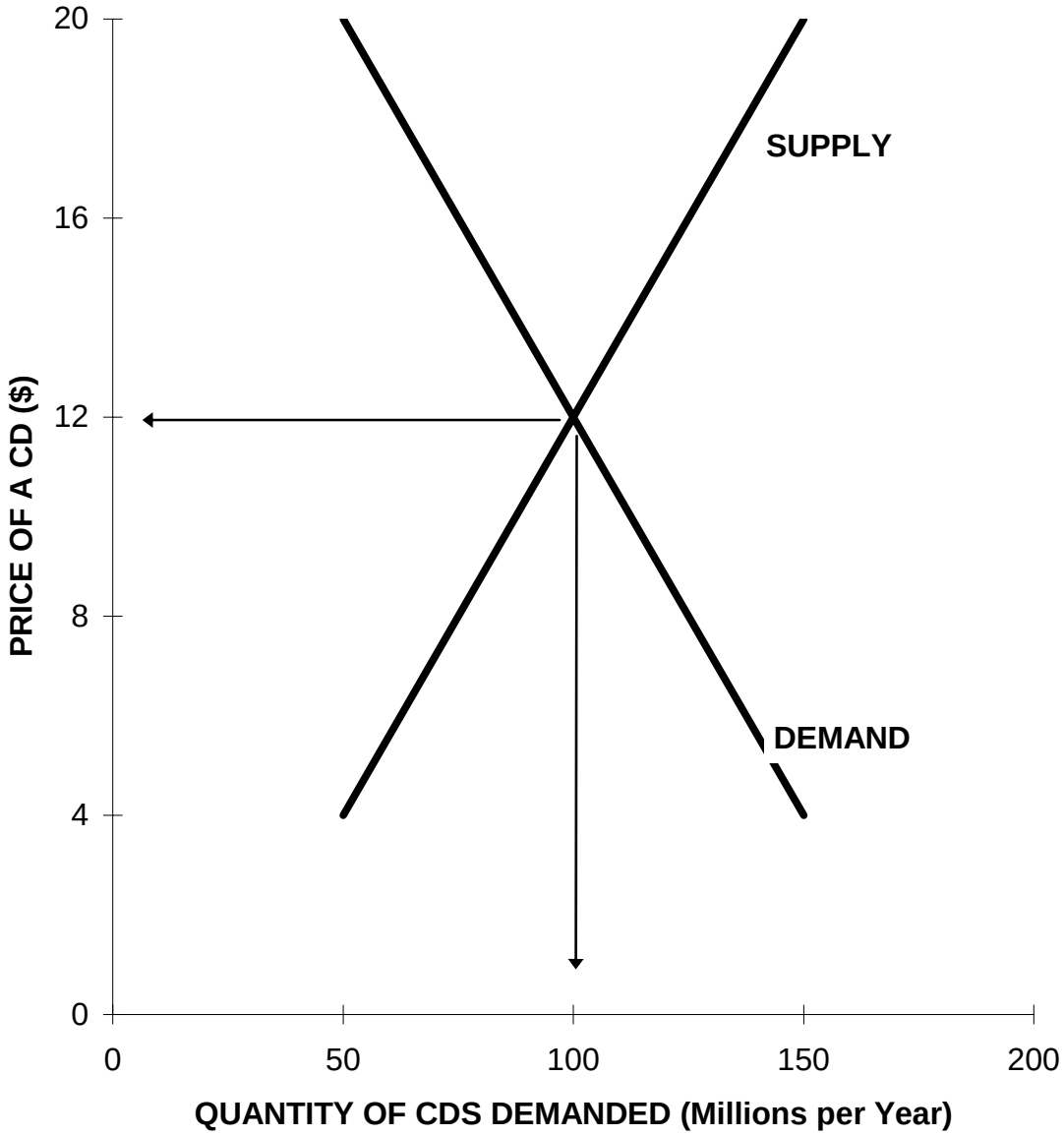
The demand curve and supply curve are both depicted in Figure S.5. Note that they intersect where price is $12 and quantity is 100 million. Excess demand is the horizontal distance between the demand and supply curves, and it is zero only where they intersect.

We know that demand and supply are in balance when price is $12, but is there any reason to believe that the price in the CD market will actually be $12? How does it get there, and why would it stay there?

The price in this market will move to $12 and stay there because the actions of suppliers and consumers, in pursuit of their own best interests, will push it there. At any price below $12, suppliers will find that they can sell more CDs than they are producing. They will find that they can raise their price because consumers will be willing to pay more since there is excess demand at any price below $12. Suppliers are happy to produce more CDs as prices rise because a higher price will offset the rising marginal cost of production. Thus, should the price be below $12 at any time, forces are set into motion that push it upwards to $12.

If the price at some time is above $12, suppliers will not be able to sell their output. They have no choice but to cut prices, since otherwise their inventories will grow. As the price settles down closer to $12, firms produce fewer CDs since they will use only those facilities that have a lower cost of production. Thus, at a price above $12, forces are set into motion that push the price downward to $12. At a price of $12, then, the market is in equilibrium, meaning there is no further tendency for either price or quantity to change.

Figure S.5: Demand And Supply Curves For CDs



Suppose now that the government passed a law, in response to pressure from consumer groups concerned about the high cost of CDs, requiring the price to be no higher than $4. What we would observe in the market is a severe shortage of CDs; demand would far exceed supply, and lines would form at the retail stores as consumers waited to buy the limited supply offered at that price. While consumers would pay less for the CDs they do buy, they would buy and enjoy far few of them, in fact half as many in our example.

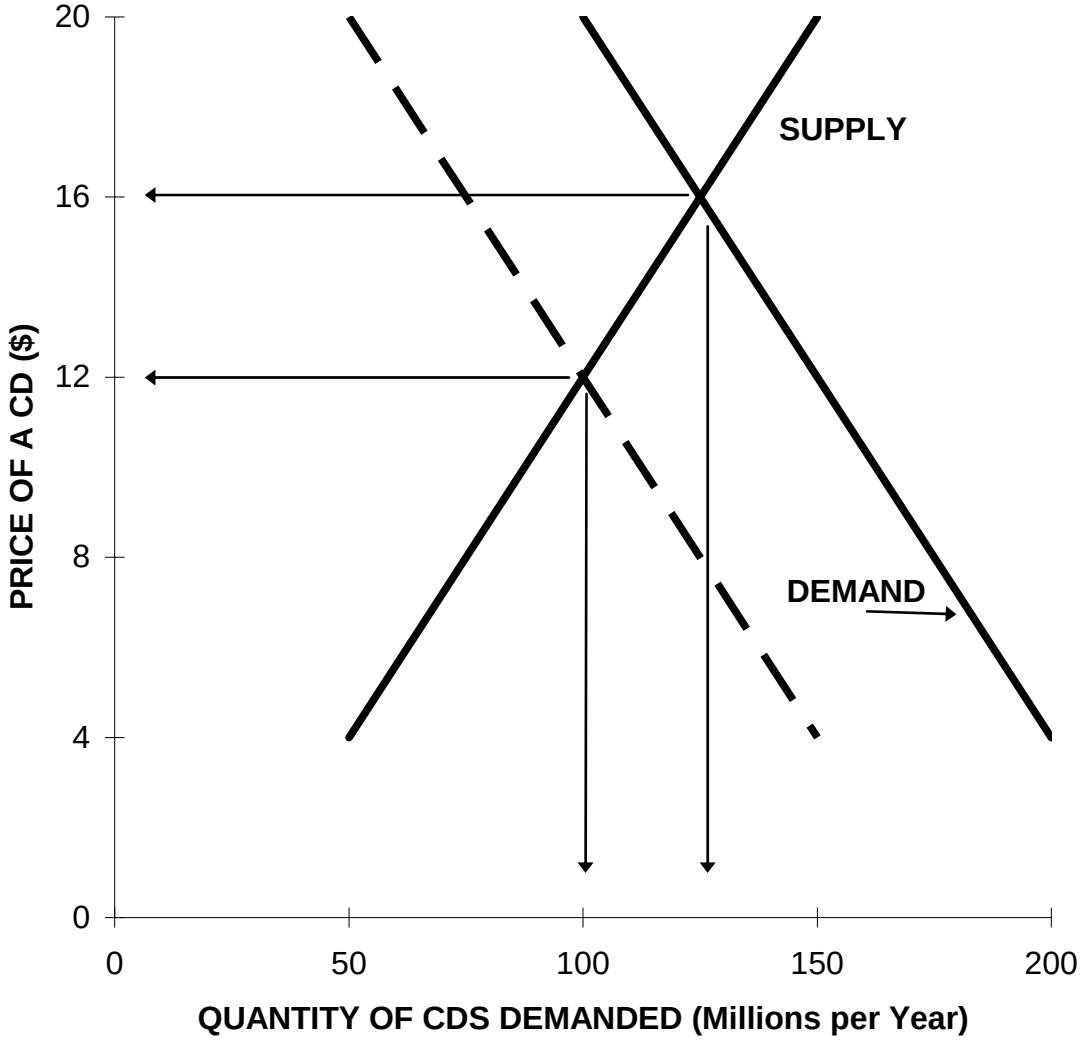
The fact that *government price controls have always resulted in shortages*, based on observations from the time of the Roman Emperor Diocletian to U.S. President Jimmy Carter, is a striking confirmation of the validity of our theory of how markets work.

Suppose instead that CD firms succeeded in getting Congress to pass a law requiring a *minimum* price level of $20 per CD. To make this happen, the government would have to be prepared to buy all the extra CDs that would be produced at that price but not purchased by consumers. In fact, it would have to buy 100 million CDs per year, the excess supply at a price of $20. The wastefulness of such a policy is clear in the fact that the industry responds to the high price by producing another 50 million CDs per year, while consumers buy and enjoy 50 million fewer than they would if the market were setting the price and output. Nevertheless, it is precisely a price support program of this kind that has dominated U. S. agricultural policy for decades, resulting in higher prices to consumers while surpluses purchased by the U.S. Department of Agriculture rotted in storage bins.

What happens to price and quantity if consumers' incomes or tastes change, or prices of substitutes changes, or producers' costs change? These changes are of course constantly occurring in real markets, and they can be understood as shifts in the curves causing the point of intersection to move. Figure S.6 depicts the response of the CD market to an increase in consumers' incomes, causing them to demand more CDs at any given price. The intersection of supply and demand shifts to a price of $16 and a quantity of 125 million CDs per year.

Note that this is accomplished by *a move along the supply curve*. It is demand that has shifted, not supply, and it is only the change in price that brings about a change in the quantity supplied as producers bring higher cost facilities into production to meet the greater demand.

Figure S.6: Response To A Shift In The Demand Curve For CDs



S.8 Supply in the Long Run

Recall that the "long run" is a period of time sufficient for a firm to adjust its size by changing its capital stock, the factories, equipment, and long term contracts that cannot be altered over the "short run." According to our hypothetical supply schedule, Murky Music will supply a quantity of 10 million CDs per year to the market *this year* when the price is $12, but it may well not *continue* to supply one million CDs if the price stays at $12.

If the price of a CD is expected to remain at $12, Murky's management must consider whether the firm should make the investments required to expand its CD business, or just try to maintain its current position in the industry, or even go out of business as its plant wears out and contracts with performers expire. Although the output of one million CDs gives Murky the highest profit it can possibly earn today, that does not necessarily mean that this profit level is perceived to be attractive over the long run. Murky may be able to do better by expanding or contracting its CD operations.

For example, suppose that Murky's profit represents only a 1% return on the financial capital that the shareholders have invested. They might well decide that they are better off selling some or all of Murky's assets to other firms and reinvesting their capital in another business, or just purchase U.S. Treasury bills that yield 5%. In that case, Murky would not continue to supply 10 million CDs to the market at $12. It would supply fewer than that over the long run and perhaps none at all if Murky goes out of business.

Short run profit maximization does not even imply that Murky is making a positive profit. It could be that Murky cannot make a profit at $12 per CD and is only able to minimize its losses in the short run by producing 10 million CDs. In that case its management and shareholders must consider seriously whether to continue in the CD business at all. Perhaps the firm would become profitable if additional capital expenditures were made, say a new warehouse in the midwest that would cut costs. Perhaps they would conclude that there are too many firms in the CD business and that they should not invest further but rather sell the warehouses, factories, and equipment that they have, exit the industry, and deploy their capital elsewhere.

On the other hand, it may be that Murky is not only maximizing profits but actually making a very large profit. Murky's management may also see that by expanding the firm it can increase profits further. For example, investment in a new warehouse in the midwest might be estimated to earn a return of 50% per year, so Murky's management borrows from its bank, paying only 13% interest on the loan, to build the warehouse. In the long run, Murky would then be supplying many more than 10 million CDs to the market.

The conclusion from these thought experiments is that *firms will expand and supply more if they see that expansion will add to their profits over the long run, and they will contract or even exit the industry if they see that such a course of action will be more profitable over the long run.*

Clearly, at higher prices firms will tend to increase their long run supply more than at lower prices. For example, if the CD is expected to be $20 instead of $12, there are many more expansion opportunities that become profitable. In fact, new firms will see the CD industry as a very attractive one to be in, so new firms will enter the industry. The effect of the entry of new firms is to expand long run supply even further. On the other hand, if the price is expected to stay at $4, then firms will not only contract their operations over time but exit the industry altogether. This suggests that the quantity supplied in the long run is not only positively related to price, but is more sensitive to a change in price than is short run supply. Economists refer to the sensitivity of supply to a given change in price as the elasticity of supply, What we can call the Second Law of Supply states that *the elasticity of supply is greater in the long run than in the short run.*

We might imagine that the long run supply schedule for the CD industry would compare with the short run supply schedule shown below.

In this example, at a price of $12 the industry would continue to supply what it does today, but at a lower price the industry would "downsize" drastically. Indeed, at a price of $4 the industry would disappear in the long run. A higher price would bring about an expansion of the industry. The corresponding short and long run supply curves are depicted in Figure S.7. Note that the long run supply curve is flatter than the short run curve, reflecting the greater elasticity of supply in the long run.

A very important implication of the second law of supply is that the response to a shift in demand is greater in the short run than in the long run. If consumers suddenly develop a taste for CDs, the price will rise sharply in the short run with little increase in production. Over the next several years the CD industry will add new capacity, moving along its long run supply curve, so that in the long run there will be less change in price but a larger increase in production.

Quantity of CDs Supplied Per Year by the Industry

Price of a CD	In the Short Run	In the Long Run
$4	50 million	Zero
$12	100 million	100 million
$20	120 million	200 million

S.9 Demand in the Long Run

Think about a change in the price of CDs from $12 to $20 and what your response as a consumer might be after one month, after one year, and after several years, assuming that the new, higher price is maintained. It seems clear that the longer the price increase remains in effect the more will you reduce your purchase of CDs. After one month you might simply substitute a movie or concert, after one year you would probably find that you have gone back to buying tapes, and after two years you would very likely have made the investment in equipment to play digital tapes or music diskettes.

This thought experiment suggests that demand is more responsive or elastic to price changes over periods long enough for people to alter their consumption patterns, in part by changing the "capital goods" that they use in consumption. These are consumer durables such as appliances, housing, and cars. Here, again, is the distinction between the short run and the long run.

An example from American experience is the change in the demand for gasoline that followed a large increase in the price of gas in the mid 1970s. At first, people reduced their consumption by only a small amount since they were largely stuck with their gas guzzling cars and their existing commuting patterns. But smaller, more fuel efficient cars began to sell well, and over a period of a few years the composition of the auto fleet shifted toward cars with better fuel economy. People also had adjusted their commuting to reduce gas consumption, for example by using car pools. Thus, the long run response to higher gas prices, over a period long enough for consumers to change the capital good used for transportation, was much greater than the short run response.

We can imagine that the difference between a short run, say one month, and a long run, say two years, demand schedule for CDs might look something like the one shown below.

These two demand schedules illustrate how the response to a price change increases if it is maintained for a long time. We can visualize this contrast by plotting the two corresponding demand curves as in Figure S.8. Note that the long run demand curve is much flatter than the short run demand curve. Economists use the term elasticity of demand to refer to the percentage change in the quantity demanded relative to a given percentage change in price. It is clear from the table and the figure that *demand is more elastic in the long run than it is in the short run.*

This phenomenon is so pervasive in economic behavior that it is sometimes referred to as the Second Law of Demand.

The Demand for CDs in the U. S. Per Year

Price of a CD	Quantity Demanded in the Short Run	Quantity Demanded in the Long Run
$4	150 million	200 million
$12	100 million	100 million
$20	50 million	zero

Figure S.7: The Supply Curve For CDs In The Short And Lng Run

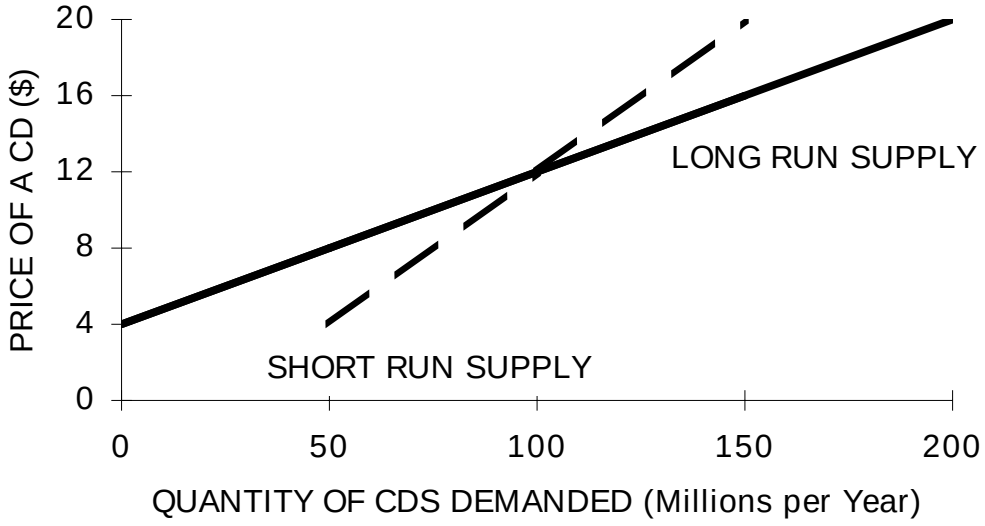
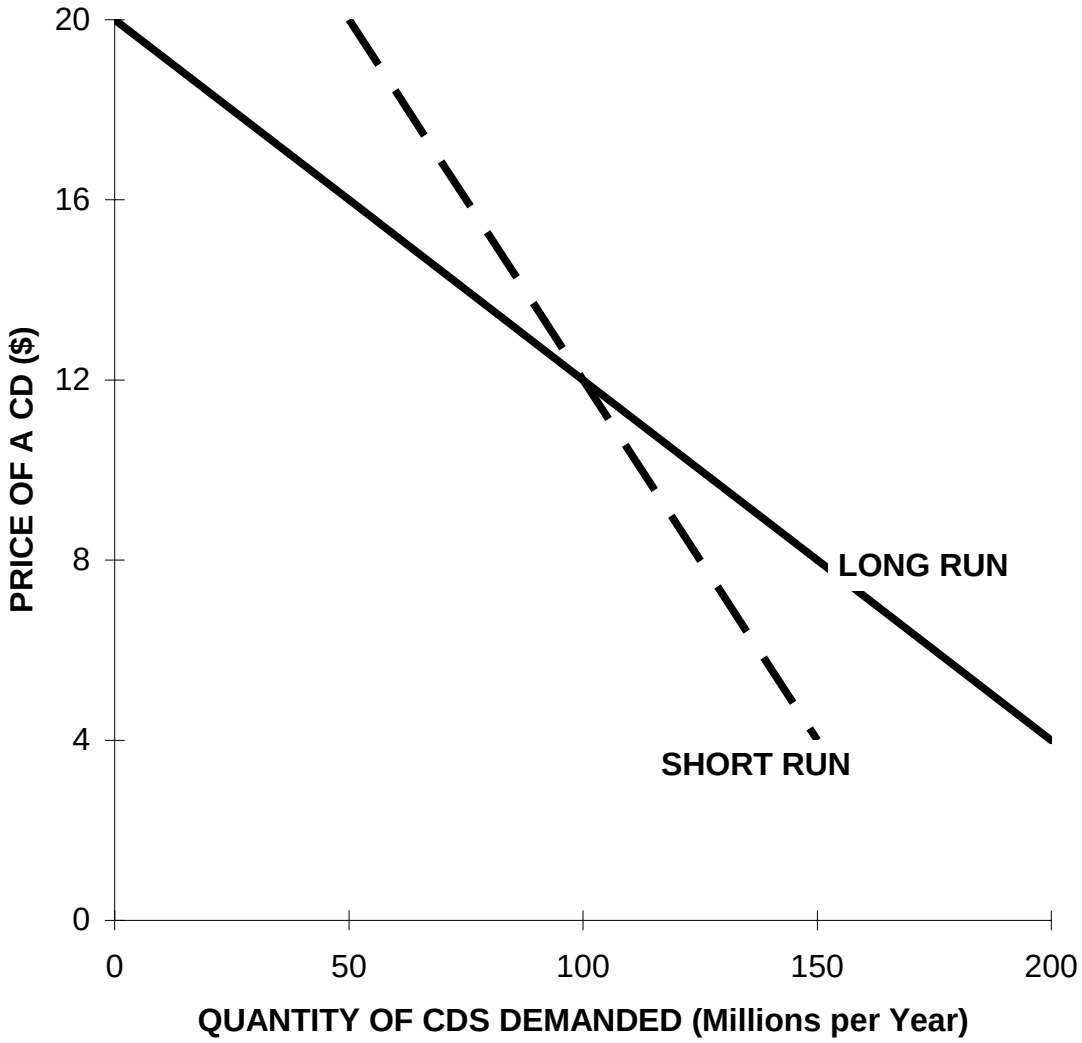


Figure S.8: The Demand Curve For CDs In The Short And Long Run



Exercises for Supplement on Microeconomics

A. Pick a consumer good or service that you normally buy and make a table of the quantity you would buy over a range of prices that includes the actual price today and hypothetical prices both lower and higher. Express in your own words what information this table contains. Now add another column of quantities that estimate your purchases if your income increased by 50%.

B. Now estimate the number of consumers in the U.S. for the good you chose and make a table of your estimates of the total quantities demanded over the same range of prices. Graph the result. Add to your table and graph the demand schedule under the assumption that all consumers enjoy a 50% increase in income.

C. What would be a substitute for the good you chose? What will happen to the demand schedule if the price of that substitute were to fall by 50%?

D. Use your imagination to sketch a short run supply curve for your good and a long run supply curve. Why do they differ in shape? Re-sketch your short run supply curve under the assumption that the largest factory in the industry was destroyed by fire last night. What effect will that event have on the price, and how is this reflected in your graph of supply and demand?

E. Suppose that the supply of this good were permanently restricted for some reason. Compare the short run response in the price to the response over, say two years. What aspect of consumer behavior accounts for the difference?

END.