Chapter 3

This chapter introduces the economic model of demand and supply-one of the most powerful models in all of economics. The discussion here begins by examining how demand and supply determine the price and the quantity sold in markets for goods and services, and how changes in demand and supply lead to changes in prices and quantities.

3.1 Demand, Supply, and Equilibrium in Markets for Goods and Services

Economists use the term **demand** to refer to the amount of some good or service consumers are willing and able to purchase at each price. Demand is fundamentally based on needs and wants-if you have no need or want for something, you won't buy it. While a consumer may be able to differentiate between a need and a want, from an economist's perspective they are the same thing. Demand is also based on ability to pay. If you cannot pay for it, you have no effective demand. By this definition, a person who does not have a drivers license has no effective demand for a car.

What a buyer pays for a unit of the specific good or service is called **price.** The total number of units that consumers would purchase at that price is called the **quantity demanded.** A rise in price of a good or service almost always decreases the quantity demanded of that good or service. Conversely, a fall in price will increase the quantity demanded. When the price of a gallon of gasoline increases, for example, people look for ways to reduce their consumption by combining several errands, commuting by carpool or mass transit, or taking weekend or vacation trips closer to home. Economists call this inverse relationship between price and quantity demanded the **law of demand.** The law of demand assumes that all other variables that affect demand (which we explain in the next module) are held constant.

We can show an example from the market for gasoline in a table or a graph. Economists call a table that shows the quantity demanded at each price, a **demand schedule.** In this case we measure price in dollars per gallon of gasoline. We measure the quantity demanded in millions of gallons over some time period (for example, per day or per year) and over some geographic area (like a state or a country). A **demand curve** shows the relationship between price and quantity demanded.

Demand curves will appear somewhat different for each product. They may appear relatively steep or flat, or they may be straight or curved. Nearly all demand curves share the fundamental similarity that they slope down from left to right. Demand curves embody the law of demand: As the price increases, the quantity demanded decreases, and conversely, as the price decreases, the quantity demanded increases.

Supply of Goods and Services

When economists talk about **supply,** they mean the amount of some good or service a producer is willing to supply at each price. Price is what the producer receives for selling one unit of a good or service. A rise in price almost always leads to an increase in the **quantity supplied** of that good or service, while a fall in price will decrease the quantity supplied. When the price of gasoline rises, for example, it encourages profit-seeking firms to take several actions: expand exploration for oil reserves; drill for more oil; invest in more pipelines and oil tankers to bring the oil to plants for refining into gasoline; build new oil refineries; purchase additional pipelines and trucks to ship the gasoline to gas stations; and open more gas stations or keep existing gas stations open longer hours. Economists call this positive relationship between price and quantity supplied-that a higher price leads to a higher quantity supplied and a lower price leads to a lower quantity supplied-the **law of supply.** The law of supply assumes that all other variables that affect supply (to be explained in the next module) are held constant.

A **supply schedule** is a table that shows the quantity supplied at a range of different prices. Again, we measure price in dollars per gallon of gasoline and we measure quantity supplied in millions of gallons. A **supply curve** is a graphic illustration of the relationship between price, shown on the vertical axis, and quantity, shown on the horizontal axis. The supply schedule and the supply curve are just two different ways of showing the same information.

Equilibrium-Where Demand and Supply Intersect

Because the graphs for demand and supply curves both have price on the vertical axis and quantity on the horizontal axis, the demand curve and supply curve for a particular good or service can appear on the same graph. Together, demand and supply determine the price and the quantity that will be bought and sold in a market.

The **equilibrium price** is the only price where the plans of consumers and the plans of producers agree-that is, where the amount of the product consumers want to buy (quantity demanded) is equal to the amount producers want to sell (quantity supplied). Economists call this common quantity the **equilibrium quantity.** At any other price, the quantity demanded does not equal the quantity supplied, so the market is not in equilibrium at that price.

The word "equilibrium" means "balance." If a market is at its equilibrium price and quantity, then it has no reason to move away from that point. However, if a market is not at equilibrium, then economic pressures arise to move the market toward the equilibrium price and the equilibrium quantity.

When the price is below equilibrium, there is **excess demand,** or a **shortage-that** is, at the given price the quantity demanded, which has been stimulated by the lower price, now exceeds the quantity supplied, which has been depressed by the lower price. In this situation, eager gasoline buyers mob the gas stations, only to find many stations running short of fuel. Oil companies and gas stations recognize that they have an opportunity to make higher profits by selling what gasoline they have at a higher price. As a result, the price rises toward the equilibrium level.

3.2 Shifts in Demand and Supply for Goods and Services

What Factors Affect Demand?

We defined demand as the amount of some product a consumer is willing and able to purchase at each price. That suggests at least two factors that affect demand. Willingness to purchase suggests a desire, based on what economists call tastes and preferences. If you neither need nor want something, you will not buy it, and if you really like something, you will buy more of it than someone who does not share your strong preference for it. Ability to purchase suggests that income is important. Professors are usually able to afford better housing and transportation than students, because they have more income. Prices of related goods can affect demand also. If you need a new car, the price of a Honda may affect your demand for a Ford. Finally, the size or composition of the population can affect demand. The more children a family has, the greater their demand for clothing.

The more driving-age children a family has, the greater their demand for car insurance, and the less for diapers and baby formula. These factors matter for both individual and market demand as a whole. Exactly how do these various factors affect demand, and how do we show the effects graphically? To answer those questions, we need the assumption.

The *Ceteris Paribus* Assumption

A demand curve or a supply curve is a relationship between two, and only two, variables: quantity on the horizontal axis and price on the vertical axis. The assumption behind a demand curve or a supply curve is that no relevant economic factors, other than the product's price, are changing. Economists call this assumption **ceteris paribus,** a Latin phrase meaning "other things being equal." Any given demand or supply curve is based on the assumption that all else is held equal. A demand curve or a supply curve is a relationship between two, and only two, variables when all other variables are kept constant. If all else is not held equal, then the laws of supply and demand will not necessarily hold.

Factors That Shift Demand Curves

Income is not the only factor that causes a shift in demand. Other factors that change demand include tastes and preferences, the composition or size of the population, the prices of related goods, and even expectations. A change in any one of the underlying factors that determine what quantity people are willing to buy at a given price will cause a shift in demand. Graphically, the new demand curve lies either to the right (an increase) or to the left (a decrease) of the original demand curve. Let's look at these factors.

Changing Tastes or Preferences

From 1980 to 2021, the per-person consumption of chicken by Americans rose from 47 pounds per year to 97 pounds per year, and consumption of beef fell from 76 pounds per year to 59 pounds per year, according to the U.S. Department of Agriculture (USDA). Changes like these are largely due to movements in taste, which change the quantity of a good demanded at every price: that is, they shift the demand curve for that good, rightward for chicken and leftward for beef.

Changes in the Composition of the Population

The proportion of elderly citizens in the United States population is rising. It rose from 9.8% in 1970 to 12.6% in 2000, and will be a projected (by the U.S. Census Bureau) 20% of the population by 2030. A society with relatively more children, like the United States in the 1960s, will have greater demand for goods and services like tricycles and day care facilities. A society with relatively more elderly persons, as the United States is projected to have by 2030, has a higher demand for nursing homes and hearing aids. Similarly, changes in the size of the population can affect the demand for housing and many other goods. Each of these changes in demand will be shown as a shift in the demand curve.

Changes in the Prices of Related Goods

Changes in the prices of related goods such as substitutes or complements also can affect the demand for a product. A **substitute** is a good or service that we can use in place of another good or service. As electronic books, like this one, become more available, you would expect to see a decrease in demand for traditional printed books. A lower price for a substitute decreases demand for the other product. For example, in recent years as the price of tablet computers has fallen, the quantity demanded has increased (because of the law of demand). Since people are purchasing tablets, there has been a decrease in demand for laptops, which we can show graphically as a leftward shift in the demand curve for laptops. A higher price for a substitute good has the reverse effect.

Other goods are **complements** for each other, meaning we often use the goods together, because consumption of one good tends to enhance consumption of the other. Examples include breakfast cereal and milk; notebooks and pens or pencils, golf balls and golf clubs; gasoline and sport utility vehicles; and the five-way combination of bacon, lettuce, tomato, mayonnaise, and bread. If the price of golf clubs rises, since the quantity demanded of golf clubs falls (because of the law of demand), demand for a complement good like golf balls decreases, too. Similarly, a higher price for skis would shift the demand curve for a complement good like ski resort trips to the left, while a lower price for a complement has the reverse effect.

Changes in Expectations about Future Prices or Other Factors that Affect Demand

While it is clear that the price of a good affects the quantity demanded, it is also true that expectations about the future price (or expectations about tastes and preferences, income, and so on) can affect demand. For example, if people hear that a hurricane is coming, they may rush to the store to buy flashlight batteries and bottled water. If people learn that the price of a good like coffee is likely to rise in the future, they may head for the store to stock up on coffee now. We show these changes in demand as shifts in the curve. Therefore, a **shift in demand** happens when a change in some economic factor (other than price) causes a different quantity to be demanded at every price. The following Work It Out feature shows how this happens.

How Production Costs Affect Supply

A supply curve shows how quantity supplied will change as the price rises and falls, assuming so that no other economically relevant factors are changing. If other factors relevant to supply do change, then the entire supply curve will shift. Just as we described a shift in demand as a change in the quantity demanded at every price, a **shift in supply** means a change in the quantity supplied at every price.

In thinking about the factors that affect supply, remember what motivates firms: profits, which are the difference between revenues and costs. A firm produces goods and services using combinations of labor, materials, and machinery, or what we call **inputs** or **factors of production.** If a firm faces lower costs of production, while the prices

"Access for free at openstax.org."

Greenlaw, S., Shapiro, D., & MacDonald, D. (2024, July 18). Principles of Economics 3E.
https://openstax.org/details/books/principles-economics-3e

for the good or service the firm produces remain unchanged, a firm's profits go up. When a firm's profits increase, it is more motivated to produce output, since the more it produces the more profit it will earn. When costs of production fall, a firm will tend to supply a larger quantity at any given price for its output. We can show this by the supply curve shifting to the right.

Take, for example, a messenger company that delivers packages around a city. The company may find that buying gasoline is one of its main costs. If the price of gasoline falls, then the company will find it can deliver messages more cheaply than before. Since lower costs correspond to higher profits, the messenger company may now supply more of its services at any given price. For example, given the lower gasoline prices, the company can now serve a greater area, and increase its supply.

Conversely, if a firm faces higher costs of production, then it will earn lower profits at any given selling price for its products. As a result, a higher cost of production typically causes a firm to supply a smaller quantity at any given price. In this case, the supply curve shifts to the left.

Other Factors That Affect Supply

Several other things affect the cost of production, too, such as changes in weather or other natural conditions, new technologies for production, and some government policies. Changes in weather and climate will affect the cost of production for many agricultural products. For example, in 2014 the Manchurian Plain in Northeastern China, which produces most of the country's wheat, corn, and soybeans, experienced its most severe drought in 50 years. A drought decreases the supply of agricultural products, which means that at any given price, a lower quantity will be supplied. Conversely, especially good weather would shift the supply curve to the right.

When a firm discovers a new technology that allows the firm to produce at a lower cost, the supply curve will shift to the right, as well. For instance, in the 1960s a major scientific effort nicknamed the Green Revolution focused on breeding improved seeds for basic crops like wheat and rice. By the early 1990s, more than two thirds of the wheat and rice in low-income countries around the world used these Green Revolution seeds-and the harvest was twice as high per acre. A technological improvement that reduces costs of production will shift supply to the right, so that a greater quantity will be produced at any given price.

Government policies can affect the cost of production and the supply curve through taxes, regulations, and subsidies. For example, the U.S. government imposes a tax on alcoholic beverages that collects about $8 billion per year from producers. Businesses treat taxes as costs. Higher costs decrease supply for the reasons we discussed above. Other examples of policy that can affect cost are the wide array of government regulations that require firms to spend money to provide a cleaner environment or a safer workplace. Complying with regulations increases costs

A government subsidy, on the other hand, is the opposite of a tax. A subsidy occurs when the government pays a firm directly or reduces the firm's taxes if the firm carries out certain actions. From the firm's perspective, taxes or regulations are an additional cost of production that shifts supply to the left, leading the firm to produce a lower quantity at every given price. Government subsidies reduce the cost of production and increase supply at every given price, shifting supply to the right.

Summing Up Factors That Change Supply

Changes in the cost of inputs, natural disasters, new technologies, and the impact of government decisions all affect the cost of production. In turn, these factors affect how much firms are willing to supply at any given price.

Because demand and supply curves appear on a two-dimensional diagram with only price and quantity on the axes, an unwary visitor to the land of economics might be fooled into believing that economics is about only four topics: demand, supply, price, and quantity. However, demand and supply are really "umbrella" concepts: demand covers all the factors that affect demand, and supply covers all the factors that affect supply. We include factors other than price that affect demand and supply by using shifts in the demand or the supply curve. In this way, the two-dimensional demand and supply model becomes a powerful tool for analyzing a wide range of economic circumstances.

3.3 Changes in Equilibrium Price and Quantity

Good Weather for Salmon Fishing

Suppose that during the summer of 2015, weather conditions were excellent for commercial salmon fishing off the California coast. Heavy rains meant higher than normal levels of water in the rivers, which helps the salmon to breed. Slightly cooler ocean temperatures stimulated the growth of plankton, the microscopic organisms at the bottom of the ocean food chain, providing everything in the ocean with a hearty food supply. The ocean stayed calm during fishing season, so commercial fishing operations did not lose many days to bad weather. How did these climate conditions affect the quantity and price of salmon?

Newspapers and the Internet

According to the Pew Research Center for People and the Press, increasingly more people, especially younger people, are obtaining their news from online and digital sources. The majority of U.S. adults now own smartphones or tablets, and most of those Americans say they use them in part to access the news. From 2004 to 2012, the share of Americans who reported obtaining their news from digital sources increased from 24% to 39%. How has this affected consumption of print news media, and radio and television news?

The Interconnections and Speed of Adjustment in Real Markets

In the real world, many factors that affect demand and supply can change all at once. For example, the demand for cars might increase because of rising incomes and population, and it might decrease because of rising gasoline prices (a complementary good). Likewise, the supply of cars might increase because of innovative new technologies that reduce the cost of car production, and it might decrease as a result of new government regulations requiring the installation of costly pollution-control technology.

Moreover, rising incomes and population or changes in gasoline prices will affect many markets, not just cars. How can an economist sort out all these interconnected events? The answer lies in the assumption. Look at how each economic event affects each market, one event at a time, holding all else constant. Then combine the analyses to see the net effect.

3.4 Price Ceilings and Price Floors

To this point in the chapter, we have been assuming that markets are free, that is, they operate with no government intervention. In this section, we will explore the outcomes, both anticipated and otherwise, when government does intervene in a market either to prevent the price of some good or service from rising "too high" or to prevent the price of some good or service from falling "too low".

Economists believe there are a small number of fundamental principles that explain how economic agents respond in different situations. Two of these principles, which we have already introduced, are the laws of demand and supply. Governments can pass laws affecting market outcomes, but no law can negate these economic principles. Rather, the principles will become apparent in sometimes unexpected ways, which may undermine the intent of the government policy. This is one of the major conclusions of this section.

Controversy sometimes surrounds the prices and quantities established by demand and supply, especially for products that are considered necessities. In some cases, discontent over prices turns into public pressure on politicians, who may then pass legislation to prevent a certain price from climbing "too high" or falling "too low."

The demand and supply model shows how people and firms will react to the incentives that these laws provide to control prices, in ways that will often lead to undesirable consequences. Alternative policy tools can often achieve the desired goals of price control laws, while avoiding at least some of their costs and tradeoffs.

Price Ceilings

Laws that governments enact to regulate prices are called **price controls.** Price controls come in two flavors. A **price ceiling** keeps a price from rising above a certain level (the "ceiling"), while a **price floor** keeps a price from falling below a given level (the "floor"). This section uses the demand and supply framework to analyze price ceilings. The next section discusses price floors.

A price ceiling is a legal maximum price that one pays for some good or service. A government imposes price ceilings in order to keep the price of some necessary good or service affordable. For example, in 2005 during Hurricane Katrina, the price of bottled water increased above $5 per gallon. As a result, many people called for price controls on bottled water to prevent the price from rising so high. In this particular case, the government did not impose a price ceiling, but there are other examples of where price ceilings did occur.

In many markets for goods and services, demanders outnumber suppliers. Consumers, who are also potential voters, sometimes unite behind a political proposal to hold down a certain price. In some cities, such as Albany, renters have pressed political leaders to pass rent control laws, a price ceiling that usually works by stating that landlords can raise rents by only a certain maximum percentage each year. Some of the best examples of rent control occur in urban areas such as New York, Washington D.C., or San Francisco.

Rent control becomes a politically hot topic when rents begin to rise rapidly. Everyone needs an affordable place to live. Perhaps a change in tastes makes a certain suburb or town a more popular place to live. Perhaps locally-based businesses expand, bringing higher incomes and more people into the area. Such changes can cause a change in the demand for rental housing.

Price ceilings do not simply benefit renters at the expense of landlords. Rather, some renters (or potential renters) lose their housing as landlords convert apartments to co-ops and condos. Even when the housing remains in the rental market, landlords tend to spend less on maintenance and on essentials like heating, cooling, hot water, and lighting. The first rule of economics is you do not get something for nothing-everything has an opportunity cost. Thus, if renters obtain "cheaper" housing than the market requires, they tend to also end up with lower quality housing.

Price ceilings are enacted in an attempt to keep prices low for those who need the product. However, when the market price is not allowed to rise to the equilibrium level, quantity demanded exceeds quantity supplied, and thus a shortage occurs. Those who manage to purchase the product at the lower price given by the price ceiling will benefit, but sellers of the product will suffer, along with those who are not able to purchase the product at all. Quality is also likely to deteriorate.

Price Floors

A price floor is the lowest price that one can legally pay for some good or service. Perhaps the best-known example of a price floor is the minimum wage, which is based on the view that someone working full time should be able to afford a basic standard of living. The federal minimum wage in 2022 was $7.25 per hour, although some states and localities have a higher minimum wage. The federal minimum wage yields an annual income for a single person of $15,080, which is slightly higher than the Federal poverty line of $11,880.

Congress periodically raises the federal minimum wage as the cost of living rises. As of March 2022, the most recent adjustment occurred in 2009, when the federal minimum wage was raised from $6.55 to $7.25.

Price floors are sometimes called "price supports," because they support a price by preventing it from falling below a certain level. Around the world, many countries have passed laws to create agricultural price supports. Farm prices and thus farm incomes fluctuate, sometimes widely. Even if, on average, farm incomes are adequate, some years they can be quite low. The purpose of price supports is to prevent these swings.

The most common way price supports work is that the government enters the market and buys up the product, adding to demand to keep prices higher than they otherwise would be. According to the Common Agricultural Policy reform effective in 2019, the European Union (EU) will spend about 58 billion euros per year, or 65.5 billion dollars per year (with the December 2021 exchange rate), or roughly 36% of the EU budget, on price supports for Europe's farmers. Economists estimate that the high-income areas of the world, including the United States, Europe, and Japan, spend roughly $1 billion per day in supporting their farmers. If the government is willing to purchase the excess supply (or to provide payments for others to purchase it), then farmers will benefit from the price floor, but taxpayers and consumers of food will pay the costs. Agricultural economists and policy makers have offered numerous proposals for reducing farm subsidies. In many countries, however, political support for subsidies for farmers remains strong. This is either because the population views this as supporting the traditional rural way of life or because of industry's lobbying power of the agro-business.

3.5 Efficiency

The familiar demand and supply diagram holds within it the concept of economic efficiency. One typical way that economists define efficiency is when it is impossible to improve the situation of one party without imposing a cost on another. Conversely, if a situation is inefficient, it becomes possible to benefit at least one party without imposing costs on others.

Efficiency in the demand and supply model has the same basic meaning: The economy is getting as much benefit as possible from its scarce resources and all the possible gains from trade have been achieved. In other words, the optimal amount of each good and service is produced and consumed.

Consumer Surplus, Producer Surplus, Social Surplus

The sum of consumer surplus and producer surplus is **social surplus,** also referred to as **economic surplus** or **total surplus.**

Inefficiency of Price Floors and Price Ceilings

The imposition of a price floor or a price ceiling will prevent a market from adjusting to its equilibrium price and quantity, and thus will create an inefficient outcome. However, there is an additional twist here. Along with creating inefficiency, price floors and ceilings will also transfer some consumer surplus to producers, or some producer surplus to consumers.

Demand and Supply as a Social Adjustment Mechanism

The demand and supply model emphasizes that prices are not set only by demand or only by supply, but by the interaction between the two. In 1890, the famous economist Alfred Marshall wrote that asking whether supply or demand determined a price was like arguing "whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper." The answer is that both blades of the demand and supply scissors are always involved.

The adjustments of equilibrium price and quantity in a market-oriented economy often occur without much government direction or oversight. If the coffee crop in Brazil suffers a terrible frost, then the supply curve of coffee shifts to the left and the price of coffee rises. Some people continue to drink coffee and pay the higher price. Others switch to tea or soft drinks. No government commission is needed to figure out how to adjust coffee prices, which companies will be allowed to process the remaining supply, which supermarkets in which cities will get how much coffee to sell, or which consumers will ultimately be allowed to drink the brew. Such adjustments in response to price changes happen all the time in a market economy, often so smoothly and rapidly that we barely notice them.

Think for a moment of all the seasonal foods that are available and inexpensive at certain times of the year, like fresh corn in midsummer, but more expensive at other times of the year. People alter their diets and restaurants alter their menus in response to these fluctuations in prices without fuss or fanfare. For both the U.S. economy and the world economy as a whole, markets-that is, demand and supply-are the primary social mechanism for answering the basic questions about what is produced, how it is produced, and for whom it is produced.