1. The Role of Prices: The Forces of Supply and Demand

Categorize all forces affecting the prices of individual commodities as operating through either the demand for the commodity by buyers or the supply of the commodity offered by sellers. Think of a market as an institutional arrangement through which buyers and sellers get together—it may be associated with a particular place (e.g., the farmers’ market or the stock exchange) or it may be represented by a world-wide network of retail establishments or sales representatives.

The demand for fresh milk in a particular area is portrayed on Figure 1.1. When the price of milk falls, with everything else staying the same, consumers will tend to buy more milk because it is now cheaper in comparison to orange juice, soft drinks, and other fluids that people typically consume.

**FIGURE 1.1:**

The supply conditions for fresh milk are portrayed in Figure 1.2. Milk producers have to receive a price that covers their costs. As farmers expand their herds to increase milk production, greater demands are placed on the capacity of the land to produce feed for the cows and feed costs rise. An expansion of milk production therefore increases farmers’ costs, so higher and higher prices are required to induce them to produce larger and larger quantities.

In Figure 1.3 the demand and supply curves are presented on the same graph. The price at which the two curves cross is the equilibrium price. When the price is above the equilibrium price market forces will drive it down. And when the price is below the equilibrium price market forces will drive it up. Equilibrium occurs when there is no excess demand or supply and, hence, no pressure for the price to change.
2. Factors Affecting Individual and Market Demand

The demand curve above represents market demand—that is, the demand for the commodity in question on the part of all buyers taken together. The derivation of the market demand from the demands of the individual buyers is shown in Figure 2.1. The individual demand curves are added horizontally. As the market price falls, individuals not only consume larger quantities, but new buyers enter the market and begin consuming positive amounts.

Individuals consume in order to satisfy certain wants—food, shelter, entertainment, self-image, etc. Different commodities are substitutes in supplying these wants. One can eat chicken, fish or goat instead of beef, or abandon all of these for a vegetarian diet. What one does will depend on the relative prices of these meats. If the price of beef rises substantially, with all other prices remaining the same, many consumers will choose to consume less beef and more fish, goat or chicken. This tendency to substitute cheaper goods and services for ones whose prices have risen is called the substitution effect. The substitution effect of a price change on the quantity demanded is always negative.
The quantity of a good demanded therefore depends not only on its own price but on the price of substitute goods. In general, an increase in the price of a substitute good shifts the demand curve for a commodity to the right. This is shown in Figure 2.2.

Increases in the prices of other goods do not always cause the quantity demanded of a commodity to increase. Consider the market for shoelaces. A rise in the price of shoes will cause the quantity demanded of shoes to fall as people repair old shoes and wear them longer. Since there will be a smaller demand for shoes, there will also be a smaller demand for shoelaces. A rise in the price of shoes thus leads to a decline in the demand for shoelaces—the demand curve for shoelaces shifts to the left. People substitute other goods for both shoes and shoelaces. In this case, shoes and shoelaces are said to be complements. The effect of an increase in the price of a complementary good on the quantity of a good demanded is shown in Figure 2.3.

The quantities demanded of commodities are also affected by the level of income. When income rises and more is therefore available to spend, consumers’ total expenditure on goods will rise. If a good is a normal good, people’s expenditure on it will increase as their income increases, and the quantity demanded will increase at each price of that good. This is shown in the left panel of Figure 2.4.
Not all goods are normal. Consider, for example, rice consumption in mainland China. As that country’s income rises with the influx of capital from the rest of the world and the development of new enterprises, people are likely to decide that they can now afford to add a bit more meat to their diet and rely less heavily on rice. For this reason, the demand curve for rice might well shift to the left with an increase in income. Rice is in this instance an inferior good. This is shown in the right panel of Figure 2.4. When income rises, the demand curves for normal goods shift to the right and the demand curves for inferior goods shift to the left.

Up to this point we have argued that the demand curve is negatively sloped because of the substitution effect—when the price of a good rises consumers substitute other goods
whose prices have not risen. An increase in the price of a good also has an \textbf{income effect} on the quantity of it demanded. When the price of a good rises the cost of the consumer’s original consumption bundle increases—her income will now purchase a smaller quantity of goods in total. Real income has therefore declined. If a commodity or service is a normal good, the consumer will allocate some of this overall cut in consumption to it. So there will be a decline in demand for the good additional to that resulting from the substitution effect—this effect on the quantity demanded is called the \textbf{income effect}. In the case of a normal good, this effect will make the demand curve flatter than it would otherwise have been, as is shown in the left panel of Figure 2.5.

There is, of course, the possibility that the commodity whose price has risen may be an inferior good. In this case the income effect will make the demand curve steeper. The adverse effect on real income of an increase in the price of rice, for example, may make it necessary for people to consume less meat and more rice. This is shown in the right panel of Figure 2.5.

In the case of normal goods, the income and substitution effects work in the same direction; in the case of inferior goods they work in opposite directions. It turns out that the income effect is unlikely to be of much importance in practice. People spend tiny fractions of their income on most goods so that the effects on their real incomes of changes in the prices of those goods is likely to be trivial.

\section*{3. Costs, Competition and the Supply Curve}

The supply curve can be visualized in two ways—as indicating the response of the quantity supplied to variations in the price, or alternatively, the response of costs of production and sale as the quantity sold increases. When there is competition among suppliers, the prices of goods supplied will be bid down to levels that will just cover costs including reasonable returns to capital invested and entrepreneurial effort expended.

Cost per unit of output will rise as output expands if the prices of the inputs used in production rise as the demand for them increases. Also, cost per unit may rise as output expands as a result of \textbf{diminishing returns}. Consider the supply curve of an agricultural product such as corn. As the quantity produced increases additional quantities of machinery, fertilizer and labor must be applied to a fixed available stock of land. As more and more of these inputs are applied to the land the additional output that can be obtained from additional units of the inputs gets smaller and smaller. Yet the most recently applied units of these inputs cost the same as those units that were applied earlier when the level of output was smaller. The cost per unit of output thus increases as more and more output is produced. Suppliers must receive a higher price to induce them to produce additional units of output. Figures 3.1 and 3.2 illustrate the principle of diminishing returns.
Not all supply curves are conditioned by diminishing returns. Some products are produced with many different kinds of labor and capital but no land. Producers of them can hire additional labor away from other activities at the going market wage and additional new capital can be installed at costs no greater than were required for previous capital. The costs of producing additional units of output will not rise as output expands and the supply curve will to be a horizontal line. Industries like this are called constant cost industries.

Agriculture, mining, forestry and other natural resource industries that face diminishing returns are called increasing cost industries. In some industries costs decline as output increases. These are decreasing cost industries. The reasons for decreasing costs will be discussed in later lessons. The supply curves of the three types of industries are illustrated in Figure 3.3.

The factors causing supply curves to shift are also outlined in Figure 3.3. A movement along the supply curve occurs as costs per unit respond to increases in the quantity supplied. A rise in the prices of labor and capital inputs that is independent of output in the industry will cause the supply curve to shift upward—costs will increase at each level of output. A fall in input prices independent of industry output will cause the supply curve to shift downward.
FIGURE 3.3:

![Supply Curves](image)

Supply curves shift downward in response to:
- Lower prices for the inputs used in the production process.
- Improvements in technology that permit more output to be produced with any given quantities of inputs.
- Better conditions of nature (weather).

The supply curve will also shift in response to technological changes affecting the industry and to natural forces such as weather. Better weather means better crops with the result that more output will be produced for any given application of labor and capital inputs. This means that each output level can be produced at lower cost with the result that the supply curve can be thought of as having shifted down.

4. Applications of Supply and Demand

Figure 4.1 examines the effects on the price and quantity of fresh milk and TV sets of an increase in consumers' incomes. Fresh milk is produced under increasing costs, due to diminishing returns, and TV sets are produced under conditions of constant cost. Figure 4.2 examines the effects of a technological improvements in the two industries.

FIGURE 4.1:

![Demand Curves](image)

An increase in income leads to a rightward shift of the demand curves for both fresh milk and TV sets, assuming that both are normal goods. This results in an increase in the equilibrium quantities of both, but an increase in the equilibrium price only of the one that is produced under conditions of increasing cost.
FIGURE 4.2:

A technological improvement in an industry shifts its supply curve downward. Equilibrium price falls and equilibrium quantity increases in both the above cases.

Much supply and demand analysis deals with the situations facing producers and consumers who operate in a segment of the market. For example, Figure 4.3 considers the price and output of wool in New Zealand. The demand for New Zealand wool will not be the usual downward sloping curve that reflects the substitution of wool for other goods on the part of consumers as the relative price of wool falls. The reason is that New Zealand produces only a tiny fraction of world wool production. Wool is an internationally traded commodity whose price will be determined in the world market. The effect of a technical improvement in New Zealand wool production unmatched by corresponding technological change elsewhere in the world can be seen by shifting New Zealand’s supply curve downward.

FIGURE 4.3:

The demand curve for New Zealand wool production is a horizontal line at the price determined in the world wool market.

The effect of a disease affecting sheep that spreads everywhere in the world but New Zealand is shown in Figure 4.4.
The left panel of Figure 4.5 considers the demand for wool in New Zealand and the supply of wool to New Zealand consumers. The right panel shows how the price of wool to New Zealand consumers is determined in the world market.

New Zealand consumers face a horizontal supply of wool at the world market price.

Figure 4.6 portrays the participation of New Zealand in the world wool market on both the demand and supply sides. The price of wool is largely independent of New Zealanders’ production and consumption.
The impossibility of obtaining information about the shape of the demand curve from observing the price-quantity combinations in the market is demonstrated in Figure 4.7.

Information about the shape of the supply curve cannot be obtained from market price-quantity combinations for the same reason.

5. Shortages

Shortages and surpluses result when the market price is not free to adjust to supply and demand conditions. Rent controls are a good example of a government policy that creates a shortage.

The effects of rent controls can be analyzed with reference to Figure 5.1. At the legal rental rate there will be a housing shortage equal to the excess of $Q_2$ over $Q_1$—people wanting to rent accommodations at the rents being charged cannot find them.

If rents are allowed to rise in response to the excess demand for housing, a number of adjustments will occur. On the supply side, it will become worthwhile to construct new apartment buildings and for people to make unused areas in owner-occupied houses into apartments. On the demand side, it will become more costly to maintain a large apartment
when one can get by with a smaller one. It will also become advantageous for young people to stay longer with their parents. When but rents are not allowed to rise in response to excess demand there are no incentives for people to make these sorts of adjustments.

Under rent control all demanders along the demand curve between \( Q_1 \) and \( Q_2 \) in Figure 5.1 are willing to pay more than the legal rental rate. It therefore pays landlords to break the law and accept bribes in return for putting potential renters at the top of waiting lists. Indeed, if the landlords of large buildings do not do this, their superintendents or property managers very likely will.

Who benefits and who loses from rent controls? Clearly, landlords are worse off because they earn less from their property when rent controls are in force than they would otherwise. People who are lodged in accommodations at the time rent controls are instituted are clearly better off because they are protected from future increases in rent. New arrivals in the area are worse off because they have difficulty finding any type of rental accommodation.

**FIGURE 5.1:**

While incumbent tenants benefit initially from rent controls, the fraction of the city’s residents that benefit in this way tends to get smaller and smaller with time as young people marry and set up homes, people get transferred in distant areas of the city, and new migrants arrive.

It is sometimes argued that the poor are better off when rent controls are in force because otherwise they would not be able to afford a place to live. But this argument only applies to poor with accommodations at the time the rent controls are instituted who can remain in them. The rest will have a harder time obtaining accommodations than will rich people because, having less income and wealth, their ability to pay their rent in the future is less certain and they are thus poorer risks.

People with large families (who are also often poor) and those of a different race or with unconventional lifestyles also will have difficulty since it costs landlords nothing to discriminate —when the rental market is allowed to operate freely a landlord who rejects a tenant on racial or other grounds has to give up an opportunity to rent his property.
Regardless of who gains and loses, rent controls are much easier to institute than remove. Politicians seeking election soon realize that the number of voters in rent controlled accommodations who stand to lose if rent control is abolished will far exceed the number of landlords who stand to gain. Only if the number of people who can’t obtain suitable accommodations and are also able to vote is large compared to those in rent-controlled apartments will there be substantial pressure for the removal of rent controls.

6. Surpluses

Surpluses result when the government fixes the price of a product above the free market level. Consider the U.S. farm price support program. Corn is used as an example. To maintain the support price the government purchases all surpluses offered at that price. These are stored indefinitely or destroyed. (Assume that government regulations prevent corn from being imported and sold to the government at the support price.) The costs of the program is the shaded area in Figure 6.2 plus the costs of storing and destroying the surplus corn. (Figure 6.1 contains no information additional to that in Figure 6.2 and is therefore omitted.) Giving the surplus corn to the poor countries would not reduce the costs to the U.S. taxpayer substantially and would have an unfavorable effect on, and produce an unfavorable reaction from, foreign producers of corn.

**FIGURE 6.2:**

As time passes after the imposition of price supports, the supply curve gets flatter and flatter as producers find ways of taking advantage of the higher price—the supply curve is flatter in the long-run than in the short run. This is shown in Figure 6.3. Although it is not shown in the figure, the demand curve for corn will also get flatter in the long-run as buyers find substitute products.
To reduce the surpluses as the costs of the program mounted, the U.S. government began paying farmers to take land out of production. Since the agreement by farmers to use less land in corn production put no restrictions on the inputs of labor, machine-time, and fertilizer, farmers devoted increasing amounts of these non-land inputs to the restricted acreage. The effect was to shift the supply curve of corn upward as shown in Figure 6.4. This had the desired effect of reducing the surpluses, but the extra labor, capital and fertilizer used to produce every unit of the nation’s corn output could have been used to produce something else. Tax payers did not feel these costs directly, since nothing was taken away from them.

It is ironic that surpluses are produced in one area of the world while people are starving elsewhere. But the surpluses result from government policies designed to subsidize farmers, not from generosity to starving people.
7. Elasticity, Total Revenue and Marginal Revenue

It is not always meaningful to describe curves as flat or steep, because whether a curve appears flat or steep depends upon the units in which price and quantity are measured and on the scales on the horizontal and vertical axes. The slope of the demand curve, denoted by \( \delta \), is shown in Figure 7.1 and is defined as

\[
\delta = \frac{\Delta P}{\Delta Q}.
\]  

(1)

FIGURE 7.1:

By measuring the responsiveness of quantity to changes in price using the concept of elasticity, we can avoid the dependence on units of measurement. The elasticity of demand, represented by \( \Phi \), is defined as

\[
\Phi = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}}.
\]

(2)

This equation can be rewritten as

\[
\Phi = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}.
\]

(3)

FIGURE 7.2:

Since the term \( \Delta Q/\Delta P \) in equation (3) is the reciprocal of the slope, that equation can be
written as
\[ \Phi = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = 1/\delta \times \frac{P}{Q}. \quad (4) \]

All this is illustrated in Figure 7.2.

As shown in Figure 7.3, the elasticity of supply, denoted by the greek symbol \( \epsilon \), is calculated in exactly the same way as the elasticity of demand. The slope of the supply curve is denoted by \( \theta \).

**FIGURE 7.3:**

The elasticity equals the reciprocal of the slope times price over quantity.

**Total revenue**, which equals price times quantity, is portrayed in Figure 7.4. As we move down along the demand curve, the total revenue reaches its maximum at a point middle-distant from the two ends of the curve.

**FIGURE 7.4:**

**Marginal Revenue** is defined as the change in total revenue that occurs when we change the quantity by one unit.

\[ MR = \frac{\Delta TR}{\Delta Q} \quad (5) \]

It is the slope of the total revenue curve in Figure 7.5.
FIGURE 7.5:

The importance of the concept of **marginal revenue** and its counterpart **marginal cost**, which is the change in the total cost associated with producing and selling another unit, can be illustrated by examining the behavior of a producer-controlled egg-marketing board. Suppose that the government permits producers to establish an egg marketing board with the power to set the price of eggs to the consumer and allocate output quantities to all individual producers. Purchases of eggs from outside the local area are prohibited. The price and quota levels that will maximize the industry profits is shown in Figure 7.6. A horizontal supply curve is assumed on the grounds that most of the inputs used to produce eggs can be purchased by egg producers at fixed market prices—producers of eggs use small fractions of the total supplies of these inputs available in the economy. Profits to egg producers as a group are maximized by adjusting the quantity sold and the selling price to equalize marginal cost and marginal revenue.

FIGURE 7.6:

Finally, we note that economists have a convention of referring to the elasticity of demand as positive number even though it is in fact negative. So when economists say that the demand is highly elastic they mean that the elasticity is a large negative number.
STUDY QUESTIONS

1. The cost of providing housing in small towns in Canada is only a fraction of the cost in major cities like Toronto and Vancouver. Explain in detail why this might be true and then, using an appropriate graph, how consumers might be expected to behave in small towns as opposed to big cities as a result of this price difference. Why might they behave differently?

2. Which of the following combinations of goods are complements and which are substitutes? Can any of them be substitutes in some situations and complements in others, depending on the circumstances? a) bacon and eggs; b) steak and lobster; c) airplane and bus transportation; d) economics and mathematics.

3. Swedish economist Assar Lindbeck once quipped, “Next to bombing, rent control seems in many cases to be the most efficient technique so far known for destroying cities....” What could he have meant?

4. Suppose that the government sets a support price for corn above what would otherwise be the free market price and then pays farmers the difference between that support price and the price that will rule in the free market. Show the effects of this policy on the price and the quantities produced and consumed. Will a shortage or surplus result? Show on your graph the cost of the program to the government.

5. It is argued by one university official that the demand for admission to the university is completely price inelastic. The reason given is that the university has increased its tuition charges very substantially over the past few years without any decrease in applications for admission. Does this argument make sense?

6. Suppose that you have a well on your property that produces carbonated water at zero cost. As a seller of carbonated water you face the following market demand curve:

\[ Q = 10 - 2P \]

where \( P \) is the selling price of the water and \( Q \) is the quantity demanded. Plot the demand curve on a graph and sketch your total revenue and marginal revenue curves. Suppose that the well produces 8 units. At what price could you sell those units? Would the elasticity of demand be greater or less than unity at that price? What would be the optimum price for you to charge? Would the elasticity of demand be greater or less than unity at that optimum price?

REFERENCES


Michael Parkin and Robin Bade, Economics: Canada in the Global Environment, Addison Wesley, 1994, Chapters 4, 5 and 6, pages 69-149.