Chapter 4

Demand Curves

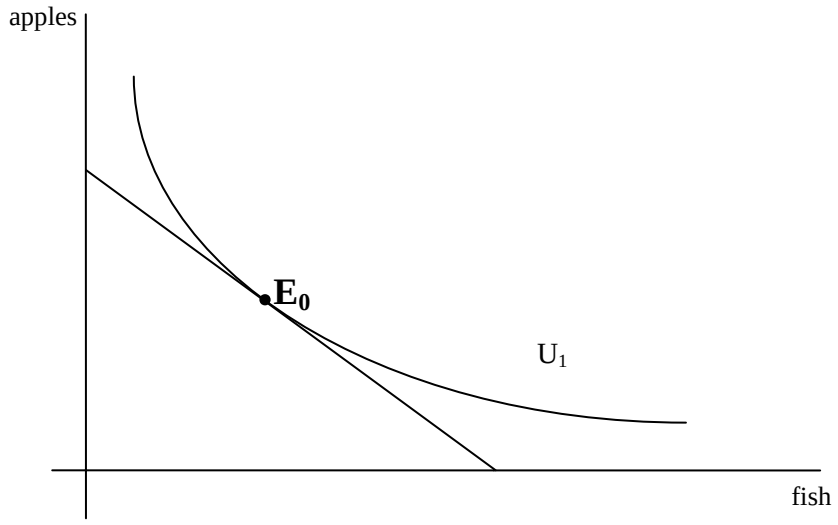
In this chapter, we consider how changes in relative prices affect welfare. Along the way, we derive the consumer's demand curve. In fact, we will consider two separate changes to the optimal bundle in this chapter. First, we consider a change in the price of one good. As relative price changes, there is a change in the optimal bundle. The demand curve plots the combination of the consumption of, say, apples, at different prices of apples.

In addition, we consider changes to income. The Engel curve plots combinations of one good at different income levels.

Demand Curve Derived

We continue with our example of an economy in which there are only fish and apples. In Chapter 2, we derived the slope of the budget constraint, finding that it is $-\frac{p_f}{p_a}$. We begin with our baseline optimal bundle. Figure 4.1 shows that at the original prices for fish and apples, our consumer would purchase the bundle labeled E_0. This bundle consists of f_0 fish and a_0 apples.

Figure 4.1



What impact does a change in the price of fish have? Let's start by just focusing on how the budget constraint changes. Suppose the price of fish increases from p_f to p_f' . Algebra tells us that $-\frac{p_f}{p_a} < -\frac{p_f'}{p_a}$ since the numerator in the latter is larger than the numerator in the former. This means that the budget constraint is steeper when the price of fish increases. Because income is unchanged, our consumer can still afford the same quantity of apples if all income is spent on apples. Hence, the vertical intercept in

Figure 4.2

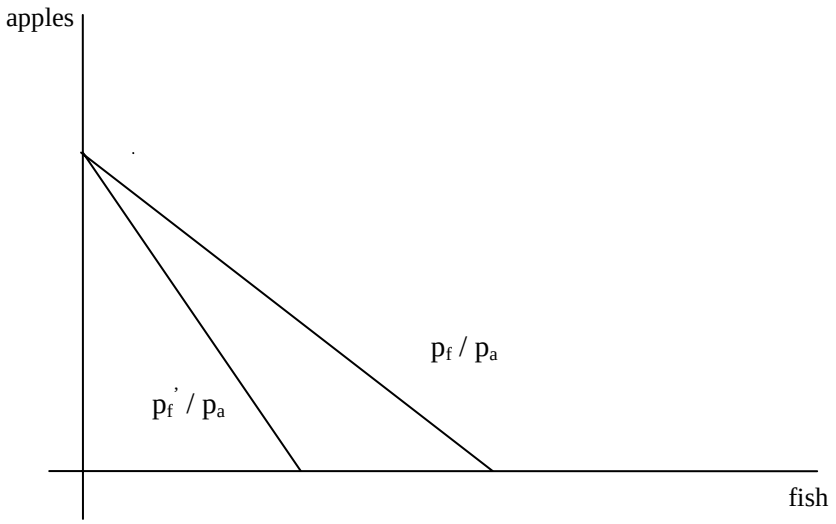


Figure 4.2 is unchanged. However, if all income is spent on fish, the higher price means that the most fish our consumer can buy is smaller compared with the case with the original price.

The upshot is that two things happen simultaneously when the price of one good increases, holding everything else constant. First, the slope of the line of the budget line changes because the relative prices change. Second, the set of affordable bundle shrinks because the same income can acquire fewer total goods at the set of higher prices that the consumer faces.

Let us move on to see how the optimal bundle will be affected by this price change. Figure 4.3 represents the original bundle and the new bundle when this consumer faces the two different relative prices.

Figure 4.3

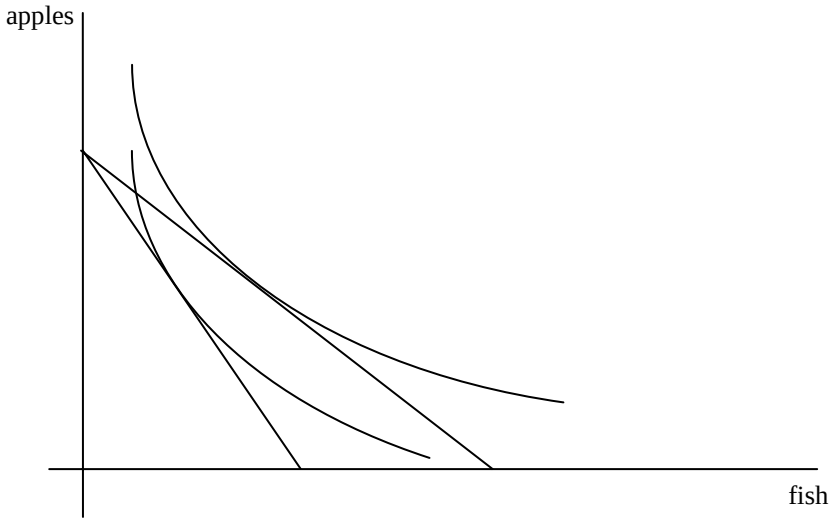
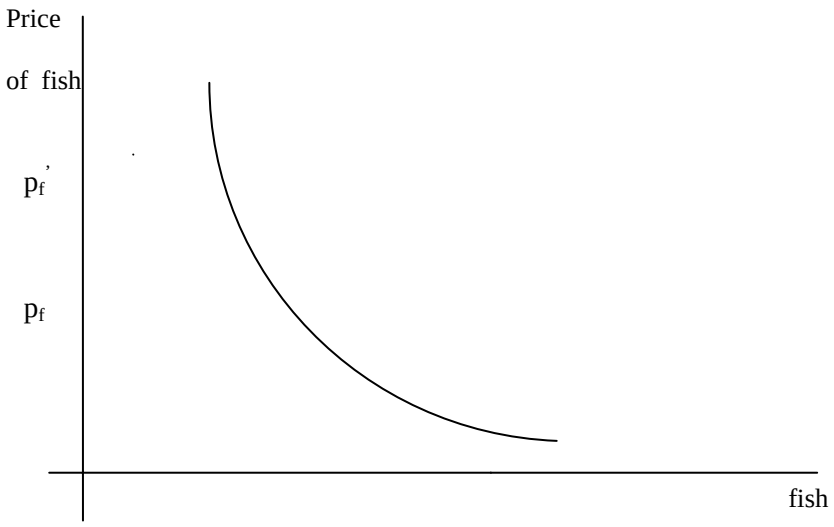


Figure 4.3 indicates that the increase in the price of fish will affect the quantities of fish and apples consumed by this person. In particular, let us focus on the combination of fish price and quantity of fish consumed. At the original price, p_f ,this consumer would want f_0 units of fish. At the new, higher price of $p_f^{'}$, this consumer wants f_1 units of fish. By inspection, we see that $f_0 > f_1$.

We have a special name for the graph that plots combinations of the quantity of fish wanted and the price of fish. The graph is called the demand curve. Figure 4.4 plots combinations of fish and price of fish, including the two points we identified from Figure 4.3. It is important to note that the vertical axis is the price of fish measured in the unit of account. In the United States, the unit of account is the dollar. So, if we adopt the United States' approach, the price of fish is measured in dollars per unit of fish. The horizontal axis measures the units of fish. Because each point on the demand curve represents a point that satisfies the optimality condition for our consumer, our consumer cannot be happier at a given price, holding everything else constant, than with the quantity demanded on the graph.

Figure 4.4



There are literally an infinite number of points on this demand curve. Each point represents a combination of the optimal quantity of fish that a person wants to consume at a particular price. Or, alternatively, each point is the price and quantity demanded at that price. The collection of price-quantity demanded points is the demand curve.

The demand curve is downward sloping. This means that as the price of fish goes up, holding everything else constant, the quantity demanded declines. This feature is referred to as the Law of Demand. If the Law of Demand is satisfied, then the item's demand curve will be this negative slope.

Market Demand derived

Market demand is the aggregate of quantities demanded by each person in the market. First, it is imperative to characterize a market. A market consists of collection of buyers of a specific product during a specific period of time. For example, if we are talking about fish, the market consists of buyers and sellers. Because fish spoils after a specified period of time, the market for fish operates over the time between when it is made available to sellers and when it no longer can be sold without making people sick. In contrast, paintings have a much longer shelf life. The market for a da Vinci painting exists whenever the owner decides that he or she wishes to sell it. The bottom line is there is no one definition of

a market. It is more of a generic term that is used to describe the time, the place, and good that will bring potential buyers together with potential sellers.

Suppose we take the market for the fish caught on Friday as opening on Friday (when the boat returns to shore). At market, these fresh fish are sold to the ultimate consumers. The demand schedule represents, in tabular form, the quantities demanded by each of three consumers—Peter, Stephen, and Elizabeth—at different prices. Table 4.1 is an example of each person's demand schedule. Here, qnty demanded is measured in units of fish; for the sake of concreteness, a unit is one ounce of fish.

Table 4.1

Price	**Peter's qnty demanded**	**Stephen's qnty demanded**	**Elizabeth's qnty demanded**
2	**20**	**28**	**50**
5	**15**	**25**	**45**
10	**12**	**22**	**40**
15	**8**	**17**	**32**
20	**4**	**12**	**21**
50	**0**	**2**	**12**

It is straightforward to compute the market demand schedule from the individual demand schedules. I simply sum up the quantities demanded by each person at each price. Table 4.2 provides the market demand schedule based on the evidence presented in Table 4.1

Table 4.2

Price	**Market qnty demanded**
2	**=20+28+50** **=98**
5	**=15+25+45** **=80**
10	**=12+22+40** **=74**
15	**=8+17+32** **=57**
20	**=4+12+21** **=37**
50	**=0+2+12** **=14**

The market demand curve exhibits the Law of Demand just as each individual's demand curve exhibits the property.

Elasticity

Sometimes it is useful to characterize the change in quantity demanded for a given change in price in percentage change form. We will see such a case when we study monopolies. For now, it is sufficient to define elasticity of demand as the percentage change in quantity demanded for a given percentage change in price. Elasticities are further divided into three categories: elastic, unit elastic and

inelastic. We begin with the method to compute the elasticity. With the calculation complete, there is a direct relationship between the computed elasticity and the category.

The elasticity of demand is computed according to the following formula: