Chapter 2 MODERN THEORY OF CONSUMER BEHAVIOR

2.1 INTRODUCTION

Pareto failed to exploit his substantial discoveries, as already indicated. The task of developing the modern theory of consumer behavior remained for Slutsky (1915), Hicks and Allen (1934), Hotelling (1935), and Hicks (1939).

2.1.a—Maximization of Satisfaction

The principle assumption upon which the theory of consumer behavior and demand is built is: a consumer attempts to allocate his limited money income among available goods and services so as to maximize his satisfaction. In short, a consumer arranges his purchases so as to maximize satisfaction subject to his limited money income. Given this assumption and the properties of indifference curves (developed in Chapter 1), individual demand curves can easily be determined. It is to this task that the present chapter is devoted.

2.1.b—Limited Money Income

If each consumer had an unlimited money income—in other words, if there were an unlimited pool of resources—there would be no problems of "economizing," nor would there be "economics." But since this utopian state does not exist, even for the richest members of our society, people are compelled to determine their course of behavior in light of limited financial resources. For the theory of consumer behavior, this means that each consumer has a maximum amount he can spend per period of time. The consumer's problem is to spend this amount in the way that yields him maximum satisfaction.

Continue to assume only two goods, X and Y, bought in quantities x and y. Each individual consumer is confronted with market-determined prices p_x and p_y of X and Y, respectively. Finally, the consumer in question has a known and fixed money income (M) for the period under consideration. Thus the maximum amount he can spend per

period is M, and this amount can be spent only upon goods X and Y.[1] Thus the amount spent on X (xp_x) plus the amount spent on Y (yp_y) must not exceed the stipulated money income M. Algebraically,

$$M \geqq xp_x + yp_y \,. \qquad (2.1.1)$$

Expression 2.1.1 is an inequality that can be graphed in commodity space since it involves only the two variables X and Y. First consider the equality form of this expression:

$$M = xp_x + yp_y \,. \qquad (2.1.2)$$

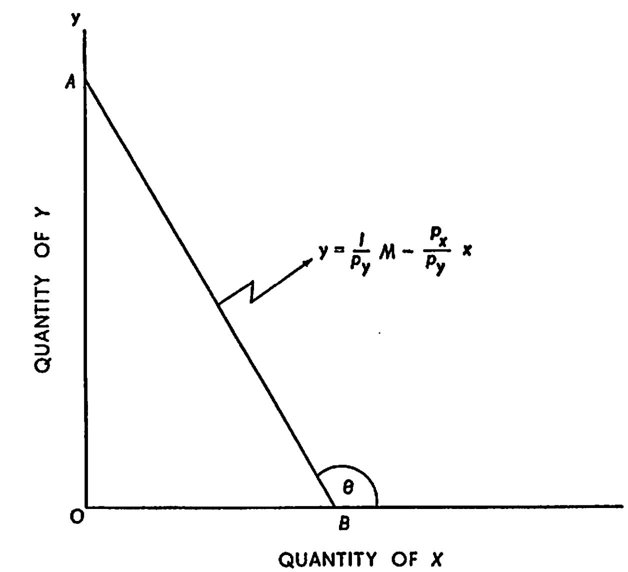

FIGURE 2.1.1
THE BUDGET LINE

This is the equation of a straight line. Solving for y—since y is plotted on the vertical axis—one obtains

$$y = \frac{1}{p_y} M - \frac{p_x}{p_y} x \,. \qquad (2.1.3)$$

Equation 2.1.3 is plotted in Figure 2.1.1. The first term on the right-hand side of equation 2.1.3, $\frac{1}{p_y} M$, shows the amount of Y

[1] In more advanced cases, *saving* may be considered as one of the many goods and services available to the consumer. Graphical treatment limits us to two dimensions; thus we ignore saving. This does *not* mean that the theory of consumer behavior precludes saving—depending upon his preference ordering, a consumer may save much, little, or nothing. Similarly, spending may in fact exceed income in any given period as a result of borrowing or from assets acquired in the past. The "M" in question for any period is the total amount of money to be spent during the period.

that can be purchased if X is not bought at all. This is represented by the distance OA in Figure 2.1.1; thus $1/p_y\, M$ is the *ordinate intercept* of the equation.

The second term on the right-hand side of equation 2.1.3, i.e. $-\frac{p_x}{p_y}$, is the *slope* of the line. Consequently, the slope of the line is the negative of the price ratio. To see this, consider the quantity of X that can be purchased if Y is not bought. This amount is $\frac{1}{p_x} M$, shown by the distance OB in Figure 2.1.1. Since the line obviously has a negative slope, its slope is given by[2]

$$-\frac{OA}{OB} = -\frac{\frac{1}{p_y} M}{\frac{1}{p_x} M} = -\frac{p_x}{p_y}.$$

The line in Figure 2.1.1 is called the *budget line.*

Definition: the budget line is the locus of budgets (or combinations of goods) that can be purchased if the entire money income is spent. Its slope is the negative of the price ratio.

The budget line is the graphical counterpart of equation 2.1.3, but it is not the graph of the inequality in expression 2.1.1. The latter includes the budget line, but it also includes all budgets whose total cost is not as great as M. Inequality 2.1.1 is shown graphically in Figure 2.1.2 by the triangular shaded area—it is the entire area enclosed by the budget line and the two axes. This area is called the *budget space.*[3]

Definition: the budget space is the set of all budgets that may be purchased by spending some or all of a given money income. The budget space comprises only a part of (or is a subset of) commodity space.

2.1.c—Shifting the Budget Line

In much of the analysis that follows, we are interested in *comparative static* changes in quantities purchased resulting from changes in price or money income. The latter changes are graphically represented by shifts in the budget line.

[2] The slope is $\tan \Theta = -\tan(180 - \Theta) = -OA/OB$, etc.

[3] Mathematically, it is more correct to say that the budget space is defined by the following three inequalities:

$$M \geqq xp_x + yp_y,$$
$$x \geqq 0,$$
$$y \geqq 0.$$

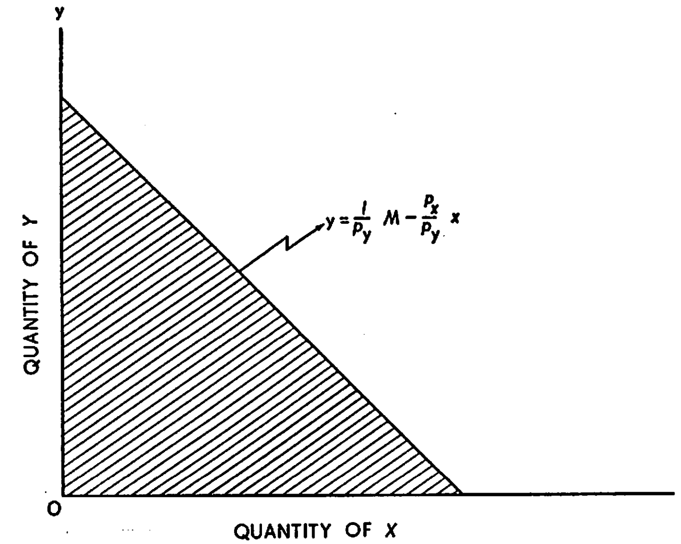

FIGURE 2.1.2
BUDGET SPACE

First consider an increase in money income from M to $M^* > M$, commodity prices remaining unchanged. The consumer can now purchase *more*—more of Y, more of X, or more of both. The maximum purchase of Y increases from $\frac{1}{p_y} M$ to $\frac{1}{p_y} M^*$, or from OA to OA' in Figure 2.1.3. Similarly, the maximum purchase of X increases from $\frac{1}{p_x} M$ to $\frac{1}{p_x} M^*$, or from OB to OB'. Since prices remain constant, the slope of the budget line does not change. Thus an increase in money income, prices remaining constant, is shown graphically by shifting the budget line upward and to the right. Since the slope does not change, the movement might be called a "parallel" shift. It readily follows that a decrease in money income is shown by a parallel shift of the budget line in the direction of the origin.

Figure 2.1.4 shows what happens to the budget line when the price of X increases, the money price of Y and money income remaining constant. Let the price of X increase from p_x to p_x^*. Since p_y and M are unchanged, the ordinate intercept does not change—it is OA in each case. But the slope of the line, the negative of the price ratio, changes from $-p_x/p_y$ to $-p_x^*/p_y$. Since $p_x^* > p_x$, $-p_x^*/p_y < -p_x/p_y$. In other words, the slope of the budget line becomes *steeper.*

Alternatively, the price change can be explained as follows. At the

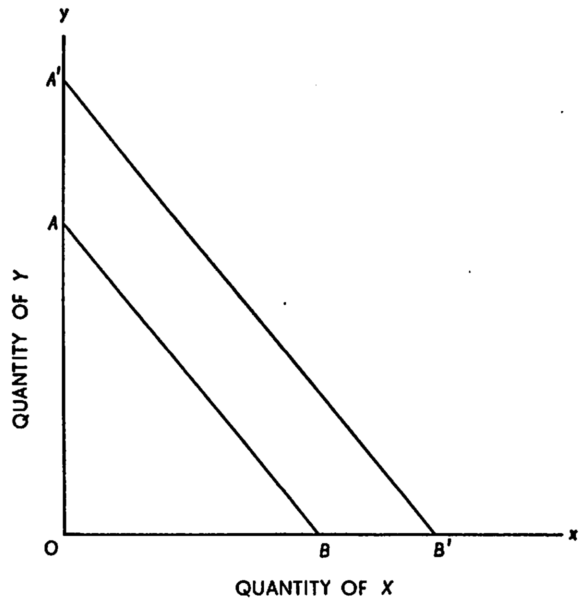

FIGURE 2.1.3
BUDGET LINES WHEN MONEY INCOME INCREASES, PRICES REMAINING UNCHANGED

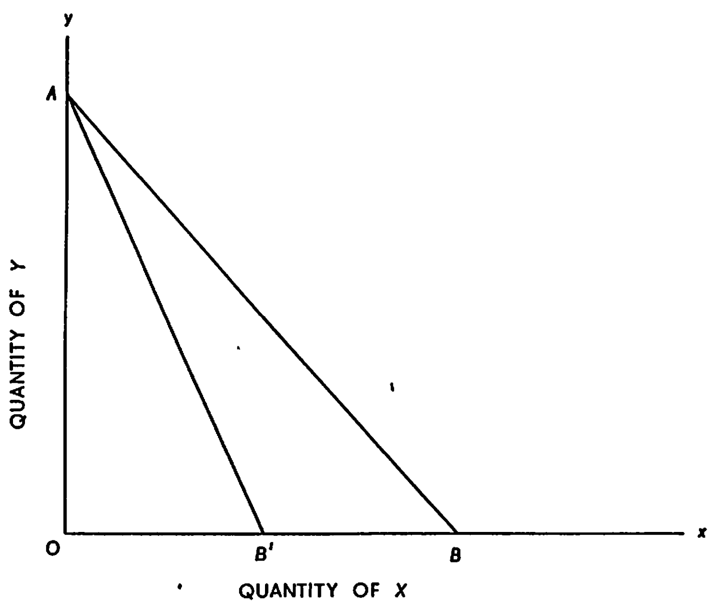

FIGURE 2.1.4
BUDGET LINES WHEN PRICE OF X INCREASES, PRICE OF Y AND MONEY INCOME REMAINING UNCHANGED

original price p_x, the maximum purchase of X is $1/p_x\, M$, or the distance OB. When the price changes to p_x^*, the maximum purchase of X is $1/p_x^*\, M$, or the distance OB'. Thus an increase in the price of X is shown by rotating the budget line *clockwise* around the ordinate intercept. A decrease in the price of X is represented by a *counterclockwise* movement.

Relationship: (*i*) An increase in money income, price unchanged, is shown by a parallel shift of the budget line—outward and to the right for an increase in money income, and in the direction of the origin for a decrease in money income. (*ii*) A change in the price of X, the price of Y and money income constant, is shown by rotating the budget line around the ordinate intercept—to the left for a price increase, and to the right for a decrease in price.

2.2 CONSUMER EQUILIBRIUM

All bundles of goods in commodity space are available to the consumer in the sense that he *may* purchase them if he *can.* The consumer's indifference map establishes a rank ordering of all these bundles. The consumer's budget space is established by his fixed money income; it shows those bundles he *can* purchase. Our fundamental assumption that each consumer attempts to maximize satisfaction from a given money income simply means that the consumer must select the most preferred bundle of goods in his budget space.

2.2.a—The Relevant Part of Commodity Space

Graphically, the consumer's problem is depicted by Figure 2.2.1. The entire *x-y* plane is commodity space; his indifference map, represented by the five indifference curves drawn in that figure, indicates his preferences among all budgets in this space. Similarly, the consumer's budget space—the line LM and the shaded area enclosed by LM and the two axes—shows the feasible budgets, those the consumer can buy. Clearly, the consumer cannot purchase any budget lying above and to the right of the budget line LM. He would prefer such a budget if it were attainable; but his income is not sufficient to pay for it.

Thus his choice is limited to those bundles lying in the budget space. But again, we can eliminate most of these. In particular, no point in the interior of the budget space—below the budget line LM—can yield maximum satisfaction because a higher indifference curve can be reached by moving out to the budget line. Hence the only portion of commodity space relevant to the consumer's decision is the budget line.

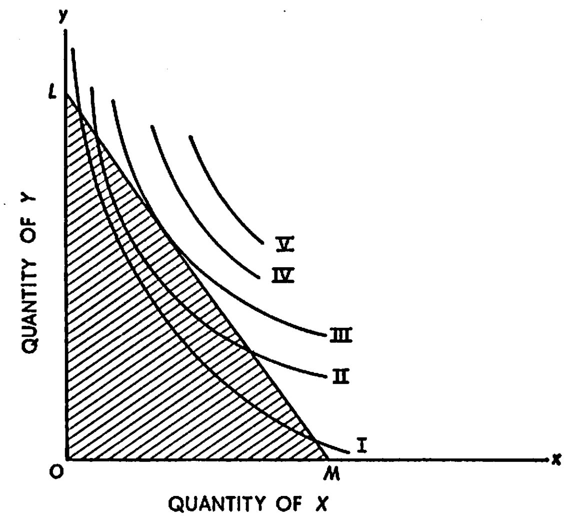

FIGURE 2.2.1
BUDGET SPACE AND THE INDIFFERENCE MAP

2.2.b—Maximizing Satisfaction Subject to a Limited Money Income

The way in which a consumer maximizes satisfaction subject to a limited money income is illustrated in Figure 2.2.2. The budget line is *LM* and the curves labeled I, II, III, and IV are a portion of an individual's indifference map. As already observed, the consumer cannot attain a position on any indifference curve, such as IV, that lies entirely beyond the budget line.

Three of the infinite number of attainable budgets on *LM* are represented by the points *Q*, *P*, and *R*. Each of these, and every other point on the budget line *LM* is attainable with the consumer's limited money income.

Suppose the consumer were located at *Q*. Without experimenting, he cannot know for certain whether *Q* represents a maximum position for him. Thus let him experimentally move to budgets just to the left and right of *Q*. Moving to the left from *Q* lowers his level of satisfaction to some indifference curve below *I*. But moving to the right brings him to a higher indifference curve; and continued experimentation will lead him to move at least as far as *P*, because each successive movement to the right brings the consumer to a higher indifference curve. If he continued to experiment, however, by moving to the right of *P*, the consumer would find himself upon a lower indifference curve

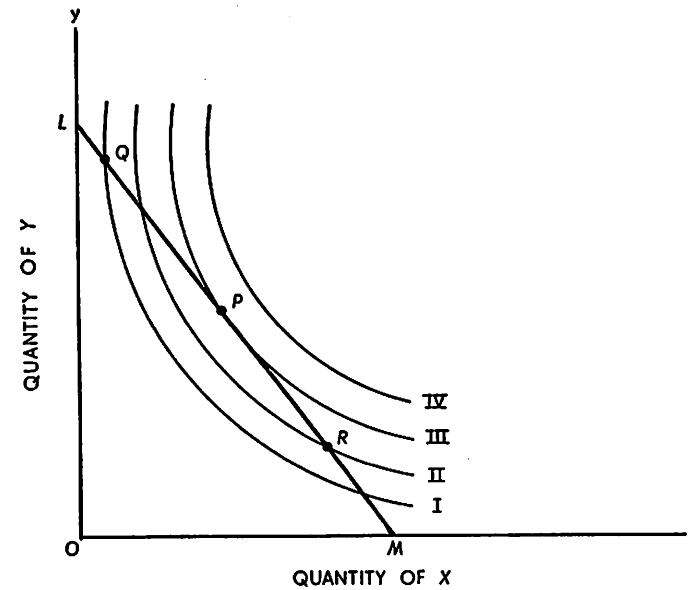

FIGURE 2.2.2
CONSUMER EQUILIBRIUM

with its lower level of satisfaction. He would accordingly return to the point *P*.

Similarly, if a consumer were situated at a point such as *R*, experimentation would lead him to substitute *Y* for *X*, thereby moving in the direction of *P*. He would not stop short of *P* because each successive substitution of *Y* for *X* brings the consumer to a higher indifference curve. Hence the position of maximum satisfaction—or the point of consumer equilibrium—is attained at *P*, where an indifference curve is just tangent to the budget line.

As you will recall, the slope of the budget line is (the negative of) the price ratio, the ratio of the price of *X* to the price of *Y*. As you will also recall, the slope of an indifference curve at any point is called the marginal rate of substitution of *X* for *Y*. Hence the point of consumer equilibrium is defined by the condition that the marginal rate of substitution equals the price ratio.

The interpretation of this proposition is very straightforward. The marginal rate of substitution shows the rate at which the consumer *is willing to substitute* X for Y. The price ratio shows the rate at which he *can substitute* X for Y. Unless these two are equal, it is possible to change the combination of X and Y purchased so as to attain a higher level of satisfaction. For example, suppose the marginal rate of substitution is two—meaning the consumer is willing to give up two units of Y in order to obtain one unit of X. Let the price ratio be unity, meaning one unit of Y can be exchanged for one unit of X. Clearly, the consumer will benefit by trading Y for X, since he is willing to give two Y for one X but only has to give one Y for one X in the market. Generalizing, unless the marginal rate of substitution and the price ratio are equal, some exchange can be made so as to push the consumer to a higher level of satisfaction.

Principle: the point of consumer equilibrium—or the maximization of satisfaction subject to a limited money income—is defined by the condition that the marginal rate of substitution of X for Y equals the ratio of the price of X to the price of Y.[4]

[4] Let there be two goods X and Y with given market prices p_x and p_y. The consumer has a given money income (M) and consumes the two goods in quantities x and y. His preference function is given by

$$U = U(x, y). \tag{2.4.1}$$

His budget constraint is

$$M = xp_x + yp_y. \tag{2.4.2}$$

To maximize (2.4.1) subject to the constraint (2.4.2) is a simple Lagrangean extremum problem. Construct the function

$$L = U(x, y) - \lambda(xp_x + yp_y - M), \tag{2.4.3}$$

where λ is a Lagrangean multiplier. The first-order conditions require that both partial derivatives equal zero:

$$\begin{aligned}\frac{\partial L}{\partial x} &= \frac{\partial U}{\partial x} - \lambda p_x = 0,\\ \frac{\partial L}{\partial y} &= \frac{\partial U}{\partial y} - \lambda p_y = 0.\end{aligned} \tag{2.4.4}$$

Transferring the second term to the right-hand side in each equation and dividing the first equation by the second, one obtains

$$\frac{\dfrac{\partial U}{\partial x}}{\dfrac{\partial U}{\partial y}} = \frac{p_x}{p_y}. \tag{2.4.5}$$

As shown in footnote 7, Chapter 1, the expression on the left-hand side of (2.4.5) is the marginal rate of substitution. Thus one obtains the condition stated in the text.

The second-order conditions for a maximum require that

$$\frac{d^2U}{dx^2} = \frac{\partial^2 U}{\partial x^2} + 2\frac{\partial^2 U}{\partial x \partial y}\left(-\frac{p_x}{p_y}\right) + \frac{\partial^2 U}{\partial y^2}\left(-\frac{p_x}{p_y}\right)^2 < 0. \tag{2.4.6}$$

Multiplying (2.4.6) by p_y^2, a positive number, one obtains

$$\frac{\partial^2 U}{\partial x^2}p_y^2 - 2\frac{\partial^2 U}{\partial x \partial y}p_x p_y + \frac{\partial^2 U}{\partial y^2}p_x^2 < 0. \tag{2.4.7}$$

A true maximum is obtained if (2.4.7) holds in addition to (2.4.4).

The slope of an indifference curve at a point, as shown in footnote 7, Chapter 1, is dy/dx. Taking its derivative, one obtains

$$\frac{d^2y}{dx^2} = -\frac{1}{\left(\dfrac{\partial U}{\partial y}\right)^3}\left[\frac{\partial^2 U}{\partial x^2}\left(\frac{\partial U}{\partial y}\right)^2 - 2\frac{\partial^2 U}{\partial x \partial y}\left(\frac{\partial U}{\partial x}\right)\left(\frac{\partial U}{\partial y}\right) + \frac{\partial^2 U}{\partial y^2}\left(\frac{\partial U}{\partial x}\right)^2\right]. \tag{2.4.8}$$

Substituting

$$\frac{\partial U}{\partial x} = \frac{p_x}{p_y}\frac{\partial U}{\partial y} \qquad \text{[from (2.4.5)]} \tag{2.4.9}$$

in (2.4.8), one obtains

$$\frac{d^2y}{dx^2} = -\frac{1}{\dfrac{\partial U}{\partial y}p_y^2}\left[\frac{\partial^2 U}{\partial x^2}p_y^2 - 2\frac{\partial^2 U}{\partial x \partial y}p_x p_y + \frac{\partial^2 U}{\partial y^2}p_x^2\right]. \tag{2.4.10}$$

Inequality (2.4.7) ensures that the bracketed term on the right-hand side of (2.4.10) is negative. Hence d^2y/dx^2 is positive, implying that indifference curves must be concave from above to ensure a stable constrained maximum.

2.3 CHANGES IN MONEY INCOME

Changes in money income, prices remaining constant, usually result in corresponding changes in the quantities of commodities bought. In particular, for so-called "normal" goods an increase in money income leads to an increase in consumption and a decrease in money income to a decrease in consumption. It is of considerable interest to analyze the effects upon consumption of changes in income. To do so, we will hold nominal prices constant so as to observe the effects of income changes alone.[5]

2.3.a—The Income-Consumption Curve

As explained in subsection 2.1.c, an increase in money income shifts the budget line upward and to the right, and the movement is a parallel shift because nominal prices are assumed to be constant. In Figure 2.3.1, the price ratio is given by the slope of LM, the original budget line, and remains constant throughout.

With money income represented by LM, the consumer comes to equilibrium at point P on indifference curve I, consuming Ox_1 units of X. Now let money income rise to the level represented by $L'M'$. The consumer shifts to a new equilibrium at point Q on indifference curve II. He has clearly gained. He also gains when money income shifts to the level corresponding to L″M″. The new equilibrium is at point R on indifference curve III.

As income shifts, the point of consumer equilibrium shifts as well.

[5] We assume throughout the discussion that the good is a "normal" good. "Inferior" good are treated in Chapter 3.

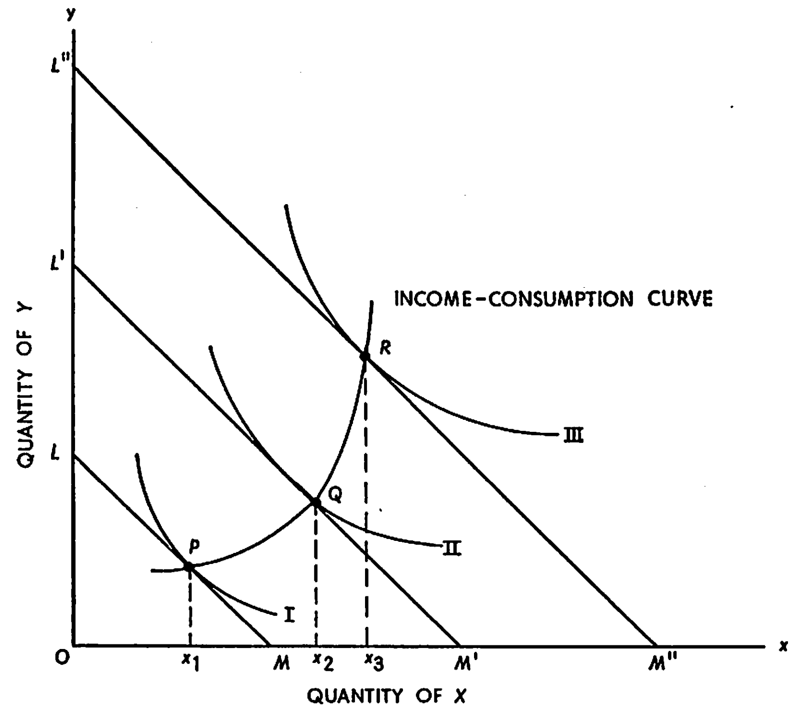

FIGURE 2.3.1
THE INCOME-CONSUMPTION CURVE

The line connecting the successive equilibria is called the income-consumption curve. This curve shows the *equilibrium combinations* of X and Y purchased at various levels of money income, nominal prices remaining constant throughout.

Definition: the income-consumption curve is the locus of equilibrium budgets resulting from various levels of money income and constant money prices. The income-consumption curve is positively sloped throughout its entire range when both goods are "normal."

2.3.b—Engel Curves

The income-consumption curve may be used to derive Engel curves for each commodity.

Definition: an Engel curve is a function relating the equilibrium quantity purchased of a commodity to the level of money income. The name is taken from Christian Lorenz Ernst Engel, a nineteenth-century German statistician.

Engel curves are important for applied studies of economic welfare and for the analysis of family expenditure patterns.

Engel curves relating the consumption of commodity X to income

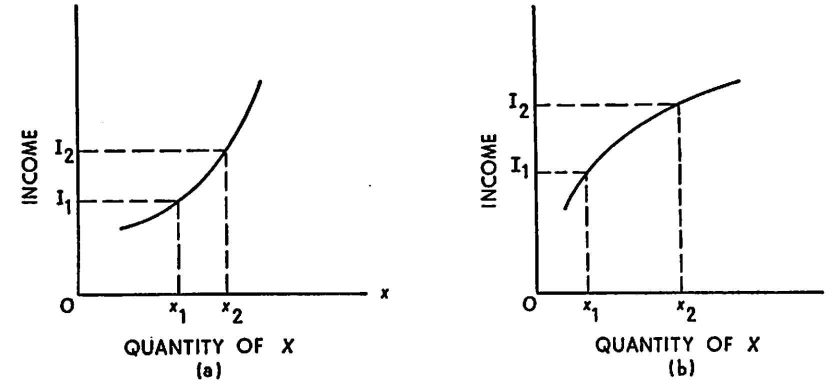

FIGURE 2.3.2
ENGEL CURVES

are constructed in Figure 2.3.2. Neither panel *a* nor panel *b* is directly based upon the particular income-consumption curve in Figure 2.3.1; but the process of deriving an Engel curve from an income-consumption curve should be clear.

At the original equilibrium point P in Figure 2.3.1, money income is $p_x \cdot OM$ (or $p_y \cdot OL$). At the income $p_x \cdot OM$, Ox_1 units of X are purchased. This income-consumption point can be plotted on a graph such as panel a, Figure 2.3.2. When the budget line shifts from LM to $L'M'$ (Figure 2.3.1), money income increases to $p_x \cdot OM'$ and consumption to Ox_2 units. This income-consumption pair constitutes another point on the Engel curve graph. Repeating this process for all levels of money income generates a series of points on a graph such as panel a, Figure 2.3.2. The Engel curve is formed by connecting these points by a line.

Two basically different types of Engel curves are shown in panels a and b, Figure 2.3.2. In panel a, the Engel curve slopes upward rather steeply, implying that changes in money income do not have a substantial effect upon consumption. An Engel curve with this property indicates that the good is bought when income is low, but the quantity purchased does not expand rapidly as income increases. If "food" is treated as a single commodity, its Engel curve would look something like the curve in panel a, even though the curve for "steak" as a separate commodity probably would not. In summary, an Engel curve that is concave from above indicates a commodity whose income elasticity of demand is low (but positive).

On the other hand, steak and many other types of goods give rise to Engel curves more nearly represented by the curve in panel b. The relatively gentle upward slope indicates that the quantity bought changes markedly with income. Such a curve indicates a relatively high income elasticity of demand.[6]

2.4 CHANGES IN PRICE

The reaction of quantity purchased to changes in price is perhaps even more important than the reaction to changes in money income. In this section we will assume nominal money income and the nominal price of *Y* remain constant while the nominal price of *X* falls. We are thus able to analyze the effect of price upon quantity purchased without simultaneously considering the effect of changes in nominal money income.[7]

2.4.a—The Price-Consumption Curve

In Figure 2.4.1 the price of *X* falls from the amount indicated by the slope of the original budget line *LM* to the amount indicated by the slope of *LM′* and then to the amount represented by the slope of *LM″*.

With the original budget line *LM*, the consumer reaches equilibrium at point *P* on indifference curve *I*. When the price of *X* falls, the budget line becomes *LM′* and the new equilibrium is attained at *Q* on indifference curve *II*. Finally, when the price falls again, the new equilibrium is point *R* on indifference curve *III* and budget line *LM″*. The line connecting these successive equilibrium points is called the price-consumption curve.

Definition: the price-consumption curve is the locus of equilibrium budgets resulting from variations in the price ratio, nominal money income remaining constant. Nothing can be said a priori about the slope of the price-consumption curve.

2.4.b—The Demand Curve

The individual consumer demand curve for a commodity can be derived from the price-consumption curve, just as an Engel curve is derivable from an income-consumption curve.

[6] If he likes, the student may associate "necessities" and "luxuries" with commodities whose Engel curves look like those in panels (a) and (b) respectively. In other words, "necessities" are goods possessing low income elasticities and "luxuries" are goods having relatively high income elasticities. One should be warned, however, that such associations are very rough and highly sensitive to the particular definitions of the commodities in question.

[7] The student should realize that if the nominal price of *y* and nominal money income remain constant while the nominal price of *x* declines, the real price of *y* increases, the real price of *x* decreases, and real money income increases. Our discussion refers almost lusively to nominal prices and income.

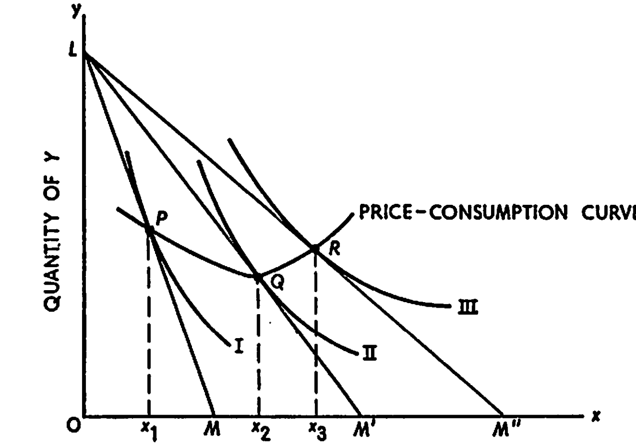

FIGURE 2.4.1
THE PRICE-CONSUMPTION CURVE

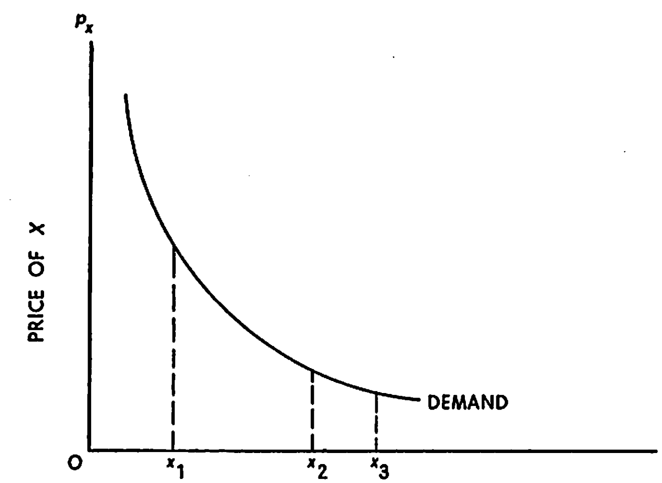

FIGURE 2.4.2
THE DEMAND CURVE

Definition: the demand curve for a specific commodity relates equilibrium quantities bought to the market price of the commodity, nominal money income and the nominal prices of other commodities held constant.

When the price of *X* is given by the slope of *LM* in Figure 2.4.1, Ox_1 units of *X* are purchased. This price-consumption pair constitutes one point on the graph in Figure 2.4.2. Similarly, when the price of *X* falls to the level indicated by the slope of *LM′*, quantity purchased increases to Ox_2. This price-consumption pair is another point that can be plotted on Figure 2.4.2. Plotting all points so obtained and connecting them with a line generates the consumer-demand curve, as shown in Figure 2.4.2. Its shape indicates an important principle, called the Law of Demand.

Principle: quantity demanded varies inversely with price, nominal money income and nominal prices of other commodities remaining constant.

2.4.c—The Elasticity of Demand

The elasticity of demand is an important concept and one known to you already.

Definition: elasticity of demand is the relative responsiveness of quantity demanded to changes in price. It may also be determined from the changes in price and in the money income spent upon a good.

At this point it may be helpful briefly to review the relationship between price elasticity of demand and changes in the total expenditure upon the good in question. First, suppose the nominal price of good X declines by 1 percent. The demand for X is said to be price elastic, of unitary price elasticity, or price inelastic according as the quantity of X demanded expands by more than 1 percent, by exactly 1 percent, or by less than 1 percent.

Next, recall that the total expenditure upon a good is the product of price per unit and the number of units purchased. Given an initial price and quantity bought, a unique initial total expenditure is determined. Now let price fall by 1 percent. If demand is price elastic, quantity demanded expands by more than 1 percent. Thus total expenditure must expand when price falls and demand is price elastic. By the same argument, one finds (a) that total expenditure remains constant when price falls and demand has unitary price elasticity, and (b) that total expenditure declines when price falls and demand is price inelastic.

Exercise: suppose the price of X increases, rather than falls as in the explanation above. By an analogous argument, show that demand is price elastic, has unitary price elasticity, or is price inelastic according as total expenditure declines, remains constant, or increases.

2.4.d—Elasticity of Demand and the Price-Consumption Curve

The elasticity of demand can be determined immediately from the slope of the price-consumption curve. Consider panel a, Figure 2.4.3. Let Y represent "all other goods," or what is frequently called "Hicks-Marshall" money. This is plotted on the vertical axis and labeled

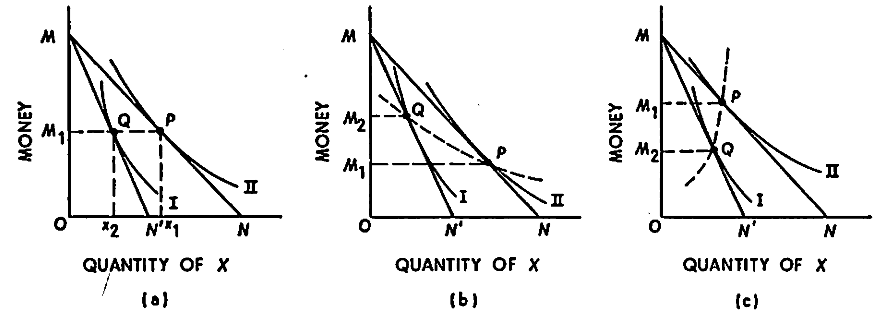

FIGURE 2.4.3

PRICE-CONSUMPTION CURVES AND THE ELASTICITY OF DEMAND

"money," whose price is unity. Thus money income is fixed at OM, and its price is fixed at one. The original budget line is MN, and its slope is the price of $X (p_x/1 = p_x)$.

The original equilibrium is at point P on indifference curve II. At this point $Ox_1 = M_1P$ units of X are bought. The slope of MN is (the negative of) MM_1/M_1P, so the price of X is MM_1/M_1P. The total amount spent on X is accordingly $M_1P(MM_1/M_1P) = MM_1$. When the price of X increases to the level given by the slope of MN', quantity purchased drops to Ox_2, but the amount spent on X remains unchanged. Price increases to MM_1/M_1Q, quantity purchased declines to M_1Q, and total expenditure on X is $M_1Q(MM_1/M_1Q) = MM_1$. The proportionate increase in the price of X is exactly offset by the proportionate decrease in the quantity of X bought. Consequently, demand has unitary elasticity over this range. And notice: the price-consumption curve is QP. Thus when the price-consumption curve is horizontal, price elasticity of demand for X is unitary.

In panel b, an increase in the price of X (from that given by the slope of MN to that given by the slope of MN') is accompanied by a decrease in expenditure on X from MM_1 to MM_2. The proportionate increase in the price of X is more than offset by the proportionate reduction in quantity demanded. Demand is therefore elastic. The price-consumption curve is QP; hence when the price-consumption curve is negatively sloped, demand is elastic.

By the same reasoning, panel c illustrates the price-consumption curve when demand is inelastic. Thus we have the following relationships.

Relationships: demand has unitary price elasticity, is price elastic, or is price inelastic according as the price-consumption curve is horizontal, negatively sloped, or positively sloped. Thus the price-consumption curve in Figure 2.4.1 reflects commodity demand that is first (at higher prices) elastic, becomes unitary at a point, and is inelastic thereafter.

2.5 CONCLUSION

The basic principles of consumer behavior and of demand have now been developed. In the following two chapters various important, but subsidiary, topics are analyzed using the tools introduced in Chapters 1 and 2. The fundamental conclusion of this chapter is explained more fully and one special exception is noted, but this conclusion remains as fundamental as ever: if consumers behave so as to maximize satisfaction from a limited money income, quantity demanded will vary inversely with price.

SUGGESTED READINGS

1. HICKS, JOHN R. *Value and Capital,* pp. 26–30. 2d ed. Oxford: Oxford University Press, 1946.
2. HENDERSON, JAMES M. AND QUANDT, RICHARD E. *Microeconomic Theory: A Mathematical Approach,* pp. 12–24. New York: McGraw-Hill Book Co., Inc., 1958. [Elementary math necessary.]
3. SAMUELSON, PAUL A. *Foundations of Economic Analysis,* pp. 96–100. Cambridge: Harvard University Press, 1947. [Advanced math necessary.]

Chapter 3 TOPICS IN CONSUMER DEMAND

3.1 INTRODUCTION

The theory of consumer behavior was developed in Chapter 2, and it was shown that an individual consumer demand curve normally slopes downward to the right—that quantity demanded varies inversely with price. This chapter presents a closer analysis of consumer demand and of market demand for related commodities.

3.2 SUBSTITUTION AND INCOME EFFECTS

A change in the nominal price of a commodity actually exerts two influences on quantity demanded. In the first place, there is a change in *relative* price—a change in the terms at which a consumer *can* exchange one good for another. The change in relative price alone leads to a substitution effect. Second, a change in the nominal price of a good (nominal income remaining constant) causes a change in *real* income, or in the size of the bundle of goods and services a consumer can buy. If the nominal price of one good falls, all other nominal prices remaining constant, the consumer's real income rises because he can now buy more, either of the good whose price declined or of other goods. In other words, his level of satisfaction must increase. The change in the level of real income may or may not—depending upon the consumer's preference map—cause a significant change in his pattern of consumption. In any event, the change in real income leads to an income effect upon quantity demanded.

3.2.a—The Substitution Effect in the Case of a Normal Good

When the price of one good changes, the prices of other goods and money income remaining constant, the consumer moves from one equilibrium point to another. In normal circumstances, if the price of a good diminishes, more of it is bought; if its price increases, fewer units are taken. The overall change in quantity demanded from one equilibrium position to another is referred to as the *total effect.*