3

CONSUMER BEHAVIOUR: THE INDIFFERENCE APPROACH*

Microeconomics studies the behaviour of the individual decision making units in the economy, of which the consumer is one of the most important. The importance of the role of consumers is apparent from the fact that in South Africa about 60 per cent of all goods and services is purchased by consumers. (The rest is purchased mainly by the government or private enterprises, or exported.) It is therefore easy to understand why economists pay so much attention to the behaviour of consumers. Consumer behaviour is also important for marketers of consumer goods who want to know how a typical consumer would react and behave under different circumstances.

In the analysis of demand and supply in Chapter 2 it was assumed that the demand curves of consumers usually slope downwards from left to right. This is in accordance with the law of demand, which states that the quantity demanded of a good will increase if its price decreases, and will decrease if its price rises *(ceteris paribus)*. In this chapter consumer behaviour is analysed in more detail. In doing so it we explain why demand curves slope downwards from left to right. In this chapter the indifference approach is used, which is an alternative to the marginal utility approach which is usually encountered in introductory microeconomic courses. An important difference between the marginal utility approach and the indifference approach is that the indifference approach does not require the measurement of marginal utility. The two approaches nevertheless yield the same results.

The indifference approach was devised towards the end of the 19th century by a famous Italian economist, Vilfredo Pareto (1848–1923), and developed further by 20th-century economists such as the Nobel Prize winner Sir John Hicks.

The indifference approach has definite advantages over the traditional utility approach in analysing consumer behaviour. First, many students (and economists) are not impressed by the notion that consumer satisfaction or utility can be measured and that changes in utility can be compared. Second, indifference curves allow us to distinguish between the income effects and substitution effects of a change in the price of a product. Third, the indifference curve technique is an extremely useful tool which can be used to

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* The author based this chapter to a large extent on a chapter which he has contributed to the book *Economics for South African students* by P Mohr *et al*, which was published in 1996 by Van Schaik.

analyse a variety of other choices, apart from consumers' choices between different goods and services. This is done in Chapter 4.

In this chapter we first explain what indifference curves are, and indicate their important properties. We then introduce the budget line and combine it with indifference curves to explain consumer equilibrium. This is followed by an investigation of the effects of changes in income and prices. The income and substitution effects of a price change are separated and different demand curves are derived.

Once you have studied this chapter you should be able to

- explain what indifference curves are and list their important properties
- define the budget line and explain consumer equilibrium
- examine the effects of changes in income or prices
- distinguish between the income and substitution effects of a price change (for normal, inferior and Giffen goods)
- derive the demand curve for normal, inferior and Giffen goods by using indifference curves
- explain the backward-bending labour supply curve

INTRODUCTION

The utility approach to the analysis of consumer behaviour, which usually forms part of an introductory course in microeconomics, is based on the assumption that a consumer can assign values to the amount of satisfaction (utility) that he or she obtains from the consumption of each successive unit of a consumer good or service. It is also assumed that it is possible to compare the utility of different consumer goods and services quantitatively. In this chapter the indifference approach is used to analyse consumer behaviour. This is an alternative, more modern approach to the analysis of consumer behaviour, which rests on more acceptable assumptions than the utility approach.

Cardinal and ordinal utility

Whereas the utility approach is based on the notion of *cardinal utility*, the indifference approach employs the notion of *ordinal utility*.

We can explain the difference between cardinal and ordinal magnitudes by considering the measurement of length. The metric scale is an example of a cardinal scale. It enables us to measure distances and allows us to compare different distances with each other. For example, if distance A is 75 kilometres and distance B 225 kilometres, then we know that B is exactly three times as long as A. We also know that the difference between A and B is exactly 150 kilometres. An ordinal scale, on the other hand, simply indicates that some distances are shorter than, longer than, or the same as other distances. Such a scale enables us to rank the distances, say, from shortest to longest, but it does not enable us to determine precisely how the distances compare. In contrast to cardinal numbers, the size relationship of ordinal numbers cannot be established.

The cardinal utility approach is based on the assumption that satisfaction (utility) is somehow measurable on a cardinal scale and that differences in utility can be precisely quantified. For example, if the marginal utility of coffee is 5 utils and the marginal utility of beer is 10 utils, then the marginal utility of beer is twice as large as the marginal utility of coffee. It is also possible to say exactly what the difference in the marginal utility of the products is.

Ordinal utility, on the other hand, simply means that the satisfaction which a consumer obtains from consuming different products or bundles of products can be *ranked* or *ordered*. The consumer can rank different products or combinations of products in order of preference but can say nothing about the absolute level of satisfaction that each product or combination of products yields. *The size of the utility differences cannot be established*. The consumer can only rank things from highest to lowest, best to worst, most satisfying to least satisfying, and so on. The indifference approach to consumer behaviour is based on this less strin-

gent (or more plausible) notion of utility. It is also confined to comparing different combinations or bundles of goods and services with each other, and therefore cannot be used to analyse the consumption of one good or service in isolation. Nevertheless, the indifference approach yields essentially the same results as the utility approach.

Three basic assumptions

The indifference approach is based on three basic assumptions: the assumption of completeness (or law of comparison), the assumption of consistency (or transitivity) and the assumption of non-satiation (or non-satiety). These assumptions may sound complicated, but they are actually quite simple. As you will see, they are also very reasonable and plausible assumptions.

Completeness

- The assumption of *completeness* simply means that it is assumed that a consumer is able to rank *all* possible combinations (or bundles) of goods and services in order of preference. Consider two bundles of consumer goods: bundle X consists of two portions of meat and five litres of milk, while bundle Y consists of one portion of meat and eight litres of milk. A consumer must then be able to say whether he or she prefers X to Y, prefers Y to X or is indifferent between them (ie values them both equally). The consumer must be able to do the same for all other possible combinations of products.

Consistency

- The assumption of *consistency* (or *transitivity*) simply means that consumers are assumed to act consistently. Consider three bundles, A, B and C. If the consumer prefers A to B and prefers B to C, then he or she (according to this assumption) must also prefer A to C. If not, then the consumer will sometimes act inconsistently and his or her behaviour cannot be analysed.

Non-satiation

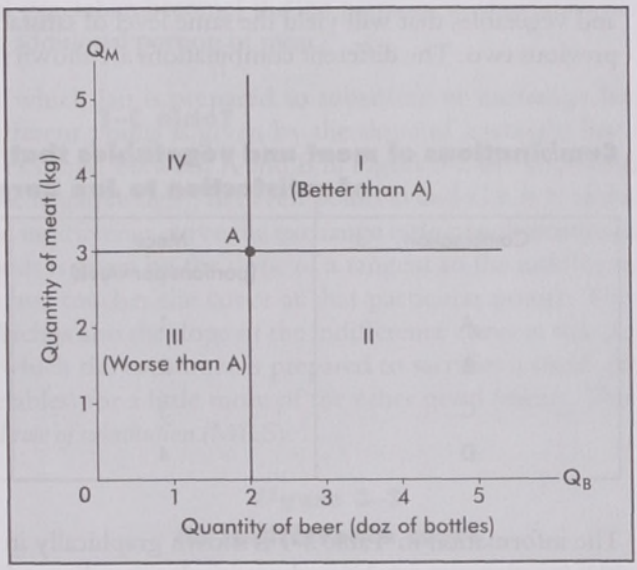
- The assumption of *non-satiation* (or *non-satiety*) simply states that consumers are not yet fully satisfied and always *prefer more to less*. Thus, if bundle A contains two kilograms of meat and two dozen bottles of beer and bundle B contains two kilograms of meat and three dozen bottles of beer, the consumer is assumed to always prefer B to A.

The assumption of non-satiation has implications which are illustrated in Figure 3-1. In the figure, meat (in kilograms) is shown on the vertical axis and beer (in dozens of bottles) on the horizontal axis. Point A shows the combination of three kilograms of meat and two dozen bottles of beer. By drawing a horizontal and a vertical line through point A we divide the area between the axes into four areas. Any point north-east of A (ie the area labelled I) is preferable to point A since the points in this area represent combinations of more meat and/or more beer than A. At worst the consumer will get more of at least one of the products while getting the same quantity of the other product.

Figure 3-1

A comparison of combinations of meat and beer

Point A represents a combination of 3 kilograms of meat and 2 dozen bottles of beer. Any point in quadrant I will be preferable to A, while A will be preferable to any point in quadrant III. In quadrants II and IV the position is uncertain. At some points in these quadrants the consumer will achieve the same satisfaction as at A.



As in the previous case, point A will be preferable to any point in area III (the area to the southwest of A). But what about areas II and IV? Here we cannot make any deductions with certainty since these areas represent points where the consumer gets more of one good but fewer of the other. It is most likely that somewhere in these areas there will be points that will represent the same level of satisfaction as A. For the consumer these points are indifferent to point A. If we combine all these points between which the consumer is indifferent (because they represent the same level of utility) we obtain an indifference curve.

▶INDIFFERENCE CURVES

Given the three basic assumptions disussed in the previous section, a consumer's tastes and preferences can be indicated by means of an indifference curve.

Definition *An indifference curve is a curve which shows all the combinations of two products that will provide the consumer with equal levels of satisfaction or utility.* The combinations are equally desirable and the consumer is thus indifferent between them.

An example

To explain indifference curves, we consider an imaginary consumer, Jan Burger, who consumes only two products, meat and vegetables. Jan decides that it does not matter to him whether he gets one portion of meat and six portions of vegetables per week or two portions of meat and three portions of vegetables. These two combinations provide him with the same amount of satisfaction, that is, he is indifferent between them. Jan also indicates some other combinations of meat and vegetables that will yield the same level of satisfaction or total utility as the previous two. The different combinations are shown in Table 3-1.

Table 3-1

Combinations of meat and vegetables that yield the same level of satisfaction to Jan Burger

Combination	Meat (portions per week)	Vegetables (portions per week)
A	1	6
B	2	3
C	3	2
D	4	1½

The information in Table 3-1 is shown graphically in Figure 3-2, with vegetables (portions per week) on the vertical axis and meat (portions per week) on the horizontal axis. Each of the combinations A, B, C and D in the table is represented by a single point in the figure. The points listed in Table 3-1 are by no means the only points between which Jan is indifferent – there are also other (intermediate) combinations (eg between A and B) which yield the same level of satisfaction. A curve drawn through points A, B, C and D is called an *indifference curve*. The points on the curve (including those between A, B, C and D) represent different combinations of the two goods that are equally desirable or attractive to Jan – he will derive the same total satisfaction or utility from each of these combinations.

The indifference curve in Figure 3-2 bulges towards the origin – we say that the curve is *convex* when it is viewed from the origin. As we move downwards to the right along the indifference curve (ie as the portions of vegetables decrease and the portions of meat increase), the curve becomes flatter (ie its slope decreases). This illustrates the *law of substitution* which is similar to the law of diminishing marginal utility encountered in the utility approach to consumer behaviour. The law of substitution states that *the scarcer a good becomes, the greater its substitution value will be*. In other words, the marginal utility of the good that becomes less plentiful rises in relation to the marginal utility of the good that

Law of substitution

becomes more plentiful. This can be explained by considering the various combinations listed in Table 3-1. The difference between combinations A and B indicates that Jan is willing to sacrifice three portions of vegetables for a second portion of meat. However, between points B and C he is only prepared to sacrifice one portion of vegetables for an extra (third) portion of meat. Moreover, he is prepared to sacrifice only half a portion of vegetables to obtain a fourth portion of meat (points C and D). The fewer his portions of vegetables (ie the less plentiful vegetables become) the less portions of vegetables he is willing to swop for an additional portion of meat.

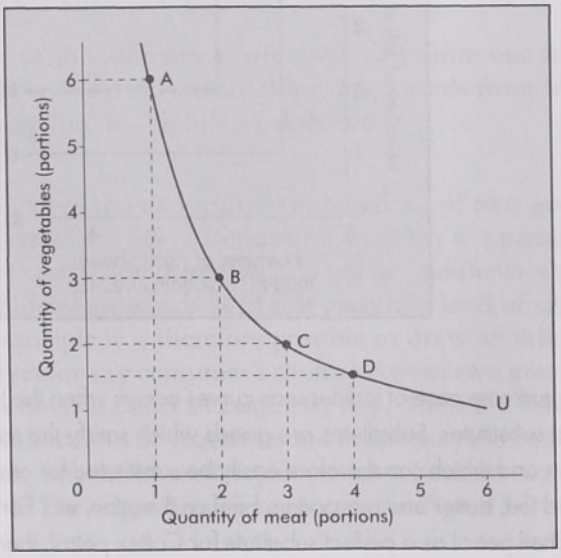
The rate at which Jan is prepared to substitute or exchange bread for meat between different points is given by the slope of a straight line between the points. For example, between A and B in Figure 3-2 the slope of such a line is 3 (ignoring the negative sign); between points B and C it is 1, and so on. At any point on the indifference curve the exchange ratio or substitution ratio between the two goods is given by the slope of a tangent to the indifference curve (ie a line which just touches the curve at that particular point). The slope of the tangent (which is also the slope of the indifference curve at that point) indicates the rate at which the consumer is prepared to sacrifice a small quantity of one good (vegetables) for a little more of the other good (meat). This rate is called the *marginal rate of substitution* (MRS).

Marginal rate of substitution

Figure 3-2

An indifference curve

A, B, C and D are all combinations between which the consumer (Jan Burger) is indifferent. The indifference curve derived in this way represents combinations of the two products which yield the same level of consumer satisfaction.



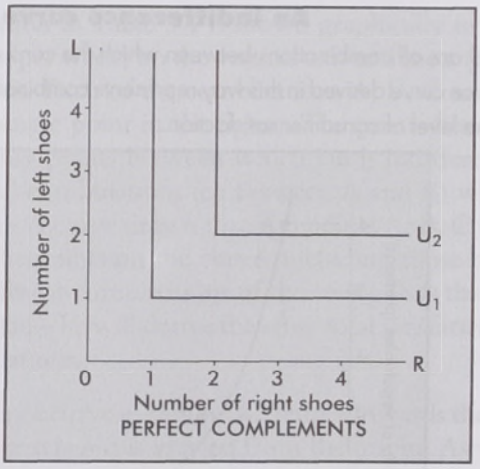
We can now restate our previous conclusion as follows. As we move downwards from left to right along an indifference curve, the marginal rate of substitution (which is equal to the slope of the curve) decreases. The law of substitution can therefore also be called the *law of the diminishing marginal rate of substitution*.

We shall return to the significance of the marginal rate of substitution later. But first we examine some properties of indifference curves and the consumer's equilibrium position.

Box 3–1

TWO EXTREME CASES

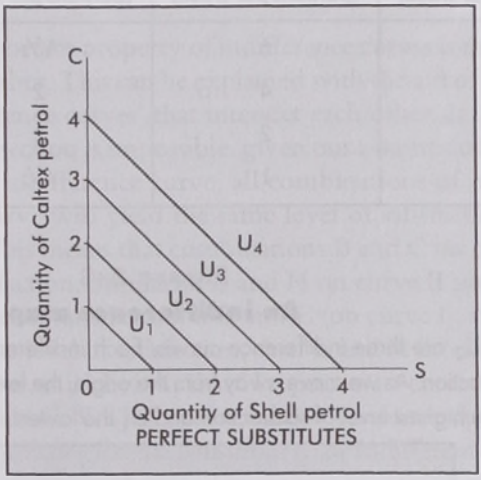
Complements are goods which complement each other in the satisfaction of consumers' wants. Examples are cars and petrol, tobacco and pipes, tables and chairs, etc. If two goods are *perfect complements* it means that they can only be used together (ie in fixed proportions). A normal, two-legged person, for example, can only use one left shoe with one right shoe. If he or she has only one left shoe, then more than one right shoe will yield no additional satisfaction. Similarly, if the consumer has only one right shoe, then the second, third or fourth left shoe will not increase his or her total utility. In perfect complements the indifference curves will therefore be L-shaped, as in the figure below.



PERFECT COMPLEMENTS

The other extreme case of indifference curves occurs when the two goods are regarded as *perfect substitutes*. Substitutes are goods which satisfy the same wants and needs of consumers and which can therefore easily be substituted for one another. Examples are coffee and tea, butter and margarine, beef and mutton, etc. For example, if a consumer regards Shell petrol as a perfect substitute for Caltex petrol, then one litre of Shell petrol

will always yield the same consumer satisfaction as one litre of Caltex petrol. In perfect substitutes the indifference curve is a straight line which slopes downward from left to right as in the figure below. Note that 'normal' indifference curves, such as the one illustrated in Figure 3-2, lie between the two extremes of perfect complements and perfect substitutes.



PERFECT SUBSTITUTES

Properties of indifference curves

The exact shape of an indifference curve will vary from one consumer to the next, but indifference curves usually slope downwards from left to right. (In Box 3-1 two exceptions to this rule are discussed.)

An indifference curve shows various combinations of two goods or services which yield the same level of satisfaction or total utility to a particular consumer. For each level of satisfaction there will be a unique indifference curve, showing the various combinations which yield that particular level of satisfaction to the consumer. In principle it is therefore possible to draw an infinite number of indifference curves for any consumer's choice between two goods. Such a *collection of indifference curves* is called an *indifference map*. Table 3-2 contains two additional sets of combinations of vegetables and meat that yield equal satisfaction to Jan Burger. These data can be used to plot two more indifference curves, U_1 and U_3, in Figure 3-3. The original indifference curve in Figure 3-2 is also shown and is labelled U_2.

Indifference map

Table 3-2

Two further sets of combinations of meat and vegetables between which Jan Burger is indifferent

U_1		U_3	
Meat (portions per week)	Vegetables (portions per week)	Meat (portions per week)	Vegetables (portions per week)
½	6	1½	6
1	4	2	4½
2	2	3	3
3	1	4½	2½

Figure 3-3

An indifference map

U_1, U_2 and U_3 are three indifference curves. Each indifference curve represents a certain level of satisfaction. As we move away from the origin, the level of satisfaction increases. U_3 represents the highest level of satisfaction and U_1 the lowest.

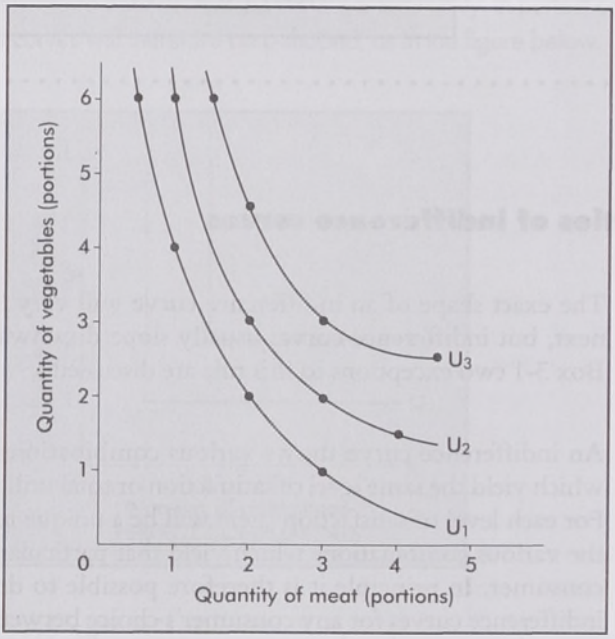


Figure 3-3 is an example of an indifference map containing three indifference curves (U_1, U_2 and U_3). The further we move away from the origin, the larger the combinations of the two goods become and therefore the greater the level of consumer satisfaction, as illustrated by the indifference curve. Given our assump-

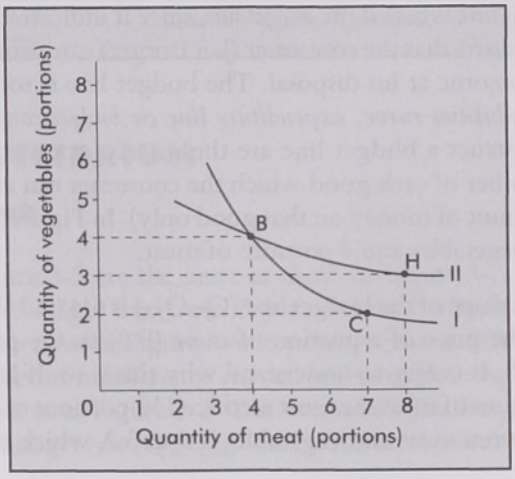
tion that the consumer is not satiated (ie not satisfied fully), it follows that he or she will derive greater utility from consuming more of both goods, as illustrated by a movement to a higher indifference curve (further away from the origin). Although we cannot quantify the amount of consumer satisfaction represented by each indifference curve, we can say that U_2 in Figure 3-3 represents a higher level of satisfaction than U_1, and that U_3 represents a greater level of satisfaction than either U_1 or U_2.

Another important property of indifference curves is that they never intersect or touch each other. This can be explained with the aid of Figure 3-4, which shows two 'indifference curves' that intersect each other. It can easily be proved that such an intersection is impossible, given our assumptions. According to the definition of an indifference curve, all combinations of meat and vegetables on a particular curve will yield the same level of satisfaction or total utility to the consumer. This means that combinations B and C on curve I represent the same level of satisfaction. Similarly, B and H on curve II provide the consumer with the same level of satisfaction. If B and C (on curve I), and B and H (on curve II) yield the same level of satisfaction, then C and H should also yield equal satisfaction. However, it is obvious that H represents a combination of more meat and vegetables than C. We have assumed that consumers prefer more to less and it is therefore impossible for the consumer to be indifferent between C and H – he or she will always prefer H to C. This proves that indifference curves cannot intersect each other. You can use the same method to prove that indifference curves cannot ever touch each other.

Figure 3–4

Indifference curves cannot intersect

By comparing B, C and H it can be shown that I and II cannot be indifference curves. If I and II were both indifference curves, then the consumer would have to be indifferent between C and H, which clearly cannot be the case.



THE BUDGET LINE

Now that we have considered the satisfaction the consumer obtains from various combinations of goods, we turn to the other element of the consumer's decision, namely the combinations that he or she *can afford*.

We return to Jan Burger's choice between meat and vegetables. We assume that he has a fixed amount of R12 per week to spend on meat and vegetables, and that vegetables cost R2 per portion and meat R3 a portion. With his R12 Jan can afford a maximum of 6 portions of vegetables (and no meat) or 4 portions of meat (and no vegetables). Table 3-3 indicates some of the ways in which Jan can spend his R12 on vegetables and meat, on the assumption that he always spends the full amount.

Table 3-3
Affordable combinations of vegetables and meat

Combination	Meat (portions per week)	Vegetables (portions per week)
a	0	6
b	1	4½
c	2	3
d	3	1½
e	4	0

The combinations in Table 3-3 (as well as the intermediate combinations, such as 5¼ portions of vegetables and half a portion of meat) are illustrated graphically in Figure 3-5 by the straight line Q_VQ_M which runs through points a to e. At a Jan spends all his income on vegetables, while at e he spends everything on meat.

Budget line

This line is called the *budget line*, since it indicates all the combinations of the two products that the consumer (Jan Burger) can afford to purchase with the amount of income at his disposal. The budget line is sometimes called the *consumption-possibilities curve, expenditure line* or *budget constraint*. All that is required to construct a budget line are the intercepts on the two axes (ie the maximum number of each good which the consumer can afford by spending the available amount of money on that good only). In Figure 3-5 the intercepts are 6 portions of vegetables and 4 portions of meat.

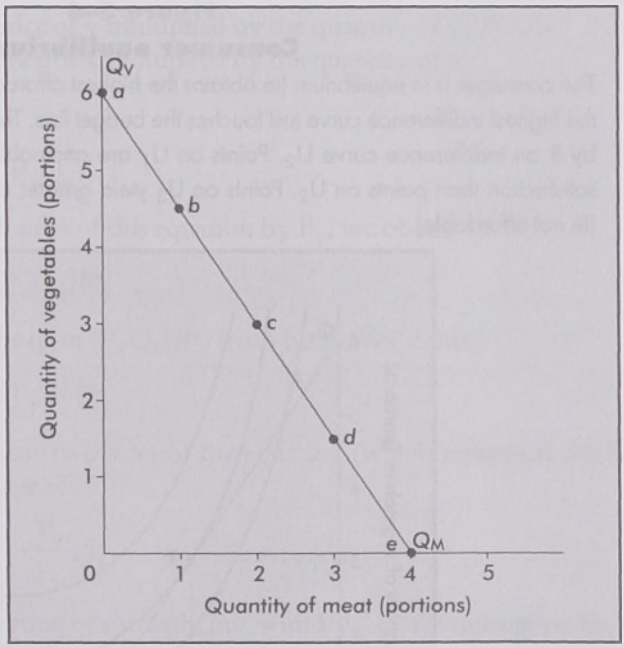
The slope of the budget line (Q_VQ_M) is 6/4 (ie 3/2), which is the same as the ratio of the price of a portion of meat (R3) to the price of a portion of vegetables (R2). It is easy to understand why this is so. If Jan wants to purchase one more portion of meat, he must sacrifice 1½ portions of vegetables. The exchange ratio between meat and vegetables is thus 3:2, which is the same as the ratio between

the price of meat and the price of vegetables. This is, of course, also equal to the *opportunity cost* of meat in terms of vegetables (ie the portions of vegetables that are sacrificed to gain one more portion of meat).

We now combine indifference curves and the budget line to determine the consumer's equilibrium position.

Figure 3-5
The budget line

The line Q_VQ_M illustrates all the possible combinations of vegetables and meat that Jan can afford to purchase for R12, if the price of vegetables is R2 and that of meat R3 per portion, respectively. Points a to e correspond to the combinations in Table 3-3.



CONSUMER EQUILIBRIUM

A graphical approach

The axes in Figure 3-5 are the same as those in Figure 3-3. We can therefore superimpose the budget line from Figure 3-5 on the indifference map from Figure 3-3 – this is done in Figure 3-6. In principle the indifference map contains an infinite number of indifference curves, but to explain equilibrium we show only three curves, as in Figure 3-3. Our consumer (Jan Burger) can choose any point along the budget line (Q_VQ_M). Any position above and to the right of the

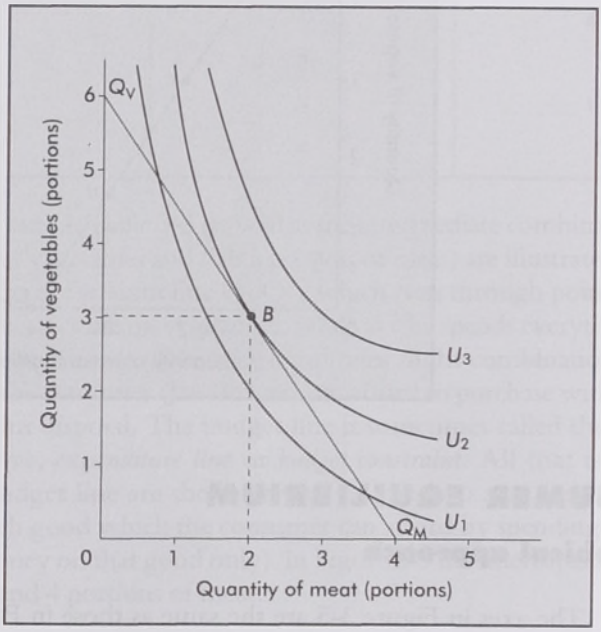
budget line is unaffordable and any point below and to the left of the budget line can be ignored, since we assume that Jan Burger spends the full R12 that he has available.

The consumer (Jan Burger) will be in equilibrium when he obtains the maximum satisfaction for the amount he spends. This is indicated by point B in Figure 3-6, which is the same as point B in Figure 3-2. At B the budget line just touches the indifference curve U_2 without intersecting it. This is the highest indifference curve (ie the highest level of satisfaction or total utility) that Jan can reach, given the amount of money that he has available to spend. At equilibrium (point B) the slope of the indifference curve is equal to the slope of the budget line.

Figure 3-6

Consumer equilibrium

The consumer is in equilibrium (ie obtains the highest affordable level of satisfaction) where the highest indifference curve just touches the budget line. This point of tangency is indicated by B on indifference curve U_2. Points on U_1 are attainable (ie affordable) but yield less satisfaction than points on U_2. Points on U_3 yield greater satisfaction but are unattainable (ie not affordable).



Any indifference curve which intersects the budget line, such as U_1 in Figure 3-6, represents a lower level of satisfaction than U_2. On the other hand, any indifference curve which does not touch or intersect the budget line, such as U_3 in Figure 3-6, is beyond the consumer's means.

An algebraic approach

The consumer's equilibrium position, illustrated in Figure 3-6, can also be derived using symbols and equations. Consider the position of a consumer who spends his or her available income (I) during a certain period on two goods, good x and good y. Let Q_x be the quantity of x and let Q_y be the quantity of y that the consumer purchases in this period. The prices of x and y are P_x and P_y respectively.

We know that the budget line indicates the different combinations of the two goods the consumer can afford to purchase, given his or her income and the prices of the goods. The budget line states that the income (I) is equal to the amount spent on the two goods, ie

Income = (price of y multiplied by the quantity of y) PLUS
(price of x multiplied by the quantity of x)

OR

$$I = (P_yQ_y) + (P_xQ_x)$$

Dividing both sides of this equation by P_y, we obtain

$$I/P_y = Q_y + (P_xQ_x)/P_y$$

Subtracting the term $(P_xQ_x)/P_y$ from both sides yields:

$$I/P_y - (P_xQ_x)/P_y = Q_y$$

By switching the two sides of the equation (which represents the budget line), we can rewrite it as

$$Q_y = \frac{I}{P_y} - \frac{P_x}{P_y}Q_x$$

This is the equation of a straight line with I/P_y as the intercept on the vertical axis and P_x/P_y as the slope of the line.

To draw the budget line, we need only the intercepts on the vertical axis and the horizontal axis. These are I/P_y and I/P_x respectively, as shown in Figure 3-7(a).

Drawing the budget line is simply a matter of joining these two intercepts with a straight line. The slope of this line is

$$\frac{\text{vertical difference}}{\text{horizontal difference}} = \frac{I}{P_y} \div \frac{I}{P_x}$$

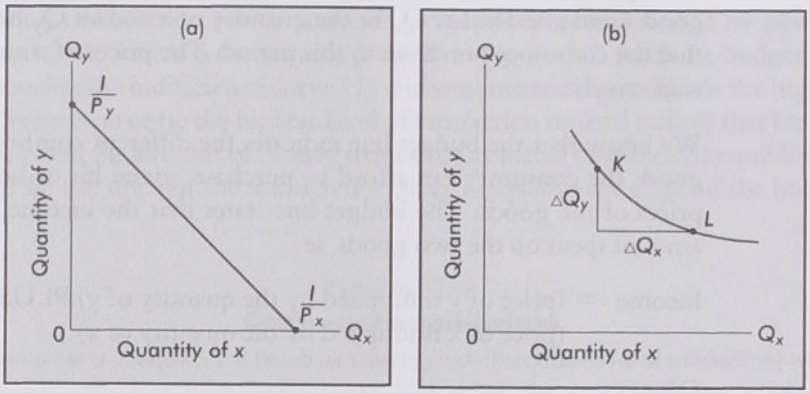
$$= I/P_y \times P_x/I$$

$$= P_x/P_y$$

Figure 3-7

Intercepts of the budget line and slope of indifference curves

In (a) we indicate how the two intercepts are obtained. In (b) we show how the slope of an indifference curve can be measured between two points.



This is a restatement of our previous result that the slope of the budget line is equal to the ratio of the price of good x (ie P_x) to the price of good y (ie P_y).

The same type of approach can be applied to indifference curves. All the points on an indifference curve indicate the same level of consumer satisfaction or total utility. Hence, total utility is unchanged as a consumer moves from one point on an indifference curve to another point, for example from point K to point L in Figure 3-7(b). Total utility will only remain unchanged if the utility that the consumer sacrifices by consuming less of y is exactly compensated for by the additional utility derived from consuming more of x. This means that the following condition must be met:

$$\Delta Q_y \times MU_y = \Delta Q_x \times MU_x \qquad (3\text{-}1)$$

where ΔQ_y = the change in the quantity of y
MU_y = the marginal utility of y
ΔQ_x = the change in the quantity of x
MU_x = the marginal utility of x

We can rearrange Equation 3-1 to obtain:

$$\Delta Q_y/\Delta Q_x = MU_x/MU_y \qquad (3\text{-}2)$$

The term $\Delta Q_y/\Delta Q_x$ is the slope of an indifference curve. From Equation 3-2 we see that this is equal to the ratio between the marginal utilities of the two goods, MU_x/MU_y. We have already seen that the slope of an indifference curve is also equal to the marginal rate of substitution (MRS) between the two goods. It follows, therefore, that

$\Delta Q_y/\Delta Q_x = MU_x/MU_y = MRS$

We are now in a position to reconsider the equilibrium position illustrated in Figure 3-6. Maximum satisfaction (or consumer equilibrium) is attained at the point where the budget line is tangent to (ie just touches) the highest possible indifference curve, indicated by B in Figure 3-6. Moreover, at equilibrium the *slope of the budget line is equal to the slope of the indifference curve.*

The slope of the budget line is given by P_x/P_y while the slope of the indifference curve ($\Delta Q_y/\Delta Q_x$) is equal to MU_x/MU_y and MRS.

Equilibrium is thus obtained where

$$MRS = \Delta Q_y/\Delta Q_x = MU_x/MU_y = P_x/P_y \quad (3\text{-}3)$$

The following observations are important:

- The marginal rate of substitution (or the slope of the indifference curve) is none other than the ratio of the marginal utility of the one good to the marginal utility of the other good, that is

  $MRS = MU_x/MU_y$

- If the consumer is in equilibrium, the marginal rate of substitution (MRS) is exactly equal to the ratio of the prices of the two goods concerned (P_x/P_y).

- At equilibrium the ratio of the marginal utilities of the two goods is equal to the ratio of their prices, that is

  $$MU_x/MU_y = P_x/P_y \quad (3\text{-}4)$$

Multiplying both sides of Equation 3-4 with MU_y/P_x we obtain $MU_x/P_x = MU_y/P_y$. In other words, at equilibrium the marginal utilities and prices of the consumer goods must be in proportion to one another. This result is known as the law of equalising the weighted marginal utilities, which means that the consumer is only in equilibrium when he or she derives the same marginal utility from the last rand spent on good x as from the last rand spent on good y. This equation can be expanded to any number of goods, so that consumer equilibrium may be defined as

$$MU_x/P_x = MU_y/P_y = MU_z/P_z = ... = MU_n/P_n \quad (3\text{-}5)$$

As long as the ratios of marginal utility to price are not equal for all goods, the consumer can attain a higher level of total utility by adjusting his or her purchasing pattern. Should the marginal utility per rand spent, derived from the last unit of good y purchased, be greater than that derived from the last unit of good x purchased, then the consumer can increase his or her total utility by

buying more of good y and less of good x. When the ratios are equal, however, total utility cannot increase further and consumer equilibrium has been reached.

The consumer's valuation and the market valuation

At equilibrium the consumer's subjective valuation of the relative value of different consumer goods (indicated by the ratio of their marginal utilities) is the same as the objective valuation of the relative value of the goods in the market (indicated by the ratio of their market prices). This is essentially what the equilibrium position is all about. As long as there is a difference between the consumer's subjective valuation and the market's objective valuation of the relative importance of the goods, the consumer can improve his or her position by exchanging goods, but when the valuations coincide, no further improvement is possible and equilibrium is reached.

CHANGES IN EQUILIBRIUM

In this section we investigate how the equilibrium position changes if the consumer's income or the price of one of the goods changes.

A change in income

If the consumer's income changes while prices remain constant, a new table of consumption possibilities, similar to Table 3-2, can be determined. For example, if the consumer's income increases from I_1 to I_2, then he or she can choose to purchase more of one or both goods. The budget line shifts to the right, as indicated in Figure 3-8. Since the price ratio P_x/P_y remains unchanged, the new budget line has the same slope as the original one (ie the two budget lines are parallel). The intercepts increase from I_1/P_x and I_1/P_y to I_2/P_x and I_1/P_y respectively. The new budget line will be tangent to a higher indifference curve than before. In Figure 3-8 the equilibrium shifts from B to B′. If we join points such as B and B′ we obtain an *income-consumption curve*, which indicates the effect of changing income on the consumer's consumption of the *two* goods.

Income-consumption curve

If the consumer's income decreases, *ceteris paribus*, exactly the opposite will happen. The budget line will shift parallel to the left (ie closer to the origin). The original indifference curve will no longer be attainable. The consumer's total utility will be reduced as a result of the decrease in income.

Normal and inferior goods

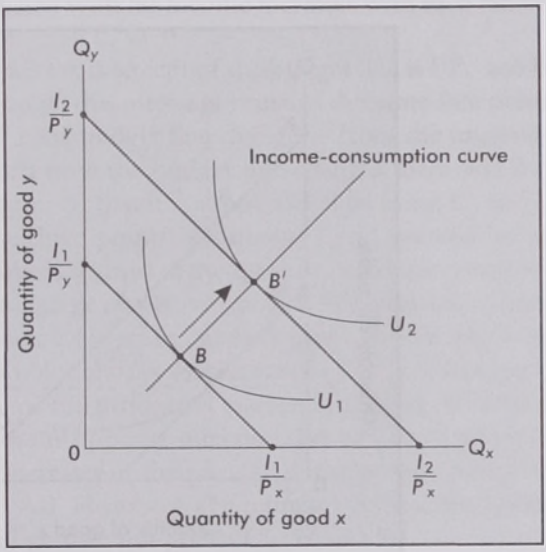
When the consumer's income changes, the equilibrium quantities of the goods concerned will not always change in the same direction. If an increase in income results in an increase in the quantity demanded of a good, the product is called a *normal good*. If an increase in income causes a decrease in the quantity demanded,

the good is called an *inferior good*. Later we will see that whether a consumer regards a good as inferior or normal is a very personal matter.

Figure 3-8

The effect of an increase in income

The original equilibrium is at B. If the consumer's income increases, the budget line shifts parallel to the right and a new equilibrium B′ is obtained on a higher indifference curve U_2. By joining B and B′ we obtain an income–consumption curve.



When a consumer's income increases, there are three possible outcomes, as shown in Figure 3-9. In the figure we show the original budget line (HJ), indifference curve (U_1) and equilibrium point (E_0).

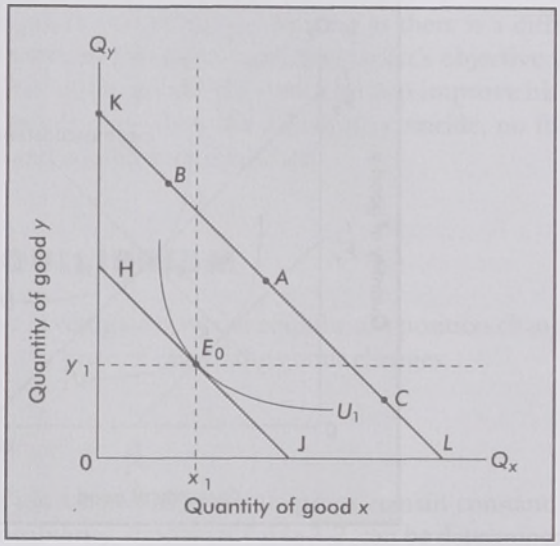
The new budget line after the increase in income is represented by KL. We do not show all the possible new indifference curves. We only show three possible new equilibrium points (ie points where the new budget line is tangent to higher indifference curves).

- If the budget line KL just touches the highest attainable indifference curve at point A, then both x and y are normal goods. After an increase in income more of both x and y is consumed.
- If consumer equilibrium occurs at point B, then y is a normal good and x is an inferior good. After an increase in income more of y but less of x is consumed than before.
- If consumer equilibrium occurs at point C, then y is an inferior good and x is a normal good. After an increase in income less of y but more of x is consumed than before.

Figure 3-9

Normal and inferior goods

The consumer is originally in equilibrium at E_0. When the consumer's income increases, the budget line shifts parallel to KL. The new equilibrium point may fall in three ranges, denoted by the broken lines through the original equilibrium point E_0. If equilibrium occurs at a point such as A, then x and y are both normal goods. If the new equilibrium is at a point such as B, then x is an inferior good; if it is at a point such as C, then y is an inferior good.



We will return to the impact of changes in income when we analyse the effect of a price change.

A change in price, the price-consumption curve and the demand curve of an individual consumer

What is the reaction of consumers to a change in the relative price of a commodity? In general we can say that as the price of a good declines (ie it becomes relatively cheaper than other goods) the quantity demanded will increase; likewise, if the price of a product increases (ie it becomes relatively more expensive) the quantity demanded will decrease. This relationship can be explained by using indifference curve analysis.

For the purpose of the analysis the price of product y (ie P_y) and the income (I) of a typical consumer are kept constant, while the price of product x (ie P_x) decreases. This is illustrated in Figure 3-10 where the indifference map of the consumer is depicted. We have already seen that the budget line can be drawn if we have its intercepts on the vertical and horizontal axis respectively. (The

intercepts we get by asking how much of a commodity could be purchased at the existing price levels if none of the other commodity were purchased.) Consider the horizontal axis. When the price of x is P_x, the amount that can be purchased (if the consumer buys only x) is determined by dividing P_x into total money income I, which gives I/P_x. This is indicated at B in Figure 3-10. When the price of x falls to P'_x, the maximum amount of x that can be purchased expands to B′; and it expands to B″ when the price falls further to P''_x. Thus, even though the money income of the consumer does not change, the amount of x that can be purchased with his income increases with each fall in price.

On the vertical axis the intercept of the budget line is I/P_y and because the price of y does not change, this intercept remains the same (see point A). With each price decrease of x the budget line changes – from the original AB to AB′ and then to AB″. Each time the budget line changes there will be a new point of consumer optimum. At first it is at point E, then point E′, and then point E″. If we connect these three points, we obtain a *price-consumption curve*. The price-consumption curve is defined as the locus of optimum combinations of x and y that result from a change in relative prices, holding money income constant. The course of a price-consumption curve depends on the consumer's indifference map, therefore it is not always shaped exactly like the illustration in Figure 3-10. (When the price of the product is increasing instead of decreasing, the budget line will swivel in the opposite direction. Let us start at point E″ in Figure 3-10 – for successive increases in the price of x, the budget line AB″ will change to AB′ and then to AB. However, the resultant price-consumption curve will be the same and will go through points E″, E′ and E.)

Price-consumption curve

The information depicted by the price-consumption curve in Figure 3-10 forms the basis for the derivation of the price-demand curve (or demand curve, for short) of the particular individual. In the analysis nominal income (I), the price of product y (ie P_y) and the consumer's tastes are held constant. Realising this, we plot the points representing the quantities (x_1, x_2 and x_3) of x demanded at the equilibrium points and the associated prices (P_x, P'_x and P''_x). This gives us three points from which to construct the individual's demand curve shown in Figure 3-10(b). The demand curve shows the quantities of *one* specific good (good x in this instance) that will be demanded at various prices. The price of the good appears on the one axis and the quantity demanded on the other. The shape of the demand curve (falling from left to right) is important and is also a graphic representation of the law of demand, which was introduced in Chapter 2. This shape of the demand curve is regarded as the normal shape and has often been proved to be correct by empirical research. (Note that the demand curve differs from the price-consumption curve. The price-consumption curve relates to the quantities of *both* goods; the demand curve refers to *one* good whose price changes. The price-consumption curve also does not explicitly show the price of the good.)

By horizontally adding all the demand curves of the individuals who buy the particular product, the market demand curve is derived. This has already been explained in Chapter 2.

Income and substitution effects of a price change

Why is there a change in the quantity demanded of a good when the price of the good increases or decreases? To answer this question we have to distinguish between the two separate effects of a price change on a consumer, namely the *income* and the *substitution effect*. One of the major advantages of the indifference approach is that it allows us to point out these two effects.

To explain the income and substitution effects, we consider a *decrease* in the price of a good. When the price of a good falls, while the prices of all other goods remain the same, consumers who buy that product experience an increase in their real incomes, even if their nominal incomes are unchanged; consumers can therefore buy more goods with the same income. In terms of indifference curve analysis, an increase in real income means that the consumer is able to reach a higher level of satisfaction by moving to a higher indifference curve. The effect of a change in real income on the consumer's purchases of a certain good is called the *income effect*. This is similar to the effect of a change in real income as a result of a change in nominal income with prices unchanged. We have seen before (Fig 3-9) that a rise in real income leads to an increase in the consumption of a normal good, but causes a decrease in the consumption of an inferior good. With a normal good, therefore, the income effect is positive, but with an inferior good it is negative. Since inferior goods are the exception, we start off by analysing a normal good. Once we have done this, we shall study what happens with inferior goods.

Income effect

Quite apart from the income effect, a decrease in the price of a good also means that the good becomes cheaper relative to all other goods, if their prices have remained constant. Therefore it becomes an attractive option to purchase more of the good whose price has fallen. If our consumer buys only meat and vegetables, and the price of meat falls while the price of vegetables stays the same, then there will be a tendency for the consumer to buy more meat, *but less vegetables*. This is known as the *substitution effect*, because the consumer substitutes the good that has become relatively cheaper for the one that has become relatively more expensive.

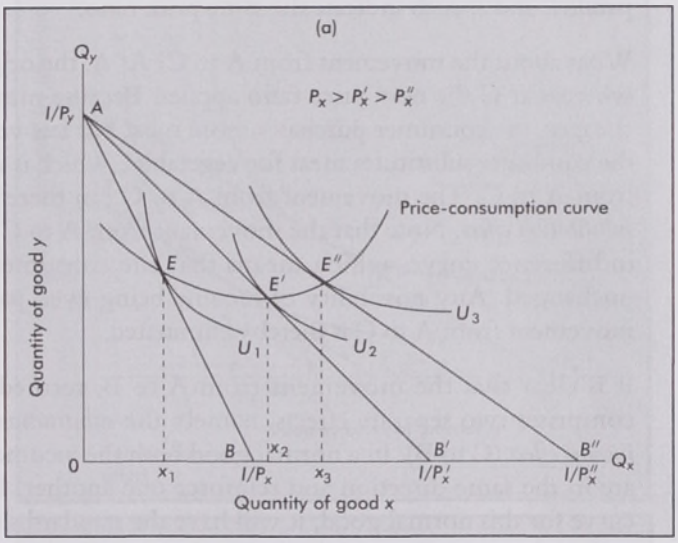
Substitution effect

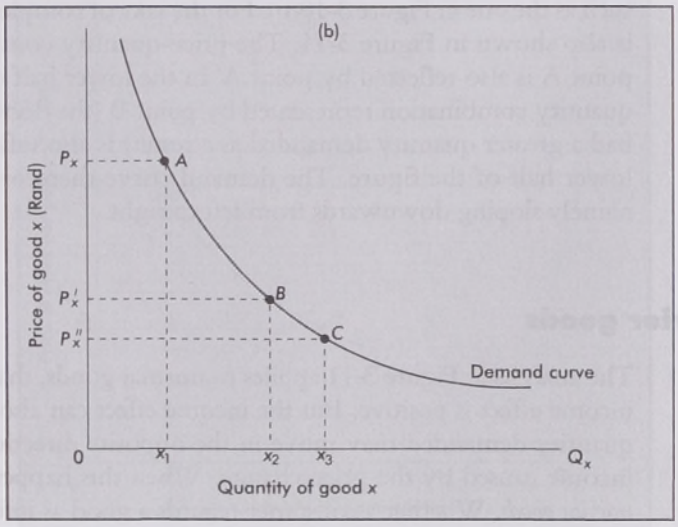
The income and substitution effects in a normal good can be analysed graphically as in Figure 3-11. If Q_VQ_M is the initial budget line, then the consumer is in equilibrium at point A. Here, the consumer purchases m_1 portions of meat. If the price of meat falls, while the price of vegetables and the consumer's money income remain constant, the position of the budget line will change, to $Q_VQ'_M$. The new point of consumer equilibrium is at B, where m_2 units of meat are

Figure 3–10

The impact of a price change and the derivation of a demand curve

The impact of a decrease in the price of product x is illustrated in (a). The original budget line is AB and the original equilibrium point is E on indifference curve U_1. When the price of product x decreases, the budget line swivels to AB′ and a new equilibrium E′ is reached on a higher indifference curve U_2. A further price decrease will have the budget line AB″ with the equilibrium point E″ on indifference curve U_3 as a result. By joining points E, E′ and E″ we obtain a price-consumption curve. The decrease in the price of product x leads to an increase in the quantity demanded of x. This relationship, which is illustrated in (b), is the familiar demand curve of an individual consumer.





purchased. This increase in the consumption of meat, also depicted by the movement from A to B, is called the price effect and is the combined impact of the income and substitution effects. We now analyse the separate contribution of each effect to this increase in consumption.

We draw an auxiliary line, ZZ, parallel to the new budget line ($Q_VQ'_M$), which therefore has the same slope and indicates the same price ratio as $Q_VQ'_M$. Line ZZ is tangent to the original indifference curve U_1 at point C. That a fall in the price of meat has increased the consumer's real income is reflected in the movement from indifference curve U_1 to U_2. The movement from C to B can be ascribed solely to the *income effect*. Any possibility that the movement could be due to the substitution effect is eliminated because lines $Q_VQ'_M$ and ZZ are parallel, and as such indicate the same price ratio.

What about the movement from A to C? At A, the original price ratio applied, whereas at C the new price ratio applies. Because meat has become relatively cheaper, the consumer purchases more meat but less vegetables – that is to say, the consumer substitutes meat for vegetables, which is shown in the movement from A to C. The movement from A to C can therefore be attributed to the *substitution effect*. Note that the movement from A to C takes place on the same indifference curve, which means that the consumer's real income is kept unchanged. Any possibility of income being even partly responsible for the movement from A to C is thereby eliminated.

Price effect

It is clear that the movement from A to B, termed the *price effect*, indeed comprises two separate effects, namely the *substitution effect* (A to C) and the *income effect* (C to B). In a normal good both the income and substitution effects are in the same direction and reinforce one another. If we draw the demand curve for this normal good, it will have the standard shape of a demand curve, such as the one in Figure 3-10(b). For the sake of completeness the demand curve is also shown in Figure 3-11. The price-quantity combination represented by point A is also reflected by point A′ in the lower half of the figure. The price-quantity combination represented by point B (the decrease in the price of meat had a greater quantity demanded as a result) is also reflected by point B′ in the lower half of the figure. The demand curve therefore has the typical shape, namely sloping downwards from left to right.

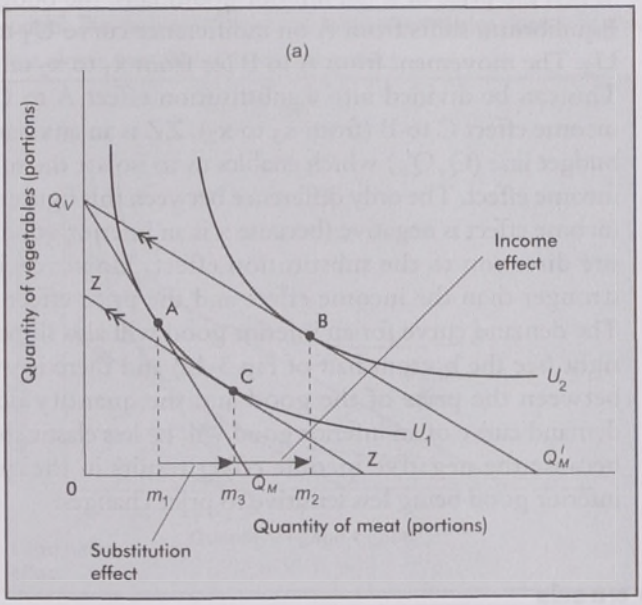
Inferior goods

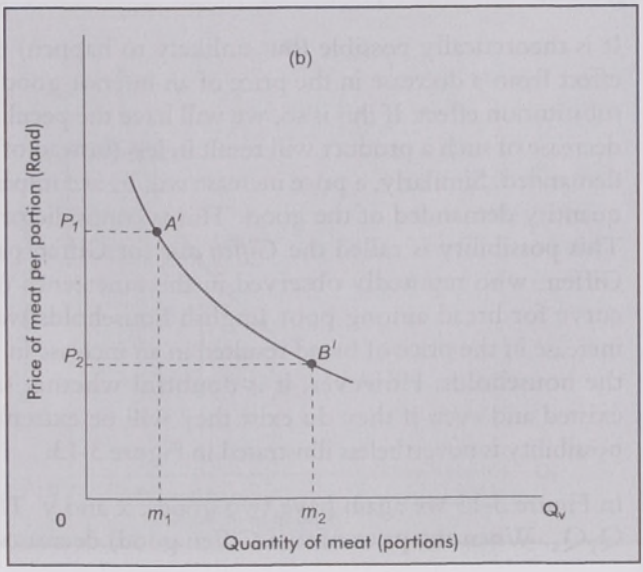
The analysis in Figure 3-11 applies to normal goods, that is goods for which the income effect is positive. But the income effect can also be negative, that is, the quantity demanded may move in the opposite direction to the change in real income caused by the price change. When this happens, the goods are called *inferior goods*. Whether a consumer regards a good as inferior or not is a personal

Figure 3–11

The income and substitution effects of a price change

The original budget line is Q_VQ_M. When the price of meat falls, the budget line swivels to $Q_VQ'_M$. Equilibrium shifts from A on indifference curve U_1 to B on indifference curve U_2. The movement from A to B (or from m_1 portions of meat to m_2 portions of meat) is the *price effect*. By means of the auxiliary line ZZ the price effect can be divided into a *substitution effect* A to C (or from m_1 to m_3) and an *income effect* C to B (or from m_3 to m_2). In a normal product these two effects are in the same direction and the demand curve has a normal course.





matter and does not necessarily refer to the quality of the product. One consumer may regard bread as an inferior good – if his real income increases he will purchase less bread (and perhaps more meat). Another consumer may regard paraffin as an inferior good – if his real income increases he will rather use electricity for household purposes. Other consumers may have different views on this. Nevertheless, in inferior goods the income effect of a price change is in the opposite direction to the substitution effect. This is shown in Figure 3-12.

In the figure we have two goods, x and y. The original budget line is Q_yQ_x. When the price of x (an inferior good) falls, the budget line swivels to $Q_yQ'_x$. Equilibrium shifts from A on indifference curve U_1 to B on indifference curve U_2. The movement from A to B (or from x_1 to x_2 units of x) is the price effect. This can be divided into a substitution effect A to C (from x_1 to x_3) and an income effect C to B (from x_3 to x_2). ZZ is an auxiliary line parallel to the new budget line ($Q_yQ'_x$) which enables us to isolate the substitution effect from the income effect. The only difference between this figure and Figure 3-11 is that the income effect is negative (because x is an inferior good) and is now in the opposite direction to the substitution effect. However, the substitution effect is stronger than the income effect and the price effect is therefore still normal. The demand curve for an inferior good will also slope downwards from left to right (see the bottom half of Fig 3-12) and there is still an inverse relationship between the price of the good and the quantity demanded. However, the demand curve of an inferior good will be less elastic than that of a normal good because the negative income effect results in the quantity demanded of an inferior good being less sensitive to price changes.

Giffen goods

It is theoretically possible (but unlikely to happen) that the negative income effect from a decrease in the price of an inferior good can be stronger than the substitution effect. If this is so, we will have the peculiar situation where a price decrease of such a product will result in less (instead of more) of the good being demanded. Similarly, a price increase will be accompanied by an increase in the quantity demanded of the good. This is contradictory to the law of demand.

Giffen paradox

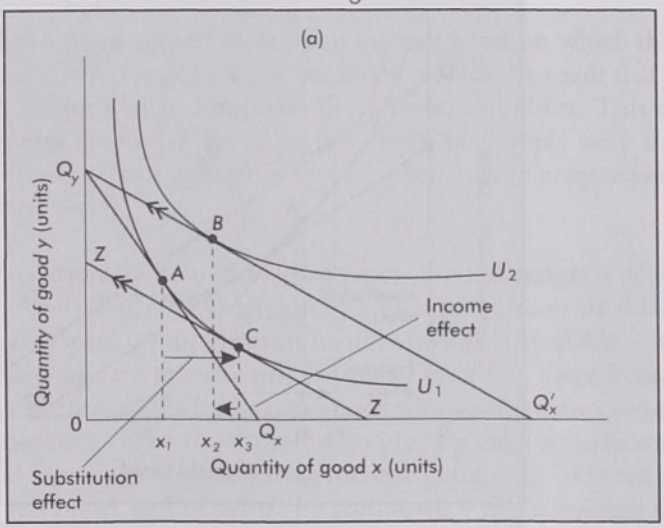
This possibility is called the *Giffen case* (or Giffen paradox) after Sir Robert Giffen, who reputedly observed in the nineteenth century that the demand curve for bread among poor English households was positively sloped – an increase in the price of bread resulted in an increase in the demand for bread by the households. However, it is doubtful whether such Giffen goods really existed and even if they do exist they will be extremely rare. The theoretical possibility is nevertheless illustrated in Figure 3-13.

In Figure 3-13 we again have two goods, x and y. The original budget line is Q_yQ_x. When the price of x (a Giffen good) decreases, the budget line swivels

Figure 3-12

The income and substitution effects in an inferior good

The original budget line is Q_yQ_x. When the price of x (an inferior good) falls, the budget line swivels to $Q_yQ'_x$. Equilibrium shifts from A on indifference curve U_1 to B on indifference curve U_2. The movement from A to B (or from x_1 to x_2 units of x) is the price effect. This can be divided into a substitution effect A to C (from x_1 to x_3) and an income effect C to B (from x_3 to x_2). ZZ is an auxiliary line parallel to the new budget line ($Q_yQ'_x$) which enables us to isolate the substitution effect from the income effect. The income effect is now in the opposite direction to the substitution effect. It is, however, smaller than the substitution effect and the price effect is therefore still normal. The demand curve of an inferior good also slopes downwards from left to right, but is less elastic than that of a normal good.



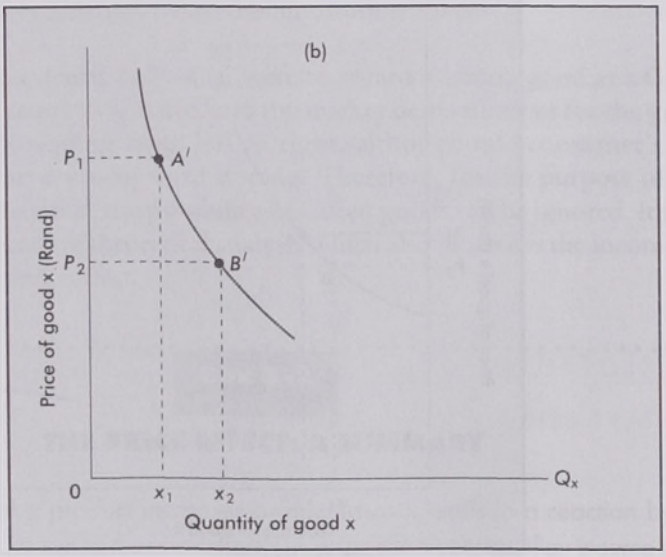
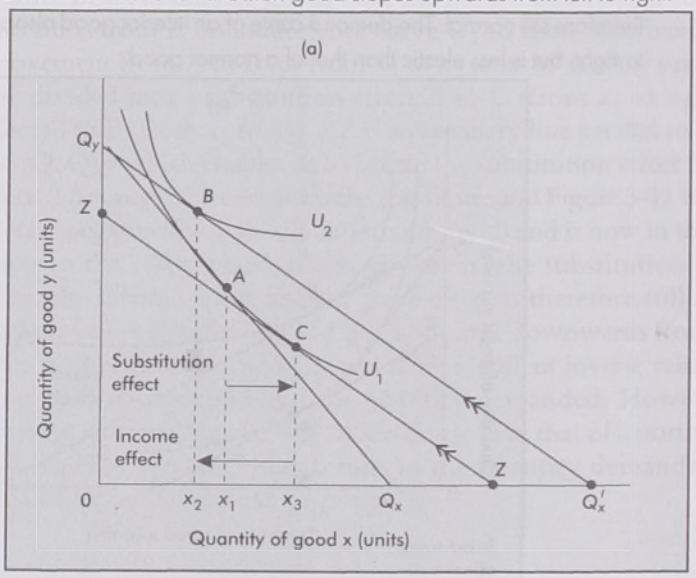
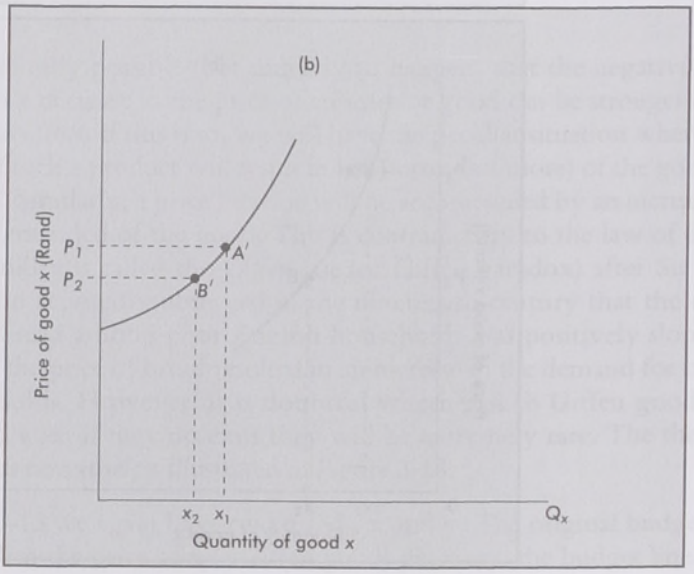


Figure 3–13

The income effect and substitution effect in a Giffen good

The original budget line is Q_yQ_x. When the price of x (a Giffen good) decreases, the budget line swivels to $Q_yQ'_x$. Equilibrium shifts from A on indifference curve U_1 to B on indifference curve U_2. The movement from A to B (or from x_1 to x_2 units of x) is the price effect. With the aid of the auxiliary line ZZ the price effect can be divided into a substitution effect A to C (from x_1 to x_3) and an income effect C to B (from x_3 to x_2). The income effect is not only in the opposite direction, but is also stronger than the substitution effect – therefore the price effect is not normal. The demand curve for a Giffen good slopes upwards from left to right.





to $Q_yQ'_x$. Equilibrium shifts from A on indifference curve U_1 to B on indifference curve U_2. The movement from A to B (or from x_1 to x_2 units of x) is the price effect. This can be divided into a substitution effect A to C (from x_1 to x_3) and an income effect C to B (from x_3 to x_2). ZZ is an auxiliary line parallel to the new budget line $Q_yQ'_x$ which enables us to isolate the substitution effect from the income effect. Here the income effect is not only in the opposite direction from the substitution effect, but the income effect is also stronger than the substitution effect. The price effect is therefore not normal, because a decrease in the price of good x resulted in a decrease in the quantity demanded of good x (it decreased from x_1 to x_2). The abnormal demand curve which follows from this is depicted in the bottom half of Figure 3-13.

To be a Giffen good a good must be an inferior good on which the consumer spends a major percentage of his or her income, with the result that the income effect is so strong that it dominates the substitution effect. This leads to the conclusion that the Giffen paradox, if it exists, may apply only to very poor consumers (only a poor consumer would spend a large proportion of income on an inferior good).

Consider an extremely poor individual whose limited budget is devoted almost entirely to food. With the exception of a little meat, most of this consumer's food budget is spent on the cheapest form of nutrition available – we assume it is bread. Now assume that the price of bread increases. Since bread comprises such a large portion of the budget, the poor consumer is now even poorer. The price increase could force the consumer to give up meat entirely and buy additional bread instead. In response to the increase in the price of bread, more bread instead of less bread will therefore be consumed – this is because the negative income effect is stronger than the substitution effect.

Even if a particular individual were to regard a certain good as a Giffen good, most consumers would not, and the market demand curve for the good will be downward sloping from left to right, although one consumer's individual demand curve was upward sloping. Therefore, for the purpose of predicting market behaviour, the possibility of Giffen goods can be ignored. It is nevertheless an interesting theoretical analysis which also illustrates the income effect and the substitution effect.

Box 3-2

THE PRICE EFFECT: A SUMMARY

When the price of a product increases or decreases it leads to a reaction by the consumer which is known as the price effect. The price effect consists of an income effect

as well as a substitution effect and there is no a priori reason to expect these two effects to work in the same direction.

Price effect = Income effect + Substitution effect

Following a fall in price of one of the goods, the *substitution effect* will always induce an individual to purchase more of the cheaper good.

The *income effect*, however, may work in two entirely opposite directions. If the good is a normal good, then more of the good whose price fell will be purchased. If the good is an inferior good, then less of the good will be purchased.

The price effect can therefore manifest itself in three different ways, depending on the good in question. In the following table the three possible cases following a fall in the price of a product are summarised. The convention is followed that if more of the good is desired we refer to the effect as being positive; if less of the good is desired we refer to the effect as being negative.

	Substitution effect	Income effect	Price effect
Normal good	+	+	+
Inferior good	+	–	+
Giffen good	+	–	–

In a *normal good* both the substitution effect and the income effect are in the same direction and the price effect is therefore positive. The demand curve has a normal slope, namely downwards from left to right. In an *inferior good* the price effect is also positive because the positive substitution effect is stronger than the negative income effect. The demand curve still has a normal slope. In a *Giffen good* the price effect is negative because the negative income effect is stronger than the positive substitution effect. The demand curve of the individual consumer at issue will be abnormal – it will slope upwards from left to right.

THE INDIFFERENCE TECHNIQUE APPLIED TO LABOUR

Trade-off between work and leisure

It has already been said that indifference curves are used not only to analyse consumers' behaviour, but also to analyse the production factor market. For example, an interesting application of the indifference curve technique is found

in the labour market. When individuals offer their labour in the market, they are offering something that they themselves can also use, because the time that they do not work can be used for leisure activities. The extent to which an individual is willing to trade off leisure for work depends on the shape and position of his or her indifference curves.

In Chapter 2 we have seen that supply curves of goods normally slope upwards from left to right, which means that higher prices usually lead to an increase in the quantity supplied. An interesting characteristic of an individual's supply curve of labour, however, is that it can bend backwards at some stage. In such a case a further increase in the wage rate (the price of labour) may lead to less of the production factor labour being offered by the individual.

Consider Figure 3-14 where the indifference curves describe how a hypothetical individual feels about the trade-off between leisure and income. The time period we are considering in this analysis is one day, therefore 24 hours are indicated on the horizontal axis as the maximum hours available for leisure. A second horizontal axis in Figure 3-14 measures the number of hours the individual worked during the day. Per definition all time must be spent in either leisure or work – therefore the second horizontal axis starts at 24 (when no time is spent in leisure) and ends at 0 (when 24 hours are spent in leisure). When the two axes are considered together it is obvious that if for example the individual works 14 hours (lower axis), then 10 hours were used for leisure (higher axis); if 6 hours were spent working, then 18 hours were available for leisure, etc.

If the wage rate (rand per hour) is equal to W, then we can easily compute the daily income Y the individual receives for working H hours, since

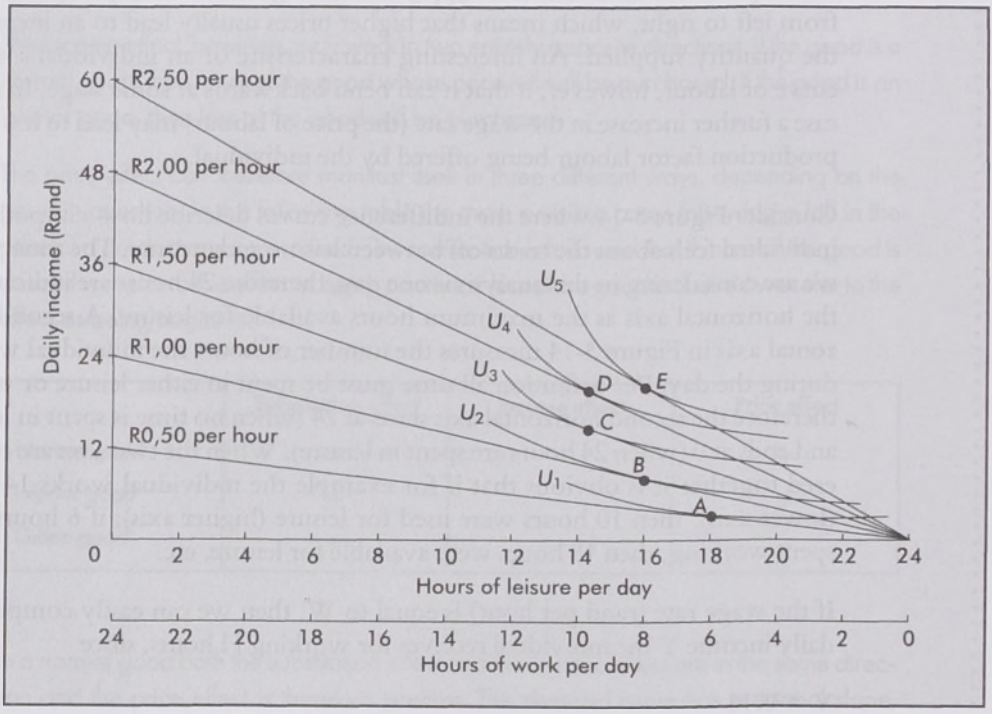
$$Y = WH$$

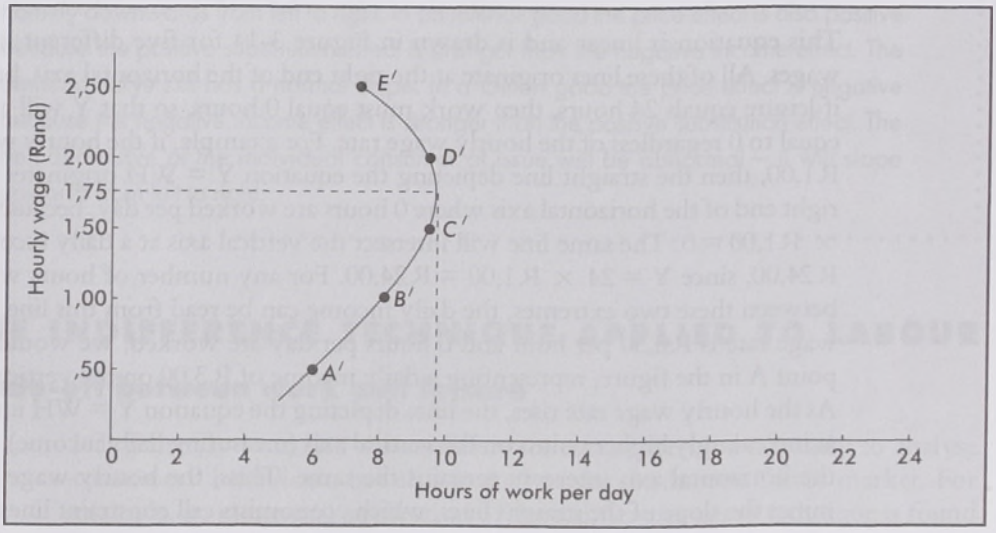
This equation is linear and is drawn in Figure 3-14 for five different hourly wages. All of these lines originate at the right end of the horizontal axis, because if leisure equals 24 hours, then work must equal 0 hours, so that Y will also be equal to 0 regardless of the hourly wage rate. For example, if the hourly wage is R1,00, then the straight line depicting the equation Y = WH originates at the right end of the horizontal axis where 0 hours are worked per day, because $Y = 0 \times R1{,}00 = 0$. The same line will intersect the vertical axis at a daily income of R24,00, since $Y = 24 \times R1{,}00 = R24{,}00$. For any number of hours worked between these two extremes, the daily income can be read from this line. If the wage rate is R0,50 per hour and 6 hours per day are worked, we would be at point A in the figure, representing a daily income of R3,00 on the vertical axis. As the hourly wage rate rises, the lines depicting the equation Y = WH intersect at increasingly higher points on the vertical axis (measuring daily income), while the horizontal axis intercept remains the same. Thus, the hourly wage determines the slope of the straight lines, which economists call constraint lines. Each

Figure 3–14

Backward-bending supply curve of labour

The indifference curves show that as the hourly wage rises, the individual is initially willing to work extra hours – see the equilibrium points A, B and C. However, a point is reached where a further increase in the wage rate results in a decrease in the hours worked – see points D and E. This results in a backward-bending supply curve.





of these lines represents a wage constraint under which the individual must maximise utility.

Backward-bending supply curve of labour

The two 'products' between which the consumer has to choose in the indifference curve diagram are income on one axis and leisure on the other axis. Utility maximisation will occur at the point where an indifference curve is tangent to its corresponding wage constraint line. From the figure we can see that if the hourly wage is R0,50, the highest possible indifference curve that can be reached is curve U_1 and the individual will be in equilibrium at point A. Other equilibrium points at higher wages are also indicated (see B, C, D and E). Initially, when the wage increases from R0,50 to R1,00 and then to R1,50, our hypothetical individual is willing to work extra hours in order to earn a higher income – that is illustrated by equilibrium points A, B and C. However, when the wage increases from R1,50 to R2,00 there is no change in the quantity of labour offered – see points C and D. When the wage increases to R2,50 there is even a decrease in the hours worked per day. This is also illustrated in the lower part of the figure, where the labour supply curve depicting the information from the upper part of the figure, is shown. (Note how the horizontal axis in the lower part of the figure is labelled.) The backward-bending supply curve of labour reveals that the individual will work the maximum number of hours per day when the wage is R1,75 per hour. At wages higher than R1,75 per hour the number of hours of labour supplied will begin to diminish.

Interaction between the income effect and the substitution effect in labour

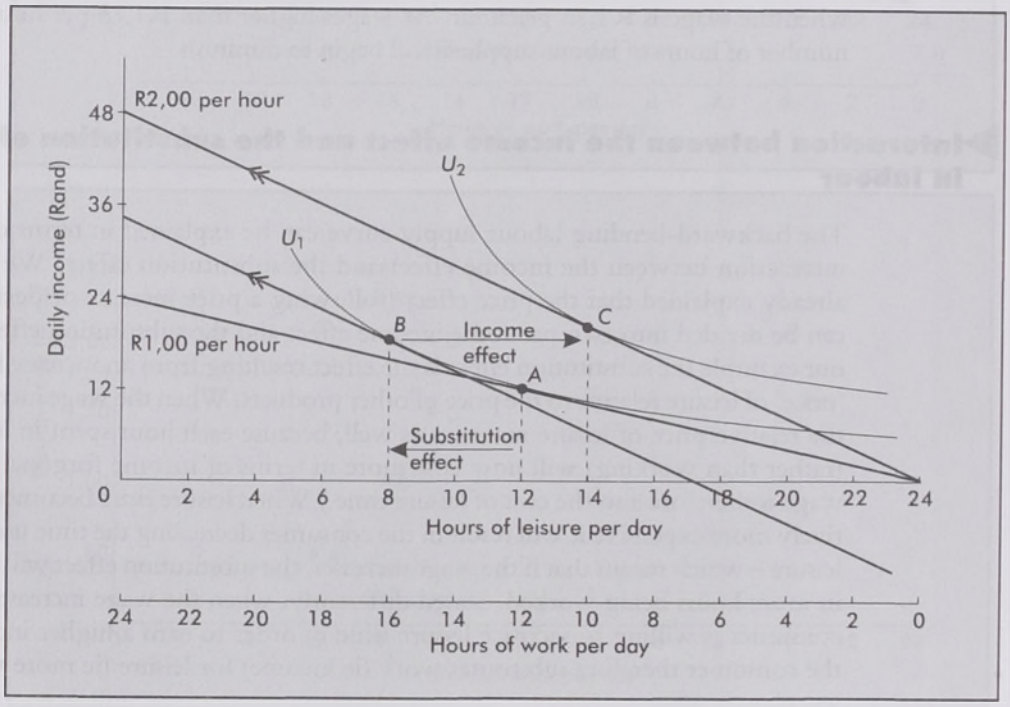
The backward-bending labour supply curve can be explained in terms of the interaction between the income effect and the substitution effect. We have already explained that the price effect (following a price increase or decrease) can be divided into two parts: the income effect and the substitution effect. In our example the substitution effect is the effect resulting from an increase in the 'price' of leisure relative to the price of other products. When the wage increases, the relative price of leisure increases as well, because each hour spent in leisure (rather than working) will now cost more in terms of income forgone. (The wage is therefore also the cost of leisure time.) When leisure time becomes relatively more expensive it will result in the consumer decreasing the time used for leisure – which means that if the wage increases, the substitution effect will result in more hours being worked. Stated differently: when the wage increases, the consumer is willing to sacrifice leisure time in order to earn a higher income; the consumer therefore substitutes work (ie income) for leisure (ie more work, less play).

In addition to the substitution effect there is an income effect, which in this example is quite different from the income effect in the purchase of most consumer goods. In the first place, the income effect here works in the opposite direction from the income effect in the purchase of the typical consumer product. As we have seen previously, the income effect of a price decrease of a (normal) good is generally to increase the consumption of the good, because the consumer's real income has increased. Similarly, the income effect of a price increase will result in the consumer buying less of the product, because his real income has decreased. However, this is not so here. An increase in the price of his leisure time due to an increase in his wage makes the consumer more affluent and better able to afford the things he wants, including leisure. Thus the income effect of an increase in the price of leisure is likely to be an increase in the demand for leisure.

Figure 3–15

Income effect and substitution effect in labour

The individual is initially in equilibrium at point A. Following an increase in the wage rate, the individual is in equilibrium at point C. The substitution effect is the movement from A to B – an increase in the wage rate (ie the price of leisure time) results in work being substituted for leisure time (ie more work, less play). The income effect is the movement from B to C – an increase in real income results in more time being used for leisure. Leisure time is regarded as a normal 'product'.



The income effect in this example differs from the income effect for most consumer products in another important respect: it is likely to be much stronger than for most consumer products. In general the consumer spends only a small percentage of his budget on the product in question, with the result than an increase (or decrease) in its price has only a small impact on his real income. However, with leisure, an increase in its price (ie the wage rate) will almost certainly have a great effect on his real income, since most of his income is likely to originate from the sale of his labour. Thus an increase in the price of leisure time is likely to have a great effect on the consumer's income and on his consumption pattern.

The income effect is in the opposite direction from the substitution effect and may offset the latter, with the result that an increase in the wage rate may reduce the supply of labour. Stated differently: an increase in the price of leisure time may increase the quantity demanded of leisure time. (It should be mentioned here that institutional constraints, like the 40-hour week, often prevent workers from choosing their own working hours. It has nevertheless been found that as workers have become more affluent over the years, the average work week has tended to become shorter.)

Graphic representation

Figure 3-15 is a graphic representation of what we have just explained about the income and substitution effects. If the initial wage is R1,00 per hour, the individual at issue will be maximising utility at point A and working 12 hours per day. When the wage is raised to R2,00 per hour, the individual will prefer point C on indifference curve U_2, thereby reducing the amount of work supplied from 12 hours to 10 hours per day. To separate the income and substitution effects, we employ the same techniques that were introduced earlier in the chapter. We construct an auxiliary line that is parallel to the new budget constraint and is tangent to indifference curve U_1 at point B. The substitution effect is the movement from A to B, indicating that when the price of leisure (ie the wage rate) rises, less leisure will be consumed (more work will be done). The income effect is the movement from B to C which indicates that leisure time is a normal good – an increase in real income results in more leisure being consumed. In our example the income effect is stronger than the substitution effect, which shows that the individual wants to work fewer hours per day when the wage rate increases from R1,00 to R2,00 per hour. When the labour supply curve is positively sloped, the substitution effect is stronger than the income effect; when the labour supply curve is negatively sloped (backward-bending) the income effect is stronger than the substitution effect.

It is important to note that it is the labour supply curve of an individual which can become backward-bending at sufficiently high wage rates. The market

supply curve for a given occupation or profession cannot be backward-bending, however, because additional workers will be attracted to the market as wages in that market increase relative to wages in other labour markets. Even though the number of hours worked per day, week or month might decline for some workers in that occupation, the total number of hours supplied will increase when wages increase. The *market supply curve* of labour will therefore slope upwards from left to right. This also applies to all variable factors of production.

IMPORTANT CONCEPTS

- Cardinal utility
- Ordinal utility
- Indifference curve
- Indifference map
- Law of substitution
- Marginal rate of substitution
- Budget line
- Consumer equilibrium
- Income-consumption curve
- Price-consumption curve
- Income effect
- Substitution effect
- Price effect
- Normal, inferior and Giffen goods
- Backward-bending supply curve of labour (of an individual)

QUESTIONS

(1) Define each of the following types of consumer goods:

- normal product
- inferior product
- Giffen product (6)

(2) Define an indifference curve. (3)

(3) Explain the three basic assumptions underlying the indifference approach. (6)

(4) Briefly describe the characteristics of indifference curves. (6)

(5) Briefly define the marginal rate of substitution with the aid of an indifference curve diagram. (8)

(6) Briefly define a budget line. Use an indifference diagram to explain consumer equilibrium. (18)

(7) You work for ABC (Pty) Ltd, a firm that sells two products – one that consumers regard as a *normal product*, and the other as an *inferior product*. The Minister of Finance makes a speech in which he emphasises the fact that the economy is doing extremely well at the moment and that the *real income* of the population is going to increase substantially in the next year. One of your colleagues happens to mention that he is unsure how the demand for the firm's two products will change and that he wishes someone could explain it to him scientifically. *Explain in writing in your own words and with the aid of an income-consumption curve, the probable change in demand that the firm can expect in respect of the two products*. (Hint: see the discussion of Figs 3-8 and 3-9.) (12)

(8) Explain in your own words and with the aid of indifference curves, how the demand curve of an inferior product can be derived and how the shape thereof affects the quantity demanded if the price were to decrease. Also explain the operation of the income and substitution effect with the aid of a diagram. (Hint: see the discussion of Fig 3–12.) (20)

(9) Summarise in table form the price effect, the substitution effect and the income effect in respect of a normal, an inferior and a Giffen product. (Follow the convention that if more of a product is required after a decrease in price, the effect can be regarded as positive.) (9)

(10) You work for a production company. During a meeting on wages, the financial manager makes the remark that an individual will always work longer hours if his or her wage rate increases, because according to him 'in all circumstances, the labour supply curve of an *individual* runs upwards from left to right'. *Explain to him that this is not the case, and that sometimes the labour supply curve of an individual may bend backwards. Use indifference curves to illustrate your explanation. Also explain how the income effect and the substitution effect operate in this particular case*. (Hint: see the discussion of Figs 3-14 and 3-15.) (25)