Chapter 2

The Theory of Individual Labor Supply

After reading this chapter, you should be able to:

1. **Use the basic income–leisure model to determine an individual's optimal combination of income and leisure.**
2. **Apply and extend the basic work–leisure model.**

In supplying labor, human beings are a curious and diverse lot. Adams moonlights at a second job, while Anderson takes numerous unpaid absences from his only job. College student Brown works full-time while attending school, roommate Bailey works part-time, and classmate Brinkman doesn't work at all. Conway quit her job to raise her young children; Cohen, also with young children, continues to work full-time in the workplace. Downy quickly grabs an opportunity for early retirement; Wong plans to work until she can no longer do so because of old age. Evans welcomes overtime work; Ebert, given an option, routinely rejects it. Fleming supplies more hours of labor when her wage rate rises; Hernandez cuts back on his work hours.

How are these diverse labor supply decisions made? How do individuals decide on the number of hours of labor, if any, to supply in the labor market? Our main goal in this chapter is to develop and apply a basic theory of individual labor supply that will help answer these questions.

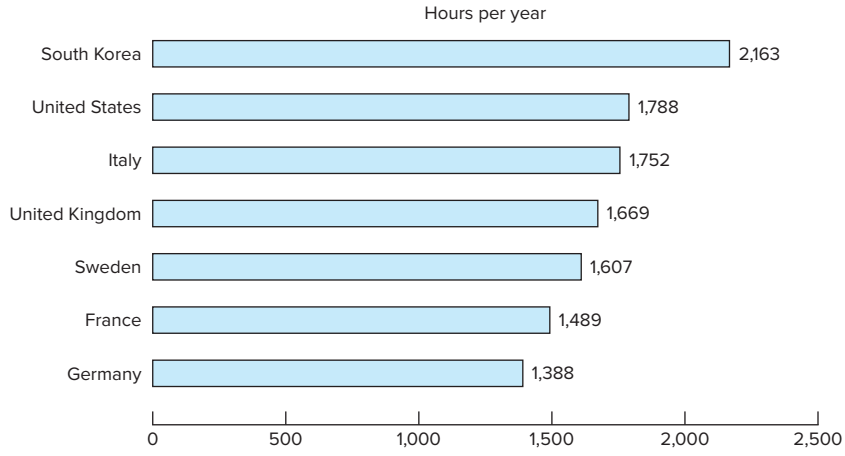
THE WORK–LEISURE DECISION: BASIC MODEL

Imagine an individual with a certain amount of education and labor force experience and, therefore, a given level of skills. That individual, having a fixed amount of time available, must decide how that time should be allocated between *work*

2.1 Global Perspective

Annual Hours of Work per Employee

Average hours worked per year differ substantially across countries. For example, the average South Korean employee works 775 more hours per year than the average German worker.



Source: Organization for Economic Cooperation and Development, *Employment Outlook*, July 2014, Table K.

GP2.1

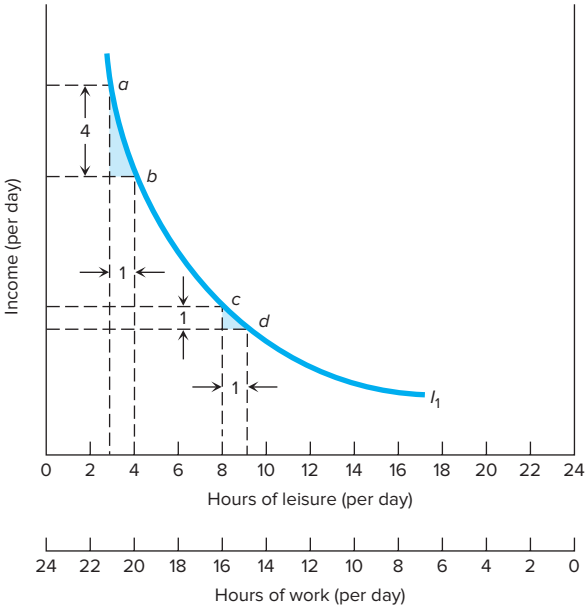
(labor market activity) and *leisure* (non–labor market activity). In the present context, *work* is time devoted to a paying job. The term *leisure* is used here in a broad sense to include all kinds of activities for which a person does not get paid: work within the household and time spent on consumption, education, commuting, rest, relaxation, and so forth.

Two sets of information are necessary to determine the optimal distribution of an individual's time between work and leisure. First, we require *subjective,* psychological information concerning the individual's work–leisure preferences. This information is embodied in *indifference curves*. Second, we need the *objective* market information that is reflected in a *budget constraint*.

Indifference Curves

As applied to the work–leisure decision, an ***indifference curve*** *shows the various combinations of real income and leisure time that will yield some specific level of utility or satisfaction to the individual*. Curve I_1 in Figure 2.1 is illustrative. Note that we measure daily income on the vertical axis and hours of leisure, or non–labor market activities, from left to right on the horizontal axis. The second horizontal axis reminds us that, given the fixed 24 hours available each day, we may measure the number of hours of work from right to left. According to the definition of indifference curves,

FIGURE 2.1 An Income–Leisure Indifference Curve
The indifference curve shows the various combinations of income (goods) and leisure that yield some given level of total utility. The curve slopes downward because the additional utility associated with more leisure must be offset by less income so that total utility remains unchanged. The convexity of the curve reflects a diminishing marginal rate of substitution of leisure for income.



each combination of income and leisure designated by any point on I_1 is equally satisfactory; each point on the curve yields the same level of utility to the individual.

Indifference curves embody several salient properties.

1 Negative Slope

The indifference curve slopes downward because leisure and real income from work are both sources of utility or satisfaction. In moving southeast down the curve, some amount of real income—of goods and services—must be given up to compensate for the acquisition of more leisure if total utility is to remain constant. Stated differently, the indifference curve is downward-sloping because as an individual gets more of one good (leisure), some of the other good (real income) must be surrendered to maintain the same level of utility.

2 Convex to Origin

A downward-sloping curve can be concave, convex, or linear. We note in Figure 2.1 that our indifference curve is *convex* (bowed inward) to the origin; alternatively stated, the absolute value of the curve's slope *diminishes* as we move down the curve to the southeast.

Why are indifference curves convex to the origin? We will explain this characteristic in intuitive terms and then more technically. Both explanations are rooted in two considerations. First, the slope of the curve reflects an individual's subjective willingness to substitute between leisure and income. And second, the individual's willingness to substitute leisure for income, or vice versa, varies with the amounts of leisure and income initially possessed.

The convexity of an indifference curve reflects the idea that an individual becomes increasingly reluctant to give up any good (in this case income) as it becomes increasingly scarce. Consider the *ab* range of our indifference curve, where the individual has a relatively large amount of income and very little leisure. Here the individual would be willing to give up a relatively large amount of abundant income (four units) in exchange for an additional unit, say an hour, of scarce leisure. The extra utility from the added hour of leisure will perfectly offset the loss of utility from having four fewer units of income. But as we move down the curve to the *cd* range, we find that the individual's circumstances are different in that income is now relatively scarcer and leisure is more abundant. The individual is now willing to trade only a small amount of scarce income (one unit) for an extra hour of leisure. As the individual obtains more leisure, the amount of income the person is willing to give up to gain still more units of leisure becomes smaller and smaller. Thus the indifference curve becomes flatter and flatter. By definition, a curve that flattens out as we move to the southeast is convex to the origin.

In more technical terms, the slope of the indifference curve is measured by the ***marginal rate of substitution of leisure for income*** (MRS *L, Y*). *The MRS L, Y is the amount of income one must give up to compensate for the gain of 1 more unit (hour) of leisure*. Although the slope of the indifference curve shown in Figure 2.1 is negative, it is convenient to think of the MRS *L, Y* as an absolute value. In these terms, MRS *L, Y* is large—that is, the slope of the indifference curve is steep—in the northwest or upper range of the curve. You can see this by penciling in a straight line tangent to I_1 at point *a* in Figure 2.1. The slope of your line measures the slope of I_1 at *a*. Observe the steep slope—the high MRS *L, Y*. This high MRS *L, Y* occurs because the person has much income and little leisure. The subjective relative valuation of income is low at the margin, and the subjective relative valuation of leisure is high at the margin. The individual, therefore, is willing to forgo many units of income (four) for an additional unit of leisure.

In moving down the indifference curve to the southeast, the quantities of income and leisure change at each point so that the individual now has less income and more leisure. Relatively more abundant leisure, therefore, has less value at the margin, and increasingly scarce income has more value at the margin. You can see this by penciling in a straight line tangent to *d* on I_1 in Figure 2.1 and comparing the slope to point *a*. This slope (at *d*) is smaller than the slope of the curve at *a*. The basic point is that MRS *L, Y*—the slope of the indifference curve—declines as one moves down the curve. Any curve whose slope or MRS *L, Y* declines as one moves southeast along it is, by definition, convex to the origin.

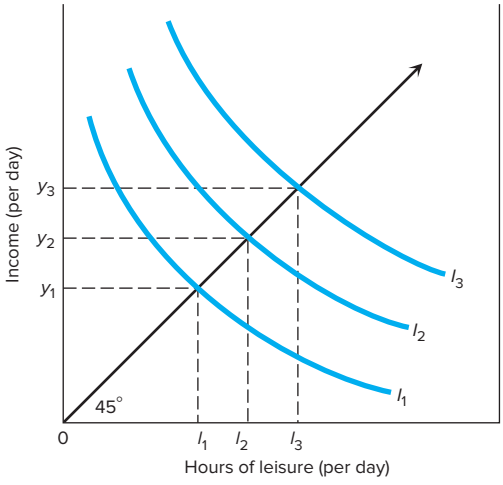


FIGURE 2.2
An Indifference Map for Income and Leisure
An indifference map comprises a number of indifference curves. Each successive curve to the northeast reflects a higher level of total utility.

3 Indifference Map

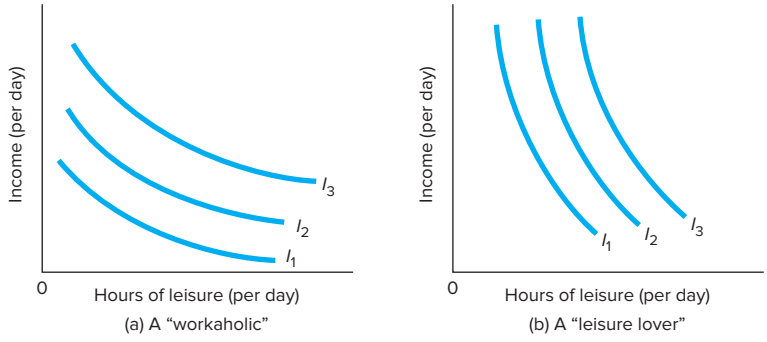
It is useful to consider an indifference map, which is a whole family or field of indifference curves, as shown in Figure 2.2. Each curve reflects some different level of total utility, much as each contour line on a topographic map reflects a different elevation. Figure 2.2 illustrates only three of a potentially unlimited number of indifference curves. Every possible combination of income and leisure will lie on some indifference curve. Curves farther from the origin indicate higher levels of utility. This can be demonstrated by drawing a 45° diagonal from the origin and noting that its intersection with each successive curve denotes larger amounts of *both* income and leisure. The y_2l_2 combination of income and leisure is preferred to the y_1l_1 combination because the former indicates larger amounts of *both* income and leisure. Similarly, the y_3l_3 combination entails greater total utility than y_2l_2, and so on.[1] It is evident that an individual will maximize total utility by achieving a position on the highest *attainable* indifference curve.

4 Different Work–Leisure Preferences

Just as the tastes of consumers for specific goods and services vary greatly, so do individual preferences for work and leisure. Different preferences for the relative desirability of work and leisure are reflected in the shape of one's indifference curves. In Figure 2.3(a), we present the indifference curves of a "workaholic" who places a low value on leisure and a high value on work (income). Note that the workaholic's curves are relatively flat, indicating that this individual would give up an hour of leisure for a relatively small increase in income. Figure 2.3(b) shows the indifference curves of a "leisure lover" who puts a high value on leisure and a low value on work (income).

[1] Indifference curves cannot intersect. We know that all points on any one curve reflect the same amount of utility, whereas any point above (below) that curve represents a larger (smaller) level of utility. If two indifference curves intersected, the level of utility would be the same at the point of intersection. However, at all other points the levels of utility would differ. Given the definition of an indifference curve, this is logically impossible.

FIGURE 2.3 Different Preferences for Work (Income) and Leisure
The shape of one's indifference curves depends on one's relative preferences for work (income) and leisure. In (a) we portray a "workaholic" who is willing to give up an hour of leisure for only a small increase in income. In comparison the "leisure lover" shown in (b) requires a large increase in income to sacrifice an hour of leisure or non–labor market time.



Observe that this individual's indifference curves are steep, which means that a relatively large increase in income must be realized to sacrifice an hour of leisure. In each case, the indifference curves are convex to the origin, but the rate of decline of MRS L, Y is far greater for the leisure lover than for the workaholic.

Why the differences? First, it may be purely a matter of tastes or preferences rooted in personality. A second and related point is that the occupations of individuals differ. The flat curves of Figure 2.3(a) may pertain to a person who has a creative and challenging occupation—for example, a painter, ceramist, or musician. Such work entails little disutility, and hence it takes only a small increase in income to induce the artist to sacrifice an hour of leisure. Conversely, an unpleasant job in a coal mine or on an assembly line may elicit steep indifference curves. Such work involves substantial disutility, and a large increase in income is required to induce one to give up an hour of leisure. Finally, an individual's personal circumstances may affect his or her relative evaluations of labor market work and leisure. For example, a young mother with two or three preschool children or a college student may have relatively steep indifference curves because "leisure" (non–labor market time) is valuable for child care and studying. Similarly, José may be married and, therefore, may have substantial financial obligations. Consequently, his indifference curves are relatively flat: He is quite willing to give up leisure for income. On the other hand, John is single and his financial responsibilities are less compelling. He is less willing to give up leisure for income, and his indifference curves are, therefore, relatively steep. In short, personality, the type of work under consideration, and personal circumstances may influence the shape of a person's indifference curves.

Budget Constraint

Our assertion that the individual maximizes utility by achieving a position on the highest *attainable* indifference curve implies that the choice of curves is constrained. Specifically, the individual is constrained by the amount of monetary income that

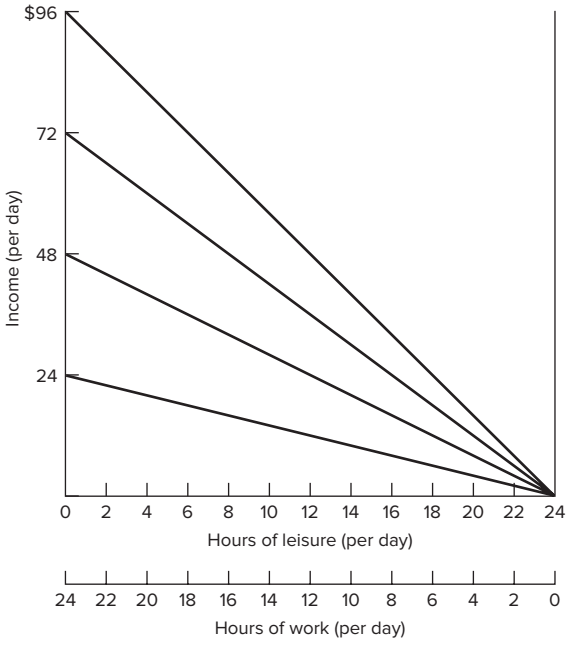


FIGURE 2.4
Budget Constraints A budget constraint (line) can be drawn for each possible wage rate. The wage rate determines the slope of each budget line. Specifically, budget lines fan out clockwise from the right origin as the wage rate increases.

is available. Let's assume for the moment that an individual's only source of monetary income is from work. In other words, we are assuming that the individual has no nonlabor income, no accumulated savings to draw on, and no possibility of borrowing funds. Let's also suppose that the wage rate confronting this person in the labor market is given in that the individual cannot alter the hourly wage paid for his or her services by varying the number of hours worked.[2] Thus we can draw a ***budget (wage) constraint*** *line, which shows all the various combinations of income (goods) and leisure that a worker might realize or obtain, given the wage rate*. If the going wage rate is $1, we can draw a budget line from 24 hours on the horizontal leisure axis to $24 on the vertical income axis in Figure 2.4. Given the $1 wage rate, at the extremes an individual could obtain (1) 24 hours of leisure and no income or (2) $24 of income and no leisure. The line connecting these two points reveals all other attainable options: $8 of income and 16 hours of leisure, $12 of income and 12 hours of leisure, and so forth. Observe that the absolute value of the slope of this budget line is 1, reflecting the $1 wage rate. In moving northwest along the line, one hour of leisure must be sacrificed to obtain each $1 of income. This is true because the wage rate is $1.

Similarly, if the wage rate is $2, the appropriate budget line would be anchored at 24 hours of leisure and $48 of real income. The slope of this line is 2, again reflecting the wage rate. The budget constraints for wage rates of $3 and $4 are also shown in Figure 2.4. We observe that the budget lines fan out clockwise from the right origin as the wage rate goes up. In each case, the wage rate—the slope of the

[2] This assumption permits us to use a linear budget constraint.

budget line—reflects the objective or market rate of exchange between income and leisure. If the wage rate is \$1, an individual can exchange one hour of leisure (by working) and obtain \$1 worth of income. If the wage rate is \$2, one hour of leisure can be exchanged in the labor market for \$2 of income, and so forth.[3]

Utility Maximization

The individual's optimal or utility-maximizing position can be determined by bringing together the subjective preferences embodied in the indifference curves and the objective market information contained in each budget line. This is shown in Figure 2.5, where we assume that the wage rate is \$2.

Recall that the farther the indifference curve is from the origin, the greater the person's total utility; therefore, an individual will maximize total utility by attaining the highest possible indifference curve. Given the \$2 wage rate, no leisure–income combination is attainable outside—to the northeast—of the resulting HW budget constraint. This particular budget constraint allows the individual to realize the highest attainable level of utility at point u_1, where the budget line just touches (is tangent to) indifference curve I_2. Of all the attainable positions on the various indifference curves, point u_1 is clearly on the curve that is farthest from the origin and, therefore, yields the highest achievable level of total utility. We observe that the individual will choose to work 8 hours, earning a daily income of \$16 and enjoying 16 hours of leisure.

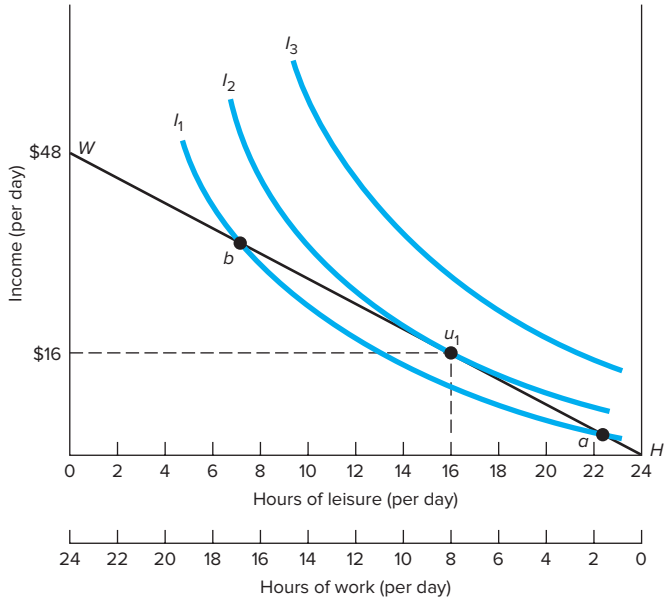


FIGURE 2.5
Utility Maximization: The Optimal Choice between Leisure and Income
The optimal or utility-maximizing combination of leisure and income for the worker is at point u_1, where the budget constraint is tangent to the highest attainable indifference curve I_2.

[3] In equation form, the budget constraint is $Y = WH$, where Y = income, W = wage rate, and H = number of hours of work. Hence $Y = W(24 - L) = 24W - WL$, where L = number of hours of leisure and the slope of the budget line is $-W$.

It is important to recognize that at this optimal position, the individual and the market agree about the relative worth of leisure and income at the margin. At u_1 the slope of indifference curve I_2 and the slope of the budget line are equal. The individual's preferences are such that he or she is subjectively willing to substitute leisure for income at precisely the same exchange rate as the objective information of the labor market requires. The ***optimal work–leisure position*** *is achieved where MRS L, Y (the slope of the indifference curve) is equal to the wage rate (the slope of the budget line)*. By definition, these slopes are equal only at the point of tangency.

We can reinforce our understanding of the optimal work–leisure position by considering briefly why points *a* and *b* are *not* optimal. Let's start with point *b,* where we note that indifference curve I_1 is steeper than the budget line, or more technically, MRS *L, Y* is greater than the wage rate. For example, the MRS *L, Y* might be 4 while the wage rate is \$2. What does this mean? It indicates that an additional hour of leisure is worth \$4 to this individual but that she will have to sacrifice only \$2 of income to obtain that extra hour of leisure. Acquiring something worth \$4 at the cost of something worth only \$2 is clearly a beneficial exchange. Thus "trading" income (by working fewer hours) for leisure will benefit her. These trades in effect move her down budget line *HW* and on to successively higher indifference curves. At point u_1, all such trades are exhausted, and this individual and the market agree about the value of work (income) and leisure at the margin. As noted earlier, at u_1 the MRS *L, Y* equals the wage rate. At this point, the individual and the market agree that the marginal hour of leisure is worth \$2. Later we will note that at point *b* the individual will feel "overemployed" in that she can increase her total utility by working fewer hours—that is, by moving to a point such as u_1 where she has more leisure and less income.

The situation is just the opposite at point *a*. Here the slope of indifference curve I_1 is less than the budget line; in other words, MRS *L, Y* is less than the wage rate. To illustrate, the wage rate is \$2 and the MRS *L, Y* might be only \$1. This indicates that an hour of leisure is worth only \$1 at the margin but that the individual can actually get \$2 worth of income by sacrificing an hour of leisure. Getting something worth \$2 by giving up something worth only \$1 is obviously a beneficial trade. In trading leisure for income (by working more hours), the individual moves up the *HW* budget line to preferred positions on higher indifference curves. Again, all such beneficial exchanges of leisure for income will be completed when point u_1 is achieved because here the MRS *L, Y* and the wage rate are equal. At u_1, leisure and income are of equal value at the margin. At point *a,* the individual would feel "underemployed." She could increase her total utility by working more hours—that is, by moving to a point such as u_1 where she has less leisure and more income.

2.1 *Quick Review*

- An income–leisure indifference curve represents all combinations of income and leisure that provide equal total utility; its slope is called the marginal rate of substitution (MRS).
- Each successive curve to the northeast in an indifference map indicates a greater level of total utility.

- An income–leisure budget line reveals all combinations of income and leisure that a worker can achieve at a specific hourly wage rate.
- The utility-maximizing combination of income and leisure occurs at the point of tangency between the budget line and the highest attainable indifference curve; there MRS *L, Y* (the slope of the indifference curve) equals the wage rate (the slope of the budget line).

Your Turn

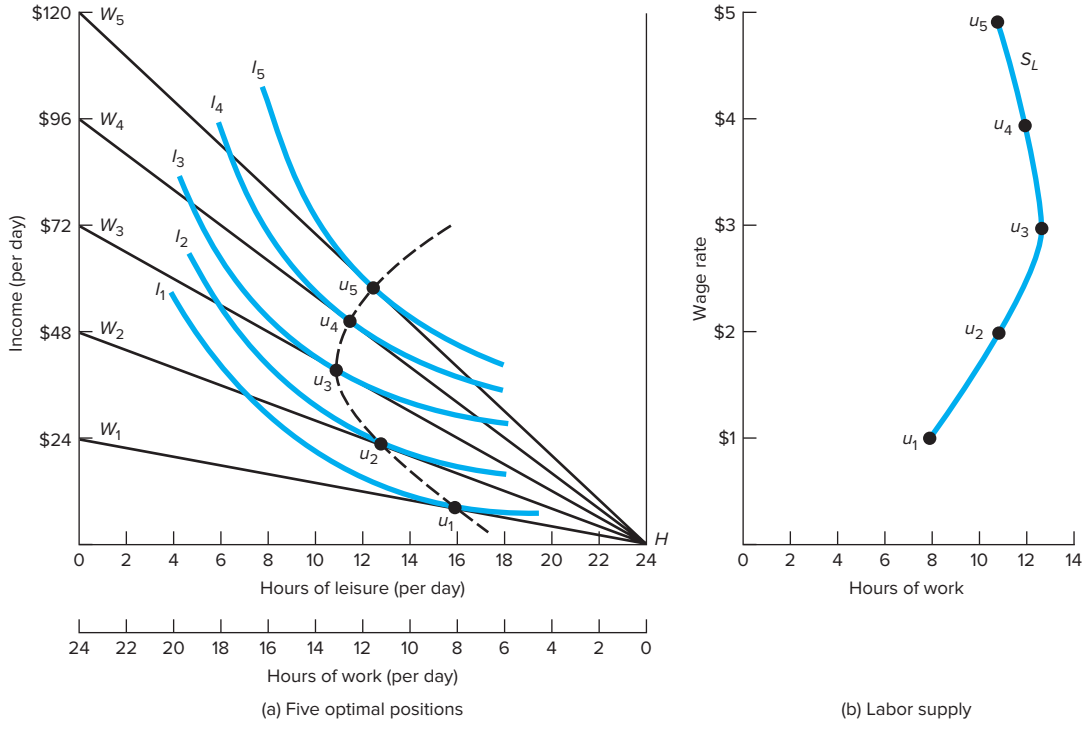
Suppose that at a particular combination of income and leisure, the slope of the budget line is steeper than the slope of the indifference curve it intersects. How should the worker adjust work hours? (*Answer:* See page 598.)

Wage Rate Changes: Income and Substitution Effects

Will an individual choose to work more or fewer hours as the wage rate changes? It depends. Figure 2.6(a) repeats the u_1 utility-maximizing position of Figure 2.5 but

FIGURE 2.6 Derivation of the Backward-Bending Labor Supply Curve

In (a) higher wage rates result in a series of increasingly steep budget lines whose tangencies with indifference curves locate a series of utility-maximizing positions. The movement from u_1 to u_2 and u_3 reveals that for a time higher wage rates are associated with longer hours of work, whereas the shifts from u_3 to u_4 and u_5 indicate that still higher wage rates entail fewer hours of work. The overall result is a backward-bending labor supply curve as shown in (b).



adds four more budget lines and indicates the relevant optimal positions associated with each. We observe that for the wage rate increase that moves the budget line from W_1 to W_2, the optimal position moves from u_1 to u_2. On the horizontal axis, we find that the individual chooses fewer hours of leisure and more hours of work. Similarly, the wage rate increase that shifts the budget constraint from W_2 to W_3 also entails more hours of work and fewer hours of leisure at u_3 than is the case at u_2. But the further wage rate boost reflected by the shift of the budget line from W_3 to W_4 produces an optimum at u_4 that involves less work and more leisure than the prior optimum u_3. Similarly, the wage increase depicted by the increase in the budget line from W_4 to W_5 causes a further reduction in hours of work at u_5.

This analysis suggests that *for a specific person, hours of work may for a time increase as wage rates rise, but beyond some point, further wage increases may reduce the hours of labor supplied*. Indeed, we can translate the hours of work–wage rate combinations associated with the five optimal positions of Figure 2.6(a) into a diagram such as that shown in Figure 2.6(b), which has traditional axes measuring wage rates on the vertical axis and hours of labor supplied left to right on the horizontal axis. In so doing, we find that this individual's labor supply curve is forward-rising for a time and then backward-bending. This curve is known as a ***backward-bending labor supply curve***, the forward-rising portion being expected or taken for granted. We can envision an individual labor supply curve for each person in the economy. But keep in mind that each individual's preferences for work versus leisure are unique, so the exact location, shape, and point of the backward bend of the curve vary from person to person.

Why is a backward-bending labor supply curve a realistic possibility? This can be explained in terms of the income and substitution effects. When the wage rate changes, these two effects tend to alter one's utility-maximizing position.

Income Effect

The ***income effect*** *refers to the change in the desired hours of work resulting from a change in income, holding the wage rate constant.*[4] We will discover that the income effect of a wage *increase* is found by isolating the increase in work hours resulting solely from the increase in potential income per hour of work, *as if the price of leisure (the wage rate) did not change*. A wage rate increase means that a larger money income is obtainable from a given number of hours of work. We would expect an individual to use a part of this enhanced income to buy goods and services: a new TV, movie tickets, and so on. But if we make the reasonable assumption that leisure is a *normal good*—a good of which more is consumed as income rises—then we can expect that a part of one's expanded income might be used to "purchase" leisure. Consumers derive utility not from goods alone but from combinations of goods and nonmarket time (leisure). Movie tickets yield satisfaction only if one has the time to enjoy them. How does one purchase leisure or nonmarket time? In a unique way: by

[4] In mathematical terms, income effect $= \left.\dfrac{\Delta H}{\Delta Y}\right| \overline{W} < 0$, where $H =$ hours of work, $Y =$ income, and $\overline{W} =$ constant wage.

working fewer hours. This means that when wage rates *rise,* and leisure is a normal good, the income effect reduces the desired number of hours of work.

Substitution Effect

The **substitution effect** *indicates the change in the desired hours of work resulting from a change in the wage rate, keeping income constant*.[5] In the context of a wage rate increase, it evidences itself in an increase in the desired number of hours of work. When the wage rate increases, the relative price of leisure is altered. Specifically, an increase in the wage rate raises the "price" or opportunity cost of leisure. Because of the higher wage rate, one must now forgo more income (goods) for each hour of leisure consumed (not worked). The basic theory of economic choice implies that an individual will purchase less of any normal good when it becomes relatively more expensive. In brief, the higher price of leisure prompts one to consume less leisure or, in other words, to work more. The substitution effect merely tells us that when wage rates rise and leisure becomes more expensive, it is sensible to substitute work for leisure. For a wage *increase,* the substitution effect makes the person want to work more hours.[6]

Net Effect

The overall effect of an increase in the wage rate on the number of hours an individual wants to work depends on the relative magnitudes of these two effects. Economic theory does not predict the outcome. *If the substitution effect dominates the income effect, the individual will choose to work more hours when the wage rate rises*. Dominance of the substitution effect is reflected in shifts from u_1 to u_2 to u_3 in Figure 2.6(a) and the upward-sloping portion of the labor supply curve in Figure 2.6(b). *But if the income effect is larger than the substitution effect, a wage increase will prompt the individual to work fewer hours*. The movements from u_3 to u_4 and u_5 in Figure 2.6(a) and the backward-bending portion of the labor supply curve in Figure 2.6(b) are relevant in this case.

Table 2.1 provides a useful summary and extension of our discussion of the implications of the relative sizes of the substitution and income effects for the desired hours of work. Columns 1, 2a, and 3 summarize the discussion we have just completed. Note from column 2a that this discussion was couched in terms of a wage rate *increase*. Columns 1, 2b, and 3 are important because they reveal that the impact of the substitution and income effects on hours of work is reversed if we

[5] In mathematical terms, substitution effect $= \left.\dfrac{\Delta H}{\Delta W}\right| \bar{Y} > 0$, where H = hours of work, W = wage, and $\bar{Y}$ = constant income.

[6] An alternative way to express the substitution effect is to say that a higher wage rate reduces the "price of income" because it now takes a smaller amount of work time to obtain $1 worth of goods. When the wage rate is $2 per hour, the "price" of $1 of income is half an hour of work time. But if the wage rate increases to $4 per hour, the "price" of $1 of income falls to one-quarter of an hour. Now that income is cheaper, it makes sense to purchase more of it. This purchase is made by working more hours and taking less leisure. The classic article is Lionel Robbins, "On the Elasticity of Demand for Income in Terms of Effort," *Economica,* June 1930, pp. 123–29.

TABLE 2.1
Wage Changes and Hours of Work: Substitution and Income Effects

(1) Size of Effects	(2) Impact on Hours of Work: (a) Wage Rate Increase	(2) Impact on Hours of Work: (b) Wage Rate Decrease	(3) Slope of Labor Supply Curve
Substitution effect exceeds income effect.	Increase	Decrease	Positive
Income effect equals substitution effect.	No change	No change	Vertical
Income effect exceeds substitution effect.	Decrease	Increase	Negative

assume a wage *decrease*. The income effect associated with a wage decline is that the desired hours of work increase. That is, a decline in the wage rate will reduce an individual's income from a given number of hours of work, and we can expect the individual to purchase less leisure and, therefore, choose to work more hours. Similarly, in terms of a wage decline, the substitution effect evidences itself as a decline in work hours. A reduction in the wage rate makes leisure cheaper, prompting one to consume more of it. Once again, the final outcome depends on the relative strength of the two effects. Study Table 2.1 carefully to be certain that you fully understand it.

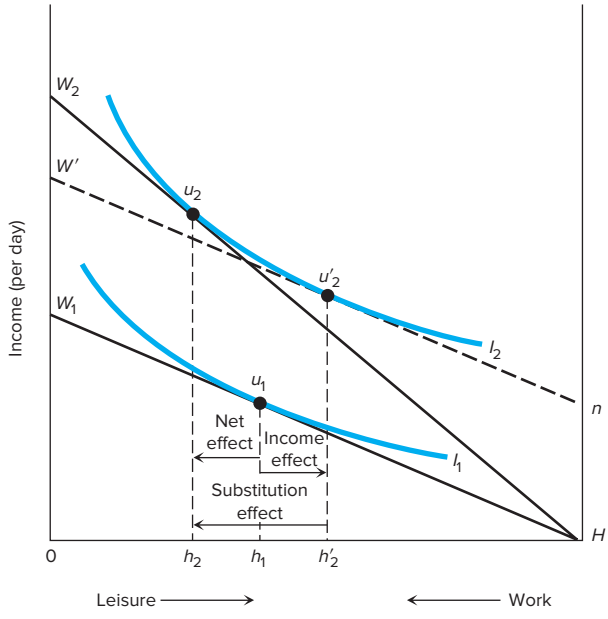
Graphic Portrayal of Income and Substitution Effects

Figure 2.7 permits us to isolate graphically the income and substitution effects associated with a wage rate increase for a specific person. Remember that the substitution effect reflects the change in desired hours of work arising solely because an increase in the wage rate alters the relative prices of income and leisure. Therefore, to isolate the substitution effect, we must control for the increase in income created by the increase in the wage rate. Recall, too, that the income effect indicates the change in the hours of work occurring solely because the higher wage rate means a larger total income from any number of hours of work. In portraying the income effect, we must hold constant the relative prices of income and leisure—in other words, the wage rate.

Consider Figure 2.7. As the wage rate increases and shifts the budget line from HW_1 to HW_2, the resulting movement of the utility-maximizing position from u_1 on I_1 to u_2 on I_2 is the consequence of the combined income and substitution effects. We isolate the *income effect* by drawing the budget line nW', which is parallel to HW_1 and tangent to I_2 at point u_2'. The vertical distance Hn measures the amount of *nonlabor* income that would be required to make the individual just as well off (that is, attain the same total utility) at u_2' as at u_2. But by moving the individual from curve I_1 to curve I_2 with *nonlabor* income, we have left the wage rate (that is, the relative prices of leisure and goods) unchanged.[7] No substitution effect is

[7] Note that the slopes of HW_1 and nW' are the same; the lines are parallel, meaning the wage rate embodied in both budget lines is the same.

FIGURE 2.7 The Income and Substitution Effects of a Wage Rate Increase
Assuming leisure is a normal good, the income effect associated with a wage increase will always reduce hours of work. It is shown here as a reduction in work time of $h_1h'_2$ hours. The substitution effect, stemming from a rise in the wage rate, evidences itself in an increase in the hours of work. The increase in hours of work of h'_2h_2 hours shows the substitution effect. In this instance, the substitution effect outweighs the income effect, and the worker chooses to work h_1h_2 additional hours as a result of the higher wage.



involved here. The movement from u_1 to u'_2, therefore, measures or isolates the income effect. As noted earlier, this effect results in fewer work hours when analyzed from the vantage point of an increase in wage rates and hence an increase in income. Specifically, the income effect would result in the individual wanting to work $h_1h'_2$ fewer hours.

We isolate the *substitution effect* as follows. The substitution effect occurs solely because the slope of the budget line—the relative prices of income and leisure—has been altered by the assumed increase in the wage rate. We are concerned with budget lines nW' and HW_2 because their comparison involves no change in the individual's well-being; they pertain to the same indifference curve I_2. Line nW', however, reflects the original wage rate (also embodied in HW_1), whereas HW_2 mirrors the new higher wage rate. The movement from u'_2 to u_2 on curve I_2 is the substitution effect. It is solely the result of a change in the relative prices of leisure and goods or, specifically, the fact that goods have become cheaper and leisure more expensive. It is no surprise that this prompts a substitution of work (goods) for leisure. For a wage rate increase, the hours of work rise (the substitution effect). In this case, the individual wishes to work h'_2h_2 more hours.

Keep in mind that the individual does not actually "move" to a new optimal position in two distinct steps, but rather goes directly from u_1 to u_2. We have conceptually isolated the income and substitution effects to stress that there are two opposing ways in which a wage increase affects the worker: by increasing monetary income *and* by increasing the relative price of leisure. Both effects are at work, but one effect may dominate the other.[8]

In Figure 2.7, the income and substitution effects can be thought of in terms of a boating analogy. Assume a boat is drifting on the ocean. Suppose the tide moves the boat eastward while the surface wind blows it westward. Both forces are present, but whether the boat actually moves east or west depends on which of these forces is strongest. So it is also with the income and substitution effects of a wage change.

To summarize: In this instance, the income effect is represented by the rightward horizontal movement from u_1 to u'_2—that is, from Hh_1 to Hh'_2 hours of work. The substitution effect is shown by the leftward horizontal movement from u'_2 to u_2—that is, from Hh'_2 to Hh_2 hours of work. In this case, the substitution effect (increased work hours) is larger than the income effect (reduced work hours). The net effect is an increase in hours of work from Hh_1 to Hh_2; at the higher wage rate, the individual wants to work h_1h_2 additional hours. This individual is clearly on the upward-sloping segment of his or her labor supply curve; the wage rate and the desired hours of work are directly related.

It is a worthwhile exercise for you to diagram and explain the case in which the income effect is larger than the substitution effect, causing the labor supply curve to be backward-bending. Questions 2 and 3 at the end of this chapter also are relevant.

Rationale for the Backward-Bending Supply Curve

From Figure 2.6, we remember that wage rate increases are initially associated with the desire to work more hours. Specifically, for the wage increases that shift the budget line from W_1 through W_3 the absolute value of the substitution effects must be greater than that of the income effects, yielding the forward-rising segment of the labor supply curve. But further increases in the wage rate that shift the budget line from W_3 through W_5 are associated with the choice to work fewer hours. The income effects of these wage rate increases are greater than the substitution effects, yielding the backward-bending segment of the labor supply curve.

What is the rationale for this reversal? The answer is that points u_1 and u_2 are at positions on indifference curves where the amount of leisure is large relative to the amount of income (goods). That is, u_1 and u_2 are located on relatively flat portions of indifference curves, where MRS L, Y is small because the individual is willing to give up substantial amounts of leisure for an additional unit of income or goods. This means that the substitution effect is large—so large that it dominates the income effect. The individual's labor supply curve is forward-rising: Higher wage rates induce more hours of work. But points u_3, u_4, and u_5 are reached only after much leisure has been exchanged

[8] We have presented the Hicks decomposition of income and substitution effects, which holds the utility constant when deriving the substitution effect. An alternative approach is the Slutsky decomposition, which holds income level constant when calculating the substitution effect. The decompositions don't differ in the ultimate impact of a wage change on labor supply—just in the intermediate steps.

in the labor market for income. At these points, the individual has a relatively large amount of income and relatively little leisure. This is reflected in the relative steepness of the indifference curves. In other words, MRS L, Y is large, indicating that the individual is willing to give up only a small amount of leisure for an additional unit of income. This means that the substitution effect is small and in this case is dominated by the income effect. Consequently, the labor supply curve of the individual becomes backward-bending: Rising wage rates are associated with fewer hours of work.

Empirical Evidence

What do empirical studies reveal about labor supply curves? The evidence differs rather sharply between males and females. Specifically, most studies indicate that male labor supply is quite insensitive to changes in wage rates, whereas female labor supply is more responsive to changes in wage rates. In a survey of recent studies, McCelland and Mok report that a 10 percent increase in male and single-women wage rates would change the amount of labor supplied by 1 percent.[9] However, the corresponding figure for married women is 4 percent.[10] Apparently for men the substitution effect very slightly dominates the income effect when wage rates rise. For women, the substitution effect seems to substantially dominate the income effect.

How might we explain the apparent differences in the labor supply responses of males and females to a wage change? The answer hinges on existing differences in the allocation of time. A high percentage of prime-age adult males—nearly 90 percent—work full-time. Furthermore, men on the average do relatively little housework. Thus, increased hours of work in response to a wage rate increase would have to come at the expense of pure leisure—that is, nonproductive activities or rest and relaxation. Apparently pure leisure and labor market work are not highly substitutable. The result is a small substitution effect for men and a nearly vertical labor supply curve. In comparison, the labor market participation rate for women is significantly less than that for men; many women work part-time, and women assume major responsibility for work within the home. At the risk of oversimplification, this means that while men use their time in basically two ways (market work and pure leisure), women use their time in three ways (market work, work in the home, and pure leisure). For many married women, work in the home and work in the labor market are highly substitutable. That is, household work may be accomplished by doing it oneself *or* by working in the labor market and using a portion of one's earnings for hiring housecleaning and child care help and purchasing prepared meals. Thus, when wage rates increase, many women substitute labor market work for work in the home. They enter the labor force, switch from part-time to full-time jobs, or increase their hours on full-time jobs.[11] In other words, a strong substitution effect occurs, which implies an upward-sloping labor supply curve for married women.

WW2.1

[9] Based on the range midpoint in Robert McCelland and Shannon Mom, "A Review of Recent Research on Labor Supply Elasticities," Congressional Budget Office Working Paper 2012-12, October 2012.

[10] For another survey of labor supply elasticities, see Michael P. Keane, "Labor Supply and Taxes: A Survey," *Journal of Economic Literature*, December 2011, pp. 961–1075.

[11] Most of the gender differences in the labor supply result from differences in labor force participation between men and women, not from differences in the hours of work supplied by those working. See James J. Heckman, "What Has Been Learned about Labor Supply in the Past Twenty Years?" *American Economic Review,* May 1993, pp. 116–21.

2.1 World of Work

Work Hours Linked to Pollution*

Pollution has many effects on the economy. For example, it reduces tourism, lowers property values, and harms the commercial fishing industry and recreational industries. Another possible way pollution may impact the economy is through its effect on work hours.

Pollution has a theoretically ambiguous effect on labor supply. On one hand, greater pollution will tend to decrease work hours since workers will be more likely to get sick and miss work. On the other hand, higher pollution levels may not decrease work hours. The health effects of pollution may not be large enough to impede work. Also, individuals may work more hours if they enjoy leisure less due to poorer health or they consume more health-related goods. Lastly, health-related declines in worker productivity may lower wages, which could lower work hours if the substitution effect outweighs the income effect.

Rema Hanna and Paulina Oliva examine the impact of pollution on work hours by analyzing the effect of the closure of a large oil refinery in Mexico City in March 1991. Pollution, as measured by the levels of sulfur dioxide, fell by 19.7 percent for neighborhoods within a 5-kilometer radius of the oil refinery after the closure. As result, individuals living near the oil refinery increased their average weekly work hours by 1.3 hours (or 3.5 percent) relative to individuals living farther away from the refinery. The distribution of work hours was also affected as well as the level of work hours. Neighborhoods affected by the closure experienced a 6 percentage point increase in the probability of working over 40 hours a week and about a 2.5 percentage point increase in the probability of working more than 10 hours per week.

* Based on Rema Hanna and Paulina Oliva, "The Effect of Pollution on Labor Supply: Evidence from a Natural Experiment in Mexico City," *Journal of Public Economics*, February 2015, pp. 68–79.

It is important to note that the sensitivity of married women to wage rates appears to be diminishing over time, and their responsiveness is becoming more like that of men. Blau and Kahn report that the responsiveness of married women to changes in wage rates fell by half between 1980 and 2000.[12] They argue that this finding is the result of women's greater labor market attachment and men and women more equally sharing home and market responsibilities. Bishop, Heim, and Mihaly report a large drop in the the responsiveness of single women to wage rates between 1979 and 2003. They indicate that part of the decline is due to the work requirements instituted in the 1996 welfare reform act.[13]

Elasticity versus Changes in Labor Supply

To this point, we have been discussing the direction in which wage changes cause an individual to alter the hours of work supplied. Implicitly, our discussion has

[12] Francine D. Blau and Lawrence M. Kahn, "Changes in the Labor Supply of Married Women: 1980–2000," *Journal of Labor Economics,* July 2007, pp. 393–438. For a similar result, see Bradley T. Heim, "The Incredible Shrinking Elasticities: Married Female Labor Supply, 1978–2002," *Journal of Human Resources* 42, No. 4 (2007), pp. 881–918.

[13] Kelly Bishop, Bradley Heim, and Kata Mihaly, "Single Women's Labor Supply Elasticities: Trends and Policy Implications," *Industrial and Labor Relations Review,* October 2009, pp. 146–168.

focused on the wage elasticity of individual labor supply. More precisely, ***wage elasticity of labor supply*** is defined as follows:

$$E_s = \frac{\text{percentage change in quantity of labor supplied}}{\text{percentage change in the wage rate}} \qquad \textbf{(2.1)}$$

Over specific ranges of an individual's labor supply curve, the elasticity coefficient given in Equation (2.1) may be zero (perfectly inelastic), infinite (perfectly elastic), less than 1 (relatively inelastic), greater than 1 (relatively elastic), or negative (backward-bending). The elasticity will depend on the relative strengths of the income and substitution effects generated by a wage rate change. But these movements *along* an existing individual labor supply curve [as in Figure 2.6(b)] should not be confused with *shifts* in the entire supply curve. These shifts—increases or decreases in labor supply—occur in response to changes in either of two factors that we have heretofore held constant. First, changes in *nonlabor income* may shift an individual's labor supply curve. Receiving a large inheritance, winning a lottery, qualifying for a pension, or becoming eligible for welfare benefits may shift one's labor supply curve leftward—that is, cause a decrease in labor supply. Or conversely, the layoff of one's spouse or a significant decline in dividend income may produce an increase (rightward shift) in labor supply.

Second, a change in a person's indifference map—that is, in work–leisure preferences—may shift the labor supply curve. An improvement in working conditions, availability of child care, or large medical bills may change a person's indifference map in ways that increase his or her labor supply. Working in the opposite direction, purchasing a product requiring leisure to enjoy or reaching a culturally acceptable retirement age may alter one's indifference map so that labor supply declines. A more detailed treatment of factors that shift the labor supply curve is found in Chapter 6.

To summarize: As Figure 2.6 suggests, given work–leisure preferences and nonlabor income, a change in wage rates traces out or locates the individual's labor supply curve. The elasticity of this curve for any particular wage change—that is, the sensitivity of hours one wants to work to a change in wages—depends on the relative sizes of the income and substitution effects. In contrast, changes in work–leisure preferences or in nonlabor income shift the location of one's labor supply curve.

2.2 *Quick Review*

- A change in the wage rate produces two simultaneous effects: *(a)* an income effect that, taken alone, changes a worker's desired hours of work in the opposite direction as the wage rate change and *(b)* a substitution effect that, taken alone, changes a worker's desired hours of work in the same direction as the wage rate change.
- As the wage rate rises, the labor supply curve for a typical person first is positively sloped as the substitution effect swamps the income effect; eventually the curve becomes negatively sloped (turns backward) as the income effect of further wage rate hikes exceeds the substitution effect.
- The wage elasticity of supply is the percentage change in the quantity of labor supplied divided by the percentage change in the wage rate.

Your Turn

Suppose an individual's wage rate decreases and the income effect dominates the substitution effect. What will be the impact on the desired hours of work? What is the relevant segment of the person's labor supply curve? (*Answers:* See page 598.)

APPLYING AND EXTENDING THE MODEL

The basic model just developed outlines the logic of the work–leisure decision, provides a rationale for an individual's backward-bending labor supply curve, and helps us understand changes in individual labor supply. Our goal now is to extend, embellish, and apply the basic work–leisure model. Specifically, we want to show that the work–leisure model is useful in delineating reasons for nonparticipation in the labor force, in explaining how a standard workweek might cause certain workers to feel overemployed or underemployed, and in comparing the impact that various pay schemes and income maintenance programs might have on work incentives.

Nonparticipants and the Reservation Wage

Figure 2.8 portrays the case of a nonparticipant: an individual who decides *not* to be in the labor force. Note the following characteristics in Figure 2.8. First, the person's indifference curves are steep, indicating that leisure (nonmarket time) is valued very highly relative to income. The marginal rates of substitution of leisure for income are high, meaning that the individual is quite willing to forgo income for leisure or nonmarket time. This might reflect the preferences of, say, a 20-year-old who deems it important to

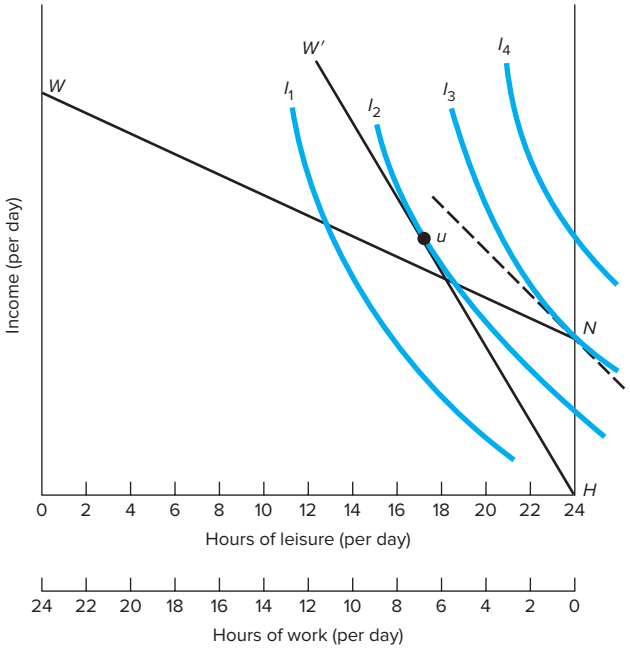


FIGURE 2.8
Nonparticipation: The College Student
A high subjective evaluation of nonwork time (reflected in steep indifference curves), the availability of nonlabor income (*HN*), and low earning ability (*NW* is relatively flat) are all factors conducive to not participating in the labor force.

devote time and effort to attending college. Second, we note the availability of nonlabor income *HN*. (Ignore all other budget lines but *HNW* for the moment.) Perhaps this nonlabor income takes the form of an intrahousehold transfer to the young student from the earned income of parents. Finally, the relative flatness of the *NW* budget line indicates that the wage rate that this individual can earn in the labor market is relatively low. For example, the student may have modest skills and little or no labor market experience and, therefore, is not yet able to command a high wage rate by working.

The optimal position in Figure 2.8 is based on the same principle employed in Figure 2.5: Given budget line *HNW,* choose the position that puts one on the highest attainable indifference curve. In this case, the highest level of utility is achieved at point *N*. Here the budget constraint *HNW* touches I_3. At this point, the individual is *not* participating in the labor market; all of this person's time is devoted to nonmarket activities. The technical reason is that at all points within the axes of the diagram, the person's indifference curves are more steeply sloped than the budget constraint. In other words, at all points within the diagram, the individual values leisure (nonmarket time) more highly at the margin than does the market. Note that in contrast to Figure 2.5, the optimal outcome at *N* is *not* a tangency position but rather a "corner" solution. At *N* the wage rate is less than MRS *L, Y,* which means the individual values nonmarket time more highly than does the market. But given the fact that the individual is a nonparticipant, no further substitution of leisure for work is possible.

The importance of low earning capacity in the labor market and the availability of nonlabor income can be understood if we replace the original budget line *HNW* in Figure 2.8 with *HuW′*. This new budget line reduces nonlabor income to zero *and* assumes that a much higher wage rate can be garnered in the labor market. Suppose, for example, that our student is a highly skilled computer programmer who has immediate employment opportunities at a high wage. Or to make the point even more graphic, suppose the student is a premier college basketball player who is sought by the National Basketball Association. We find that under these new conditions the individual would prefer to participate in the labor force. The optimal position will now be at *u,* where the person will want to work six or seven hours per day.

Figure 2.8 also allows us to introduce the concept of the reservation wage, which is useful in understanding why some individuals participate in the labor force and others do not. In simple terms, *the* **reservation wage** *is the highest wage rate at which an individual chooses* not *to work or, if you prefer, the lowest wage rate at which one would decide to work*. When nonlabor income is *HN,* as in Figure 2.8, the reservation wage is the market wage rate implicit in the broken budget line that is equal to the slope of indifference curve I_3 at zero hours of work. At this particular wage rate, the value of work and the value of nonmarket time (leisure) are equal. If the market wage is below the reservation wage, the individual will clearly choose to be a nonparticipant. The relatively low market wage rate embodied in the *NW* segment of the *HNW* budget line demonstrates this decision *not* to be in the labor force. In nontechnical terms, at point *N* the value of nonmarket time to this individual exceeds the value of work, and therefore this person's well-being would be reduced by working. Conversely, if the market wage rate were above the reservation wage, the individual would be induced to become a labor market participant. You can demonstrate this by drawing a steeper budget line from point *N* that is tangent to I_4

at some point. With this steeper (higher market wage) budget line, we would find at point N that the value of work would be greater than the value of nonmarket time and that the individual's economic welfare would be enhanced by working.

Figure 2.9 illustrates another common instance of nonparticipation in the labor force. Here we assume that an elderly worker is initially participating in the labor force, working about nine hours per day at optimal position u on indifference curve I_1. Suppose now that when the worker reaches age 65 a private or public pension of HN becomes available, *provided* the individual retires fully from work. In other words, the choice is between budget line HW and the associated optimal position at u or budget line NN' and the corner solution at point N. We find that N is preferable to u because it is associated with the higher indifference curve I_2. In this case, the availability of a pension—for example, Social Security benefits—induces the individual to become a nonparticipant. Stated differently, it shifts the person's labor supply curve [Figure 2.6(b)] leftward so that no labor is supplied at the market wage. Note that the decision to be a nonparticipant entails a *reduction* in money income but a more than compensating *increase* in leisure. The individual is better off at N than at u, even though income is reduced.

Empirical research confirms several generalizations arising from our discussion of Figures 2.8 and 2.9. First, other things being equal, full-time college attendance *is* a deterrent to labor force participation. This is also true of such things as the desire to care for one's preschool children. Stated alternatively, those who attach great marginal utility to nonmarket time (college attendance, child care) are more likely to be nonparticipants in the labor force. Second, other things being the same, the higher the nonlabor income available to a person from parents, a spouse, Social

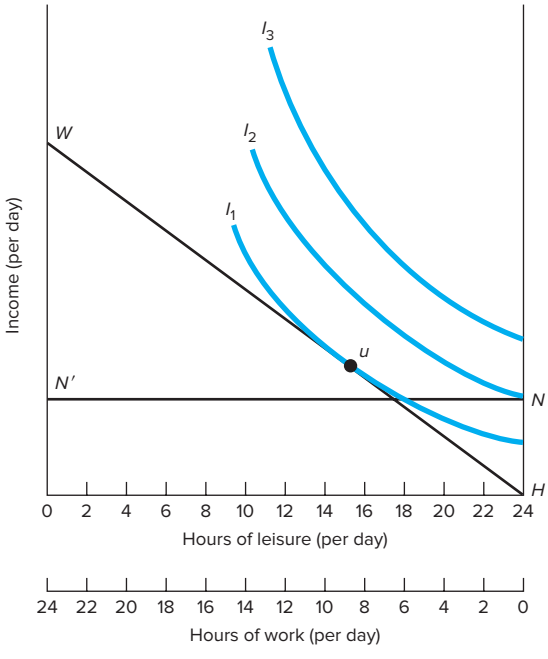


FIGURE 2.9
Nonparticipation: Pensions and the Elderly
An elderly worker whose wage rate yields the budget line HW will be a labor force participant at u. However, when a pension of HN becomes available at, say, age 65, the individual will prefer to become a nonparticipant at point N.

2.2 World of Work — The Carnegie Conjecture

In 1891 Andrew Carnegie, the well-known philanthropist and baron of U.S. Steel, asserted that "parents who leave their children enormous wealth generally deaden their children's talents and energies and tempt them to lead less productive lives." In the language of the work–leisure model, Carnegie was suggesting that large inheritances have a significant pure income effect. We know that if leisure is a normal good, this effect may cause some workers to reduce their work hours or possibly withdraw from the labor force. Graphically, inheritances will produce an upward parallel shift in the wage rate line facing an individual. The result will be a decline in the optimal number of work hours.

In 1992 Holtz-Eakin, Joulfaian, and Rosen examined three years of data from tax returns for 4,300 people receiving inheritances. Their findings lend general support to Carnegie's conjecture. For example, a single person receiving an inheritance of more than $150,000 was about four times more likely to leave the labor force as a single person inheriting $25,000. Specifically, 4.6 percent of people receiving inheritances of less than $25,000 exited the labor force, 10 percent of the people getting inheritances between $25,000 and $150,000 left, and 18.2 percent of those inheriting $150,000 or more quit their jobs.

Also, for families receiving large inheritances whose members continued to work, the growth of labor earnings slowed compared to families receiving lesser inheritances. This suggests that large inheritances may reduce work hours or the supply of effort, even when people receiving inheritances continue to work.

Two other findings of this study are of interest. First, people not working when they received large inheritances were less likely than those receiving smaller inheritances to enter the labor force in subsequent years. Second, people receiving larger inheritances were less likely to be working during the years immediately preceding the inheritance. Perhaps people *anticipating* large inheritances have lower incentives to work. An alternative explanation is that those expecting large inheritances can better afford to quit their jobs to attend to the needs of their dying parents.

Although inheritances reduce labor force participation, they permit the children to attain higher indifference curves—to achieve greater total utility. Moreover, those taking extra "leisure" may use it for socially beneficial activities such as volunteer work and educational pursuits. The point is simply that nonlabor income—be it from lottery winnings, pensions, intrahousehold transfers, or inheritance—is an important factor in understanding labor supply behavior.

Source: Douglas Holtz-Eakin, David Joulfaian, and Harvey S. Rosen, "The Carnegie Conjecture: Some Empirical Evidence," *Quarterly Journal of Economics,* May 1993, pp. 413–36. Also see, Jeffrey R. Brown, Courtney C. Coile, and Scott J. Weisbrenner, "The Effect of Inheritance Receipt on Retirement," *Review of Economics and Statistics,* May 2010, pp. 425–34.

WW2.2

Security benefits, private pensions, welfare, and other sources, the less likely it is that the person will be a labor force participant. Finally, all else being equal, the greater the opportunity cost of not working—that is, the higher the wage obtainable in the labor market—the more likely it is that a person will be a labor force participant.[14]

[14] Numerous studies confirm these conclusions. For example, for a discussion of the impact of disability insurance on the participation decision, see Eric French and Jae Song, "The Effect of Disability Insurance Receipt on Labor Supply," *American Economic Journal: Economic Policy*, May 2014, pp. 291–337. For an analysis of the effect of child care costs on the labor force participation decision, see Erdal Tekin, "Child Care Subsidies, Wages, and Employment of Single Mothers," *Journal of Human Resources,* Spring 2007, pp. 453–87. For a survey of the effects of taxes, see Michael P. Keane, "Labor Supply and Taxes: A Survey," *Journal of Economic Literature,* December 2011, pp. 961–1075.

2.3 World of Work

Labor Supply of Florida Lobster Fishermen*

Most workers are required by their employer to work a fixed number of hours, which is typically eight hours per day. This restriction makes it more difficult for economists to empirically estimate labor supply curves, which are based on the assumption that individuals can freely choose the number of hours they want to work. As result, researchers have recently focused attention on jobs where workers are free to set the number of hours of work. One such occupation is Florida lobster fishermen.

Florida lobster fishermen have a lot of flexibility to determine their work hours. Fishermen may trap lobster for as many days as they like during the lobster season. A fisherman can work as many or as fewer hours as he or she wants within the daylight hours.

Using daily data on nearly 1,000 lobster fishermen over five fishing seasons, Tess Safford reports that the average fisherman has more than 300 possible days to catch lobsters and does so about 20 percent of the time. The average fisherman works slightly less than eight hours per day and has hourly earnings of about $150.

One would expect that lobster fishermen would increase their labor supply when the hourly wage rate is higher. Stafford finds support for that conjecture. Lobster fishermen are more likely to work at the beginning of the season when lobsters are more plentiful and thus earnings are higher. They are also more likely to work near new moons when it is easier to catch lobsters.

Most of the responsiveness of labor supply of lobster fishermen comes from the decision to participate rather than hours of work per day. Stafford finds a 10 percent higher hourly wage rate increases the probability of participating by 13 percent to 14 percent. However, the same 10 percent rise in the hourly wage rate increases hours of work by only 0.7 percent.

* Based on Tess M. Stafford, "What Do Fishermen Tell Us That Taxi Drivers Don't? An Empirical Examination of Labor Supply," *Journal of Labor Economics*, July 2015, pp. 683–710.

Standard Workday

Our discussion thus far has implicitly assumed that workers can individually determine the number of hours they work. This is typically not the case. In the United States, a standard workday of 8 hours (40 hours per week) has evolved. This is partly due to federal legislation that obligates employers to pay time and a half for hours worked in excess of 40 per week. Furthermore, industries whose technologies involve the continuous processing of goods or components can divide the workday into three 8-hour shifts.

WW2.3

Overemployment

What may happen when a worker confronts a standard workday of HD hours, as illustrated in Figure 2.10? Consider first the solid indifference curves for Smith shown in the lower right portion of the diagram. Smith's optimal position is at u_s, where he prefers to work only Hh_s hours per day. But this is not a relevant choice; Smith can either work HD hours or not at all. That is, the relevant choice is between working the standard workday at P and being a nonparticipant at N. What to do? In this instance, it is preferable to work the standard workday because it entails a higher indifference curve I_{s2} as opposed to I_{s1}. Note once again that this is not a tangency position. At P the slope of I_{s2} is greater than the slope of the budget line NW.

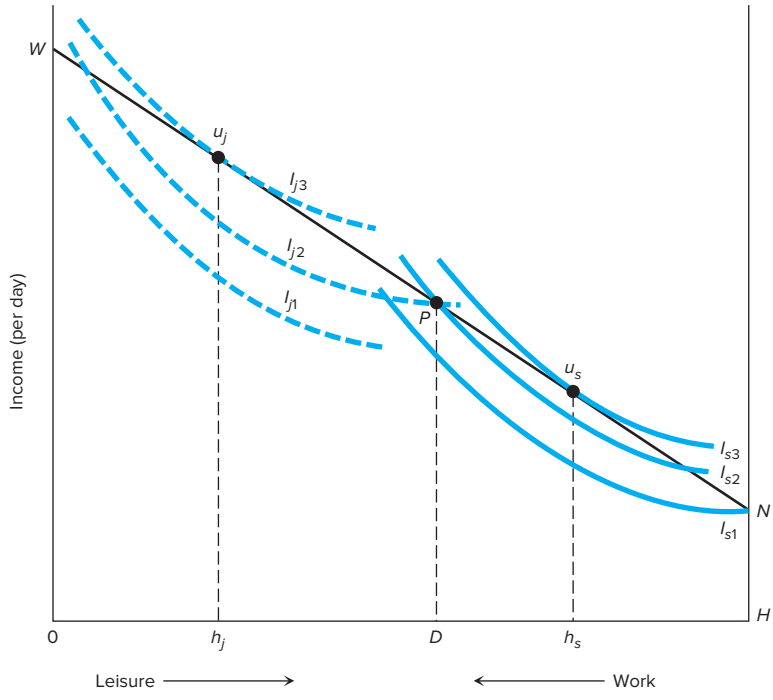


FIGURE 2.10
Overemployment and Underemployment
When confronted with a standard workday of *HD,* Smith (solid indifference curves) will feel overemployed while Jones (broken indifference curves) will feel underemployed.

The marginal rate of substitution of leisure for income exceeds the wage rate, which means that the worker values leisure more highly at the margin than does the market. Clearly Smith would be better off at u_s with more leisure and less work per day.

Simply put, at point *P* in Figure 2.10 Smith will feel ***overemployed***. Faced with a standard workday denying him added leisure, Smith may compensate by engaging in absenteeism; he may more or less habitually miss a day of work every week or so. In fact, the absence rate—the ratio of full-time workers with absences in a typical week to total full-time employment—was 2.9 percent in 2014. In that year, lost work time from absences was 1.5 percent of total hours usually worked. Many of these absent workers are absent without pay. Also, the overemployed worker described in Figure 2.10 may have a relatively high rate of job turnover. The worker obtains more leisure by frequently being "between jobs." Of course, we have purposely ruled out the possibility of part-time employment, which would appeal to this overemployed worker.

Underemployment

The broken indifference curves in the upper left portion of Figure 2.10 portray the position of Jones, an ***underemployed*** worker. Jones would prefer to be at u_j, where she would work the long workday of Hh_j hours as opposed to the shorter standard workday of *HD* hours. Note again that *P* is not a tangency position. At *P* the slope of Jones's indifference curve I_{j2} is less than the budget line. Jones's marginal rate of substitution of leisure for income is less than the wage rate. Simply

stated, at the margin Jones values leisure less highly than does the market. This means that Jones will feel *underemployed* at *P*. Jones may realize her desire for more work and less leisure by moonlighting, or taking a second job. You should use Figure 2.10 to demonstrate that Jones might be willing to take a second job even if the wage rate were less than that paid on the primary job. In fact, in 2014 some 7.2 million workers—approximately 4.9 percent of all employees—held multiple jobs.

Survey data suggest that the majority of workers are satisfied with the number of hours they work. In 2001 the Bureau of Labor Statistics surveyed some 30,000 workers, and two-thirds indicated that they would prefer to work their current number of hours at their present rate of pay, rather than work more or fewer hours at proportionately higher or lower earnings. Only 7 percent expressed a preference for shorter hours, with a proportionate decline in earnings. Approximately one-fourth of all surveyed workers wanted to work more hours, with a proportionate increase in earnings. Not surprisingly, this latter group was dominated by young workers and low-wage earners.[15]

Premium Pay versus Straight Time

Although we ordinarily think of a worker receiving the same wage rate regardless of the number of hours worked, this is not always the case. Indeed, the Fair Labor Standards Act of 1938 specifies that workers covered by the legislation must be paid a premium wage—specifically, time and a half—for hours worked in excess of 40 per week. What impact does this premium pay provision have on the work–leisure decision? And how does it compare with a straight-time equivalent wage rate that provides an identical daily or weekly income from the same number of hours of work? Suppose, for example, that in a given industry a 10-hour workday (50-hour workweek) becomes commonplace. Does it make any difference with respect to work incentives to pay $6 per hour for the first 8 hours of work and $9 per hour for an additional 2 hours of overtime *or* to pay $6.60 per hour for each 10 hours of work? Both payment plans yield the same daily income of $66, so one is inclined to conclude that it makes no difference. But with the aid of Figure 2.11, we find that it *does* make a difference.

We assume in Figure 2.11 that a worker is initially at the optimal point u_1, where HW is tangent to indifference curve I_1. At u_1 the individual chooses to work Hh_1 hours, which we will presume to be the standard workday. Let us now suppose that the employer offers additional hours of overtime work at premium pay. This renders the u_1W segment of HW irrelevant, and the budget constraint now becomes Hu_1P. We observe that the optimal position will move to u_2 on the higher indifference curve I_2 and that the worker will choose to work h_1h_2 additional hours. Daily earnings will be u_2h_2.

Consider now the alternative of a straight-line equivalent wage—that is, a standard hourly wage rate that will yield the same daily income of u_2h_2 for the Hh_2

[15] Lonnie Golden and Tesfayi Gebreselassie, "Overemployment Mismatches: The Preference for Fewer Work Hours," *Monthly Labor Review,* April 2007, pp. 18–37. For evidence that worker survey responses overstate the extent of hours constraints, see William R. Johnson, "Fixed Costs and Hours Constraints," *Journal of Human Resources*, Winter 2011, pp. 775–799.

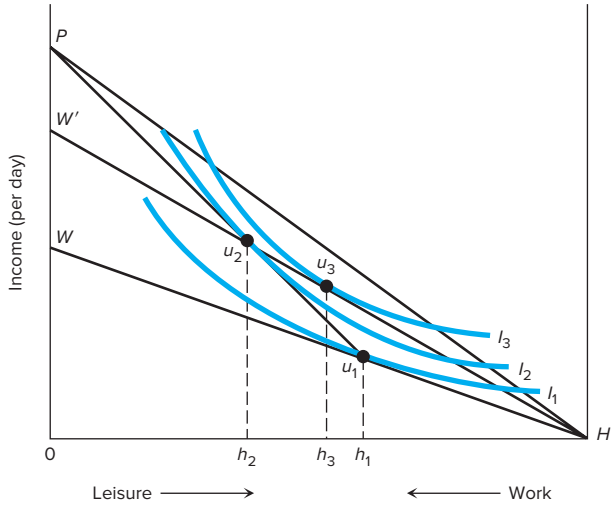


FIGURE 2.11
Premium Wages and Straight-Time Equivalent
Premium wage rates for overtime work will be more conducive to more hours of work (Hh_2) than a straight-time wage rate that would yield an equivalent daily income (Hh_3).

hours of work. We can show the straight-time equivalent wage by drawing a new budget line HW' through u_2. The budget lines Hu_1P and HW' will both yield the same monetary income of u_2h_2 for Hh_2 hours of work. The important point is that if confronted with HW', the worker will want to move from u_2 to a new optimal position at u_3, where fewer hours than Hh_2 are worked. Stated differently, at u_2 indifference curve I_2 cuts HW' from above; that is, MRS L, Y is greater than the wage rate. This means that the worker subjectively values leisure more highly at the margin than does the market, and thus u_2 is no longer the optimal position under a straight-time pay arrangement. Our worker will feel overemployed when working Hh_2 hours on a straight-time pay plan (recall Figure 2.10).

Here is the conclusion: Premium wage rates for overtime work will call forth more hours of work than a straight-time wage rate that yields the same income at the same number of hours as that actually chosen by an individual paid the overtime premium. Why the difference? The use of premium pay will have a relatively small income effect because it applies only to hours worked in excess of Hh_1. In comparison, the straight-time equivalent wage will have a much larger income effect because it applies to *all* hours of work.[16] Figure 2.11 is essentially the labor market analog of price discrimination in the product market. Sellers of some products can obtain more revenue by charging different prices for different quantities of output. In the present analysis, we are observing that an employer can obtain a greater amount of labor for a given outlay by paying different wage rates for different hours of work.[17]

[16] Figure 2.11 is drawn so that for the straight-time equivalent wage the substitution effect dominates the income effect, and therefore the individual is on the forward-rising portion of her or his labor supply curve. This is why u_3 entails more hours of work than u_1. Such an outcome is not necessary. The diagram could have been drawn so that u_3 was to the right of u_1, in which case our basic conclusion would be even more evident.

[17] Kenneth E. Boulding, *Economic Analysis,* vol. 1, 4th ed. (New York: Harper and Row, 1966), p. 616. Our conclusion holds only if we restrict the employer from hiring additional workers.

2.3 *Quick Review*

- Steep indifference curves, the availability of nonlabor income, and low earning ability all contribute to nonparticipation in the labor force.
- The reservation wage is the lowest acceptable wage rate; below this wage a person would decide not to participate in the labor force.
- The standard eight-hour workday may leave some workers wanting additional hours of work (underemployed) and others wishing to work fewer hours (overemployed), depending on their indifference maps and earning abilities.
- Premium wage rates for overtime work provide a greater incentive for additional hours of work than a straight-time wage rate yielding an equivalent daily income.

Your Turn

Suppose you have a choice between two otherwise identical jobs, including hourly pay. In one job the employer sets the hours of work each week and in the other you select the number of hours. Which job would you prefer? Why? (*Answer:* See page 598.)

Income Maintenance Programs

The United States has a variety of ***income maintenance programs***—also dubbed welfare or public assistance programs—whose purpose is to provide some minimum level of income to all families and individuals.[18] These programs include Supplemental Security Income, Temporary Assistance for Needy Families, food stamps, and Medicaid. Our objective is to examine the possible effects of such programs on work incentives.

Three Basic Features

Although details vary greatly, income maintenance programs have three basic features.

1 The ***Income Guarantee or Basic Benefit,*** *B* This is the amount of public subsidy an individual or family would be paid if no earned income were received.[19]

2 The ***Benefit Reduction Rate,*** *t* This refers to the rate at which a family's basic benefit is reduced as earned income increases. For example, if t is .50, then a family's basic benefit will be reduced by $.50 for every $1.00 of wage income earned. This means that if the market wage rate is $5.00, the family's *net* wage rate will be just $2.50 when the benefit reduction provision is taken into account. The critical point

[18] Income maintenance programs are not to be confused with various social insurance programs. Income maintenance programs are designed to assist families and individuals who have more or less permanent disabilities or dependent children. These programs are financed out of general tax revenues and are regarded as public charity. To qualify for aid, one must demonstrate economic need. In contrast, social insurance programs (such as Old Age and Survivors Insurance and unemployment compensation) are tailored to replace a portion of the earnings lost due to retirement or temporary unemployment. They are financed by earmarked payroll taxes, and benefits are viewed as earned rights as a consequence of prior financial contributions. For a discussion of a variety of means-tested transfer programs, see Robert A. Moffitt (ed.), *Means-Tested Transfer Programs in the United States* (Chicago, IL: University of Chicago Press, 2003).

[19] We simplify by assuming that no nonwage income in the form of, say, interest or dividends is received.

is that the benefit reduction rate reduces one's net gain from work. Economists often refer to the benefit reduction rate as an "implicit tax rate" because t has the same impact on the net income of a person participating in an income maintenance program as income tax rates have on the earnings of individuals not in the program.

3 The ***Break-Even Level of Income,*** Y_b The basic benefit and the benefit reduction rate permit the calculation of the *break-even income*. This is the level of earned income at which the actual subsidy payment received by an individual or family becomes zero. It is the level of earned income at which an individual is dropped from an income maintenance program. As we will see in a moment, the break-even income depends on the sizes of the basic benefit and the benefit reduction rate.

Illustration

A simple numerical illustration might help relate these concepts to one another. The ***actual subsidy payment*** S received by an individual can be determined by the following formula:

$$S = B - tY \qquad \textbf{(2.2)}$$

where B = basic benefit

t = benefit reduction rate

Y = level of earned income

Thus, for example, if B is \$2,000, t is .50, and Y is \$2,000, the actual subsidy payment received will be \$1,000:

$$\$1{,}000 = \$2{,}000 - .50(\$2{,}000)$$

Furthermore, the break-even level of income can be calculated readily. A glance back at Equation (2.2) suggests that S will become zero—that is, the break-even income will be reached—when earned income Y is equal to B/t.[20] For our illustrative numbers, B is \$2,000 and t is .50, so B/t—the break-even level of income—is therefore \$2,000/.50, or \$4,000. We verify this by substituting the relevant numbers into Equation (2.2):

$$\$0 = \$2{,}000 - .50(\$4{,}000)$$

Let's incorporate these concepts into Figure 2.12 to examine the impact of an income maintenance program on work incentives. The HW line shows us the budget constraint confronting the individual in the absence of an income maintenance program. The resulting optimal position is at u_1. For simplicity, let's assume that the wage rate is \$1.00 per hour and that the individual chooses to work 40 hours per week. Over the 50-week workyear earned income would be \$2,000, as shown on the left vertical axis.

Now suppose an income maintenance program with the characteristics just described is enacted. The impact of this program is to change the budget constraint

[20] The algebra is simple. By setting $S = 0$ in Equation (2.2) we get $0 = B - tY$; therefore, $tY = B$ and $Y = B/t$.

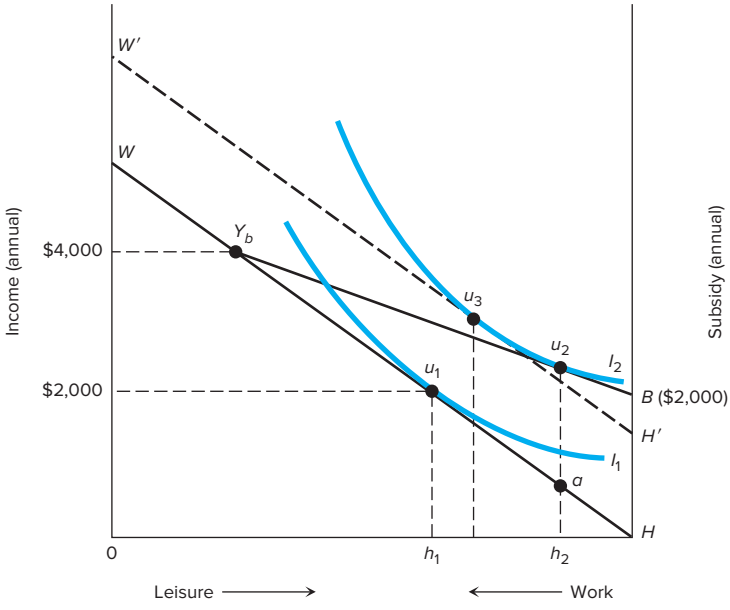


FIGURE 2.12
Income Maintenance and Incentives to Work
An income maintenance program that incorporates both a basic benefit and a benefit reduction rate will change the budget constraint from HW to $HBYbW$. This alteration moves the utility-maximizing position from u_1 to u_2 and reduces hours of work.

from HW to HBY_bW. Note that HB on the right vertical axis is the basic benefit; it is the amount of income subsidy the individual would receive if he or she had no earned income. The BY_b segment of the new budget constraint reflects the influence of the benefit reduction rate. Specifically, the slope of the BY_b segment is measured by the *net* wage rate—that is, the market wage rate as it is reduced by the benefit reduction rate. Thus while the absolute value of the slope of HW is 1.00 (reflecting the $1.00 wage rate), the slope of BY_b is only .50 (reflecting the $.50 *net* wage rate).[21] The vertical distance between HW and BY_b is equal to S, the actual subsidy received. Point Y_b indicates the break-even level of income because at this point the individual's earned income is sufficiently large ($4,000 in this case) so that the application of the .50 benefit reduction rate causes the actual subsidy payment S to become zero [see Equation (2.2)].

We observe in Figure 2.12 that the new optimal position is at u_2, where HBY_bW is tangent to indifference curve I_2. Although the individual's total money income has increased (from h_1u_1 to h_2u_2), *earned* income and the number of hours worked have both declined (from h_1u_1 to h_2a and from Hh_1 to Hh_2, respectively). In our earlier analysis of a wage *increase* (Figure 2.7), we found that the net effect on hours of work (work incentives) depended on the relative sizes of the income effect (reduction in hours of work) and the substitution effect (increase in hours of work). *In the present case, the income and substitution effects both reduce hours of work.* The tendency for the income effect to reduce hours of work is no surprise. The income maintenance program increases monetary income; and assuming leisure is a normal good, some of that income is "spent" on leisure and, therefore, fewer hours are worked. But curiously, the

[21] As noted, the slope of BY_b reflects the net wage rate wn, which is the wage rate w multiplied by $(1 - t)$; that is, $w_n = (1 - t)w$. In our example, the slope of BY_b is $.50 = (1 - .5)1$. If the benefit reduction rate were .25, the net wage rate and slope of BY_b would be $.75 = (1 - .25)1$. If the benefit reduction rate were 1.00, BY_b would be horizontal.

substitution effect also reduces hours of work. The presence of the benefit reduction rate *reduces* the *net* wage rate; it makes BY_b flatter than HW. Even though the basic benefit raises total monetary income, the benefit reduction feature means there has been an effective decrease in wage rates. Leisure is now cheaper—one sacrifices only \$.50 by not working an hour rather than \$1.00—so leisure is substituted for work.

Recalling our earlier diagrammatic separation of the income and substitution effects (Figure 2.7), we can draw the broken line $H'W'$ parallel to HW and tangent to I_2 at u_3. The horizontal distance between u_1 and u_3 is the income effect, and the horizontal distance between u_3 and u_2 is the substitution effect. We observe that both reduce the amount of work supplied.

Controversy

The various income maintenance programs have long been surrounded by controversy. This stems in part from fundamental ideological differences among policy makers. But it also reflects the fact that the accepted goals of income maintenance programs are in conflict with one another and that it is easy to disagree over the proper or optimal trade-offs. In particular, it is generally agreed that income maintenance programs should (1) effectively get poor people out of poverty, (2) maintain incentives to work, and (3) achieve goals 1 and 2 at a reasonable cost.

Figure 2.12 is a useful point of reference in explaining these goal conflicts. The imposition of an income maintenance program triggers income and substitution effects, both of which are negative with respect to work. Furthermore, we might improve the effectiveness of the program in eliminating poverty by increasing the basic benefit—that is, by shifting the BY_b line upward in Figure 2.12. But this will clearly make the program more costly. On one hand, a larger basic benefit would relocate point Y_b to the northwest on line HW and cause additional families to be eligible for subsidies. On the other hand, with a higher basic benefit, people already in the income maintenance program will each receive larger subsidy payments. Goal 1 conflicts with goal 3.

Finally, given the basic benefit, one might want to reduce the benefit reduction rate (increase the slope of the BY_b line) to preserve incentives to work. A reduction in the benefit reduction rate increases the net wage rate, boosting the price of leisure and inducing the substitution of work for leisure. The higher net wage rate may also prompt individuals who are currently not in the labor force to become participants (see Figure 2.8). However, the resulting increase in the slope of the BY_b line will extend point Y_b to the northwest along HW, making more families eligible for subsidies and, therefore, increasing program costs. An increase in the slope of the BY_b line will also boost costs by increasing the actual subsidy received for any given number of hours worked. Goal 2 conflicts with goal 3.[22]

[22] In fact, the effect on work incentives of cutting the benefit reduction rate is more complex than our discussion suggests. On one hand, a decline in the benefit reduction rate will reduce the size of the negative income and substitution effects for those currently receiving benefits; therefore, the hours of work for this group will increase. On the other hand, the lower benefit reduction rate will extend program benefits to additional families that originally had not received benefits. The resultant income and substitution effects will both be negative for this group, causing them to work fewer hours. The overall impact on work incentives will depend on the average response of each group and their relative sizes. See Gary Burtless, "The Economist's Lament: Public Assistance in America," *Journal of Economic Perspectives,* Winter 1990, pp. 68–70.

The End of Welfare as an Entitlement

In August 1996, President Clinton signed the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), which fundamentally changed the welfare system in the United States. In prior years, the welfare system had been criticized for its inherent work disincentives as well as accused of encouraging dependence among welfare recipients. The welfare reform attempted to correct these perceived deficiencies in several ways and shift more control over welfare to state governments.

A major goal of the law is to make receiving welfare a transition period before returning to work. The law replaced the existing Aid to Families with Dependent Children (AFDC) program with the ***Temporary Assistance for Needy Families (TANF)*** program. In contrast to AFDC, TANF requires welfare recipients to work after two years of receiving assistance with few exceptions.[23] Welfare recipients may meet the work provision by being employed, attending vocational training, or performing community service. The Act also mandates a five-year lifetime limit on the receipt of cash welfare payments (though states may exempt up to 20 percent of their recipients).[24] It also provides child care and health insurance for families entering the job market. Finally, most forms of public assistance are denied to legal immigrants for five years or until they become citizens.

The PRWORA also tries to encourage responsibility regarding parenthood. It includes provisions to help enforce the collection of child support payments. Teen pregnancy is discouraged with measures such as requiring that unmarried minor parents must live with an adult and stay in school to receive assistance.

As Figure 2.13 shows, since the enactment of welfare reform, there has been a large drop in the number of families receiving welfare. In 1996, 4.6 million families were receiving welfare. By 2008, this figure had fallen by 65 percent to 1.6 million families.

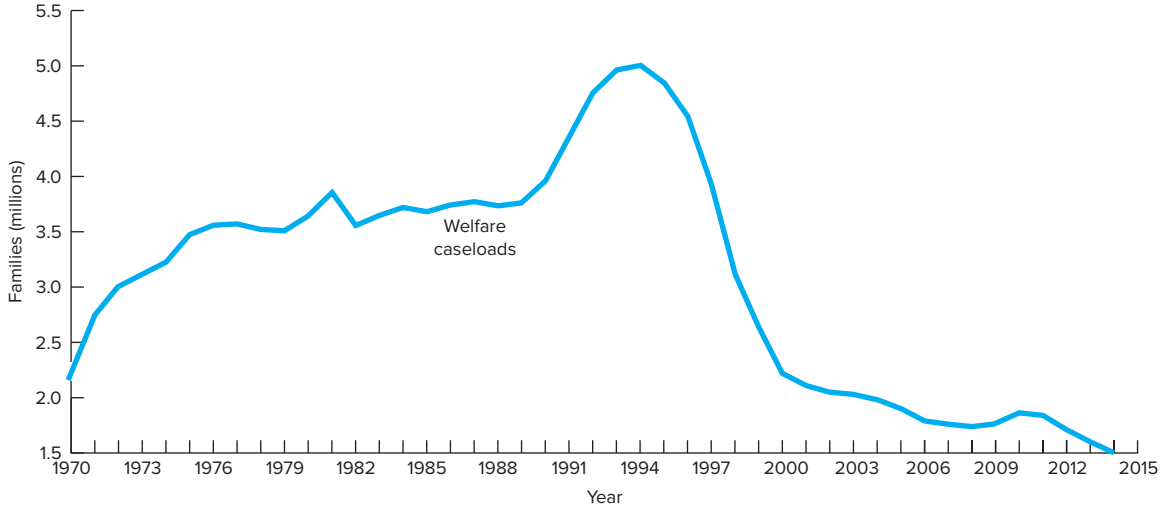
Several factors account for this dramatic drop in caseloads. First, the economic boom during the 1990s improved the labor market conditions facing welfare recipients. The unemployment rate fell over the decade, while inflation-adjusted wages of less skilled workers rose. Wallace and Blank found that the strong economy can explain about one-fifth of the decline in caseloads.[25] Second, the substantial expansion in the early 1990s of the earned income tax credit (EITC)

[23] For an overview of the differences between TANF and AFDC, see Rebecca M. Blank and David T. Ellwood, "The Clinton Legacy for America's Poor," in Jeffrey A. Frankel and Peter R. Orszag (eds.), *American Economic Policy in the 1990s* (Cambridge, MA: MIT Press, 2002).

[24] States are permitted to impose stricter limits if they so choose.

[25] Geoffrey Wallace and Rebecca M. Blank, "What Goes Up Must Come Down? Explaining the Recent Changes in Public Assistance Caseloads," in Sheldon Danziger (ed.), *Economic Conditions and Welfare Reform* (Kalamazoo, MI: Upjohn Institute, 1999).

FIGURE 2.13 Welfare Caseloads
Between 1970 and 1994, welfare caseloads under the Aid to Families with Dependent Children (AFDC) program generally expanded. Following enactment of the Temporary Assistance for Needy Families (TANF) program in 1996, welfare caseloads declined by roughly 70 percent.



WW2.4

program, which provides a tax subsidy to working low-income families, increased the incentive of welfare recipients to enter the labor market and thus lowered the number of recipients.[26] Third, policy changes such as benefit time limits, welfare benefit reductions, child care expansions, and changes in training programs appear to account for a significant portion of the decline in welfare caseloads. The importance of each factor has yet to be precisely determined.[27] The long-run consequences of welfare reform, including its success in reducing poverty rates, remain to be evaluated.[28]

[26] One study suggests that the EITC expansion is the most important factor in reducing the welfare caseload. See Bruce D. Meyer and Dan T. Rosenbaum, "Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers," *Quarterly Journal of Economics,* August 2001, pp. 1063–133. For another study showing a large effect of the EITC, see David T. Ellwood, "The Impact of the Earned Income Tax Credit and Social Policy Reforms on Work, Marriage, and Living Arrangements," *National Tax Journal,* December 2000, pp. 1063–105.

[27] For a review of the early evidence on the impact of welfare reform, see Rebecca M. Blank, "Evaluating Welfare Reform in the United States," *Journal of Economic Literature,* December 2002, pp. 1105–66. Also see Jeffrey Grogger and Lynn A. Karoly, *Welfare Reform: Effects of a Decade of Change* (Cambridge, MA: Harvard University Press, 2005).

[28] For some speculation on the long-run consequences, see David T. Ellwood, "Anti-Poverty Policy for Families in the Next Century: From Welfare to Work—and Worries," *Journal of Economic Perspectives,* Winter 2000, pp. 187–206. It is important to note that the reduction in welfare caseloads has increased caseloads in other public assistance programs such as Supplemental Security Income. See Lucie Schmidt and Purvi Sevak, "AFDC, SSI, and Welfare Reform Aggressiveness: Caseload Reductions versus Caseload Shifting," *Journal of Human Resources,* Summer 2004, pp. 792–812.

2.4 World of Work

The Labor Supply Impact of the Earned Income Tax Credit

Since its initiation in 1975, the earned income tax credit (EITC) has grown rapidly and is now the largest antipoverty program in the United States. Currently over 27 million people participate in the program. Spending on the EITC is nearly as much as the combined spending on Temporary Assistance for Needy Families and food stamps.

The EITC supplements the wages of low-income working families by providing a tax credit that reduces their income tax liability. If the tax credit is larger than the amount of income taxes owed, the family receives a check for the difference. The tax credit increases with the number of children and adults in the family, as well as the amount earned, until a plateau is achieved. For example, in 2015 the maximum tax credit was $5,548 for a married couple with two children who earned $13,870. The EITC is phased out as family income level increases. In 2015 families could participate in the program if their income was less than $53,267.

The EITC has two effects on labor supply. First, labor force participation should rise because only employed people may participate in the program. Second, it has an uncertain effect on the hours worked by employed people. Below the plateau level the EITC is the equivalent to a wage increase, and in the phase-out range above the plateau it acts as a wage decrease. Because wage changes have income and substitution effects that work in opposing directions on hours worked, the labor supply effects among those currently working cannot be determined in theory.

There are many studies of the labor supply effects of the EITC. Hotz and Scholz conclude that the EITC has increased the labor force participation rate, particularly for single parents. In fact, another study has found that the EITC could account for nearly two-thirds of the rise in the participation rate of single mothers between 1984 and 1996. Also, though the program appears to slightly reduce the hours of those currently working, the overall impact on hours worked is positive once the EITC's hours-increasing effect on participation is accounted for.

Source: V. Joseph Hotz and John Karl Scholz, "The Earned Income Tax Credit," in Robert A. Moffitt (ed.), *Means-Tested Transfer Programs in the United States* (Chicago, IL: University of Chicago Press, 2003).

Chapter Summary

1. In the work–leisure choice model, an indifference curve shows the various combinations of income and leisure that will yield a given level of utility to an individual. Indifference curves are convex to the origin, reflecting a diminishing marginal rate of substitution of leisure for income. Curves farther from the origin indicate higher levels of utility.
2. The budget (wage) constraint line shows the various combinations of income and leisure that are obtainable at a given wage rate. The absolute value of the slope of the budget line reflects the wage rate.
3. The individual achieves an optimal or utility-maximizing position by selecting the point that puts him or her on the highest attainable indifference curve.
4. Changing the wage rate and observing predicted changes in one's optimal position suggest the possibility of a backward-bending individual labor supply curve.

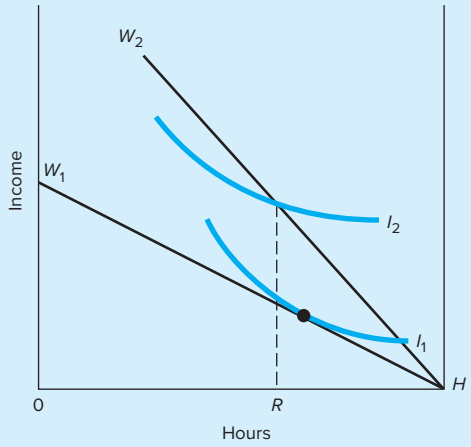
5. The impact of a wage change on hours of work depends on the sizes of the income and substitution effects. The income effect measures the portion of a total change in desired hours of work that is due solely to the change in income caused by the wage change. The substitution effect is the portion of a total change in desired hours of work that is due solely to the wage rate change, the level of income or utility being held constant. For a wage increase (decrease), the income effect decreases (increases) while the substitution effect increases (decreases) desired hours of work.
6. Empirical evidence suggests that women are significantly more responsive to a wage change in their labor supply decisions than are men.
7. The responsiveness of the quantity of labor supplied to a given change in wage rates is measured by the elasticity of labor supply. This is calculated as the percentage change in quantity of labor supplied divided by the percentage change in the wage rate. In contrast, changes in nonlabor income or work–leisure preferences alter the location of an individual's labor supply curve.
8. The case of nonparticipants—individuals who choose not to do labor market work—is portrayed by a corner solution on the right vertical axis of the work–leisure model.
9. The reservation wage is the lowest wage rate at which a person would decide to work.
10. A worker may be overemployed or underemployed when forced to conform to a standard workday. A worker is overemployed (underemployed) when for the standard workday his or her marginal rate of substitution of leisure for income is greater (less) than the wage rate.
11. A system of premium pay—such as time and a half for overtime work—has a more positive effect on work incentives than the straight-time wage rate that would yield an equivalent income for the same hours of work.
12. Most income maintenance programs entail a basic benefit and a benefit reduction rate from which the break-even level of income can be calculated. Because *(a)* the basic benefit causes only an income effect and *(b)* the benefit reduction rate *reduces* the net wage rate, the income and substitution effects both contribute to a decline in desired hours of work.
13. Welfare is no longer an entitlement, but rather is a temporary assistance program. Between 1996 and 2014, the number of welfare recipients declined by about 70 percent.

Terms and Concepts

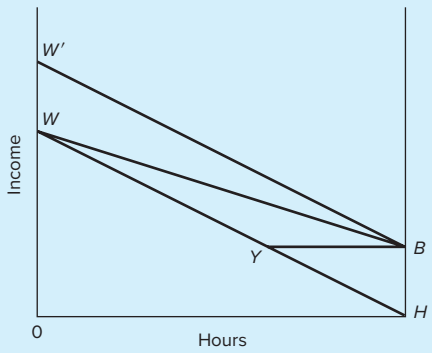
indifference curve
marginal rate of substitution of leisure for income
budget (wage) constraint
optimal work–leisure position
backward-bending labor supply curve
income effect
substitution effect
wage elasticity of labor supply
reservation wage
overemployed
underemployed
income maintenance program
income guarantee or basic benefit
benefit reduction rate
break-even level of income
actual subsidy payment
Temporary Assistance for Needy Families (TANF)

Questions and Study Suggestions

1. What information is embodied in *(a)* an indifference curve and *(b)* the budget line in the work–leisure model? Why are indifference curves *(a)* downward-sloping and *(b)* convex to the origin? Draw an indifference map and budget line and locate a worker's optimal position.
2. Indicate in each of the following instances whether the specified circumstances will cause a worker to want to work more or fewer hours:
   a. The wage rate increases and the substitution effect is greater than the income effect.
   b. The wage rate decreases and the income effect is greater than the substitution effect.
   c. The wage rate decreases and the substitution effect is greater than the income effect.
   d. The wage rate increases and the income effect is greater than the substitution effect.
3. Employ a diagram similar to Figure 2.5 to show an individual's leisure–income choices before and after a wage rate *decrease*. Isolate the income and substitution effects, indicate whether each increases or decreases hours of work, and use the two effects to explain the overall impact of the wage decline on hours of work. Is your worker on the forward-rising or backward-bending portion of the labor supply curve?
4. The "supply-side" economics of the Reagan administration (1981–1988) presumed that income tax cuts would stimulate incentives to work and thereby increase economic growth. Demonstrate this outcome with a work–leisure diagram. What does this outcome assume about the relative sizes of the income and substitution effects? Explain: "The predicted increase in work incentives associated with supply-side tax cuts might in fact be more relevant for women than for men."
5. Suppose Lauren is given two options by her employer. *First option:* She may choose her own hours of work and will be paid the relatively low wage rate implied by budget line HW_1 shown in the accompanying diagram. *Second option:* She can work exactly HR hours and will be paid the relatively high wage rate implied by budget line HW_2. Which option will she choose? Justify your answer.



6. Use a work–leisure diagram that includes nonlabor income to portray an individual who is maximizing utility by working, say, eight hours per day. Now compare the labor supply effects of imposing *(a)* a lump-sum tax (a tax that is the same absolute amount at all levels of earned income) and *(b)* a proportional tax of, say, 30 percent on earned income. Do hours of work rise or fall in each case? Can you generalize these outcomes to *all* individuals in the economy? Explain.
7. What set of circumstances will tend to cause an individual to choose not to participate in the labor force? What generalizations can you formulate on the basis of *(a)* education, *(b)* the presence of preschool children, *(c)* level of spouse's income, *(d)* race, and *(e)* location of a household (urban or rural) on the one hand and the probability that a married woman will be a labor force participant on the other?
8. What is the reservation wage? "Other things being equal, one's reservation wage increases as larger amounts of nonlabor income are realized." Do you agree? Explain. Redraw the indifference curves of Figure 2.8 to demonstrate that anything that lowers (raises) the value of nonmarket time will increase (reduce) the probability of labor force participation.
9. Using Figure 2.10, demonstrate that Smith has a stronger "taste" for leisure and a weaker "taste" for work than Jones. What factor(s) might underlie this difference in tastes? Redraw Smith's indifference curves to show the case where she would rather be a nonparticipant than work the standard *HD* workweek.
10. Use Figure 2.11 to explain the following statement: "Although premium wage rates for overtime work will induce workers to work more hours than would a straight-time equivalent wage rate, the latter will entail a higher level of well-being."
11. If an income maintenance program entails a $3,000 basic benefit and a benefit reduction rate of .30, what will be the size of the subsidy received by a family that earns $2,000 per year? What will be the family's total income? What break-even level of income does this program imply?
12. In the accompanying diagram, *WH* is the budget line resulting from labor market work. Describe the characteristics of the income maintenance programs implicit in budget lines *HBW′, HBYW,* and *HBW*. Given an individual's work–leisure preferences, which program will entail the strongest disincentives to work? Why? Which entails the weakest disincentives to work? Why? "The higher the basic benefit and the higher the benefit reduction rate, the weaker the work incentive." Do you agree?



13. In the United States, payments to disabled workers on the average replace about half of their former earnings. In some other countries such as Sweden and the Netherlands, workers with disabilities receive as much as 70 to 90 percent of their average earnings. We also observe that the proportion of workers receiving disability benefits is much lower in the United States than in the latter two nations. Are these findings consistent with the work–leisure model? Explain.
14. Suppose Congress changed our Social Security law to allow recipients to earn as much as they wanted with no reduction in benefits. Use a work–leisure diagram to show the predicted effects on labor supply.
15. One way of aiding low-income families is to increase the minimum wage. An alternative is to provide a direct grant of nonlabor income. Compare the impact of these two options on work incentives.
16. Evaluate the following statements:
    a. "An employer might reduce worker absenteeism by changing from a standard wage rate to premium pay for hours that exceed a fixed minimum."
    b. "A worker who feels underemployed may moonlight even though the wage rate is somewhat lower than the one paid in the worker's first job."
    c. "Given the wage rate, an individual will always prefer a job in which the worker, as opposed to the employer, selects the number of hours worked."
    d. "If at all points within the work–leisure diagram a person's indifference curves are flatter than the budget constraint, then that individual will choose to be a nonparticipant."
    e. "The income effect of any given wage increase is larger for individuals who are currently working many hours than it is for those who are currently working few or no hours."
17. Steve Slacker is age 25, has an MBA degree, but is not working. Instead he is living at a major ski area, using the $2,000 per week he gets from his wealthy family. The family, however, seeing that Steve is becoming a permanent slacker, ends this weekly payment. As a result, Steve chooses to take a job that pays $1,000 a week for 40 hours of work. Construct a single income–leisure choice graph to show Steve's situation before and after his parents' decision. Briefly summarize the outcome for hours of work, total weekly income, and Steve's total utility.

Internet Exercise

What Has Happened to Welfare Caseloads?

Go to the Administration for Children and Families U.S. Welfare Caseloads statistics website **(http://www.acf.hhs.gov/programs/ofa/programs/tanf/data-reports)**. Click on the link with the most recent caseload figures.

What was the percentage change in the number of TANF families between 1996 and 2008? What are some possible explanations for this change?

What was the number of TANF families in 2008? For the most recent year shown? What is the percentage change over this period? What are the corresponding numbers for your state?

Internet Links

The Office of Family Assistance in the U.S. Department of Health and Human Services publishes detailed information about the Temporary Assistance for Needy Families program (**www.acf.hhs.gov/programs/ofa**).

The Institute for Research on Poverty website provides academic research, research summaries, and policy briefs on issues related to poverty **(http://www.irp.wisc.edu)**.