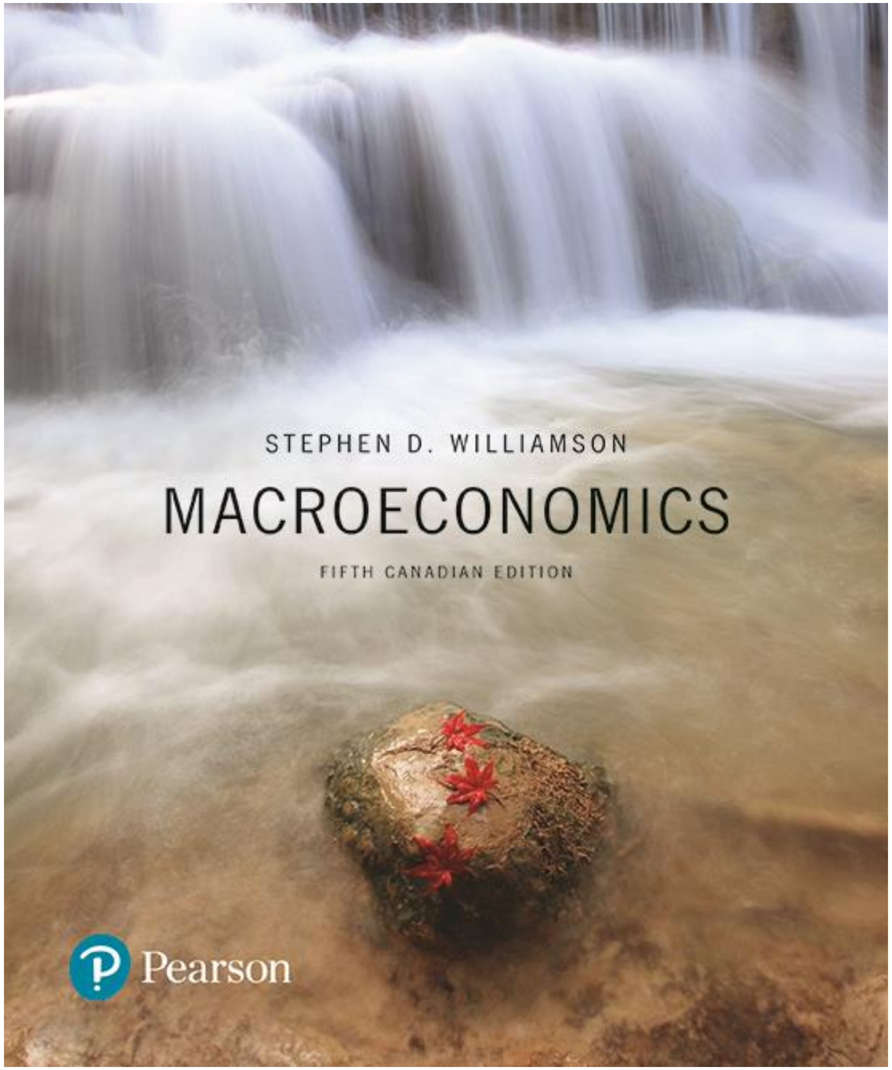
Macroeconomics

Fifth Canadian Edition



Chapter 4

Consumer and Firm Behaviour: The Work-Leisure Decision and Profit Maximization

Chapter 4 Topics

- Behaviour of the representative consumer
- Behaviour of the representative firm

c: consumption
l: leisure

Less leisure => work more => more wage => more income => more consumption
So as the consumption increase, leisure falls.

utility of living is a basket of leisure and consumption, like u(c1)>u(c2)
meanwhile the c1 is picked, l1 is also picked. So we could also say u(c1, l1)>u(c2, l2)

1) More is always better than less: consumer would pick basket that has more things
2) Complexity: consumer would prefer choice that has a higher diversity; i.e., for same utility, more option is better than only one good
3) Income increase, more normal goods consumed, and less inferior goods consumes

The indifference curve is the combination of all possibilities; the utility is same for all points on a same indifference curve, it is just some kind of tradeofff between goods on two axises.

The slope of indifference curve is the marginal rate of substitution.
The shape of the curve must be the convex of the origin.

Representative Consumer

- Consumer’s preferences over consumption and leisure as represented by indifference curves.
- Consumer’s budget constraint.
- Consumer’s optimization problem: making his or herself as well off as possible given his or her budget constraint.
- How does the consumer respond to: (i) an increase in non-wage income; (ii) an increase in the market real wage rate?

Representative Consumer's Indifference Curves

- An indifference curve slopes downward (more is preferred to less).
- An indifference curve is convex (the consumer has a preference for diversity in his or her consumption bundle).

Figure 4.1
Indifference Curves

FIGURE 4.1

Indifference Curves

The figure shows two indifference curves for the consumer. Each indifference curve represents a set of consumption bundles among which the consumer is indifferent. Higher indifference curves represent higher welfare for the consumer.

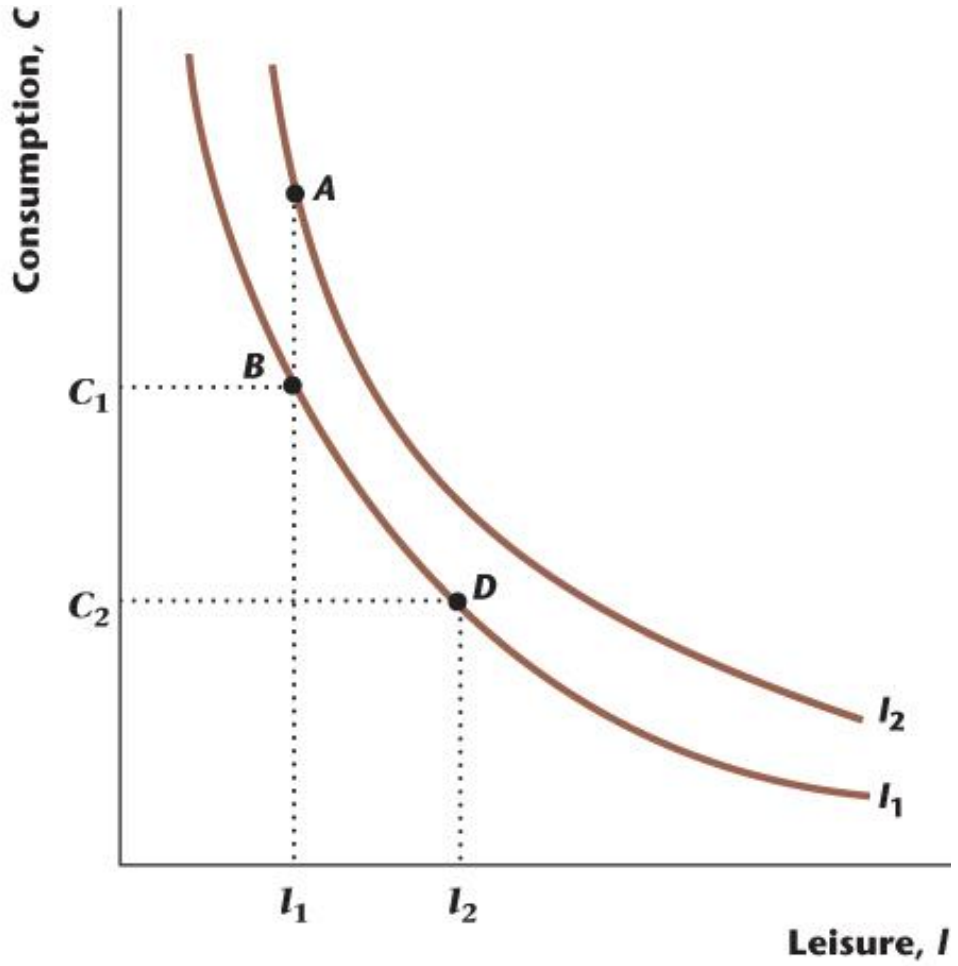


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Figure 4.2
Properties of Indifference Curves

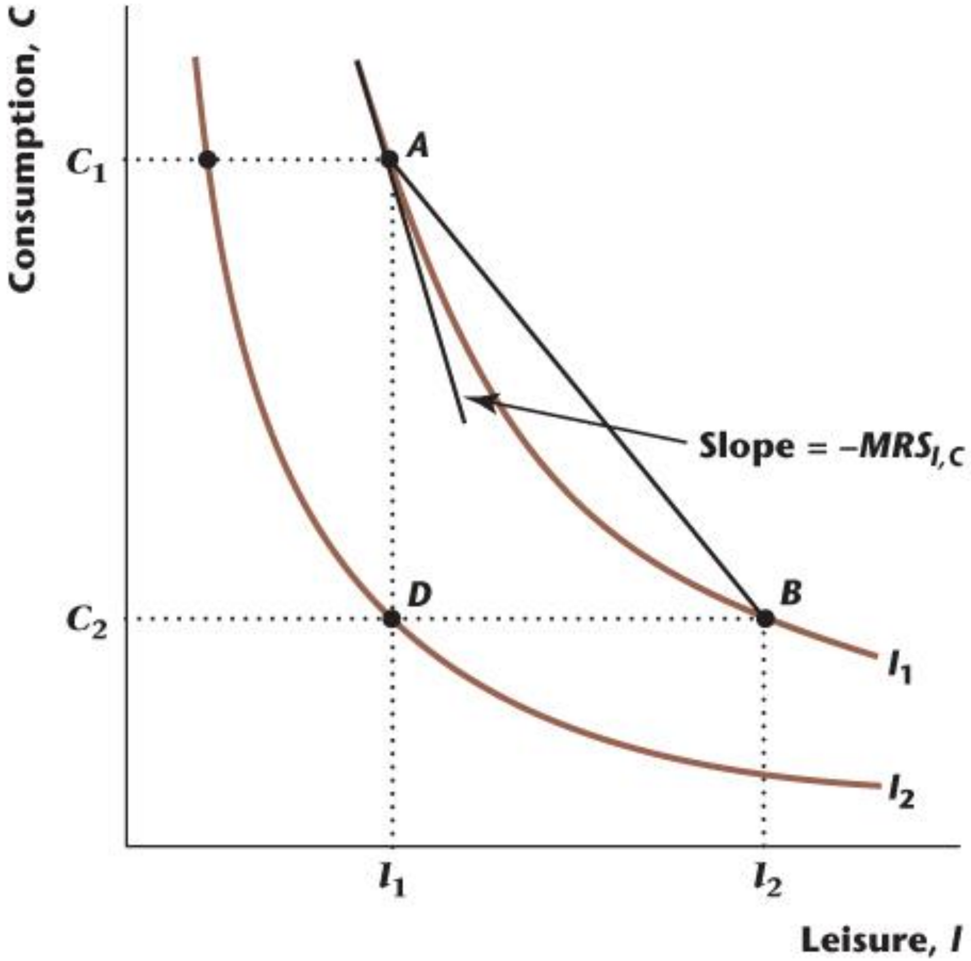


FIGURE 4.2

Properties of Indifference Curves

Indifference curves are downward-sloping because more is preferred to less. A preference for diversity implies that indifference curves are convex (bowed in toward the origin). The slope of an indifference curve is the negative of the marginal rate of substitution.

The Consumer's Time Constraint

$$l + N^S = h,$$

24(h: total hours) = 9(NS: labour supply) + 15(l: leisure)
constrain: u(c, l)
C(consumable income) = w(wage) * NS(hours of labour) + pi(external profit income) - T(tax, lump sum)
pi -T is a constant in this case
So we get NS = h - l
= w(h - l) + pi - T
So, as a result: C = wh - wl + pi -T
l = 0 ==> no leisure, working for 24 hours a day; c = wh + pi - T (y-axis intercept)
l = h ==> not working at all, take rest whole day; c = pi - T > 0 is assumed in this case.
so we get a line that of slope -w, , so at the case that the utility function is tangent to the income curve, the wage is equal to marginal substitution rate. (w = MRS)

The Consumer’s Budget Constraint

- Consumption is equal to total wage income, plus dividend income, minus taxes.

$$C = wN^{S} + \pi - T,$$

The Consumer's Budget Constraint, Accounting for the Time Constraint

$$C = w(h - l) + \pi - T.$$

Rewriting the Budget Constraint

$$C + wl = wh + \pi - T.$$

Rewriting the Budget Constraint Again

$$C = -wl + wh + \pi - T,$$

Figure 4.3

Representative Consumer's Budget Constraint when $T > \pi$

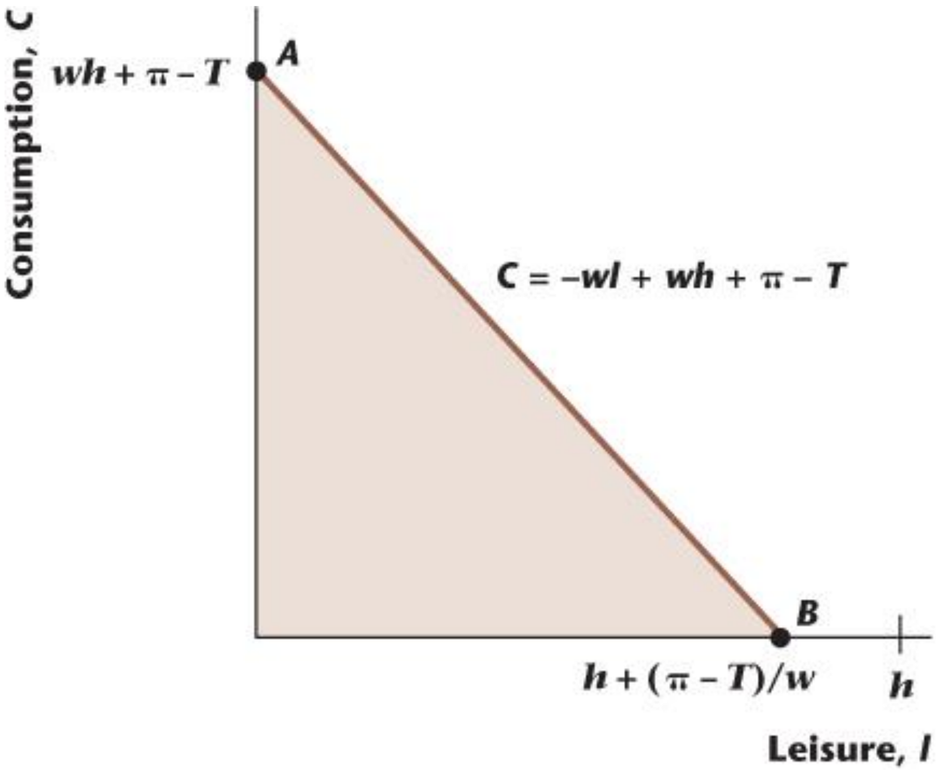


FIGURE 4.3

Representative Consumer's Budget Constraint ($T > \pi$)
The figure shows the consumer's budget constraint for the case where taxes are greater than the consumer's dividend income. The slope of the budget constraint is $-w$, and the constraint shifts with the quantity of nonwage real disposable income, $\pi - T$. All points in the shaded area and on the budget constraint can be purchased by the consumer.

At contrast, c = wh + pi - T if l = 0

At the point where C = 0, 0 = wh - wl + pi -T
l = h + (pi-T)/w
Assuming that pi-T is negative, then the points indicates that you have to work to pay the tax to have minimal consumption.

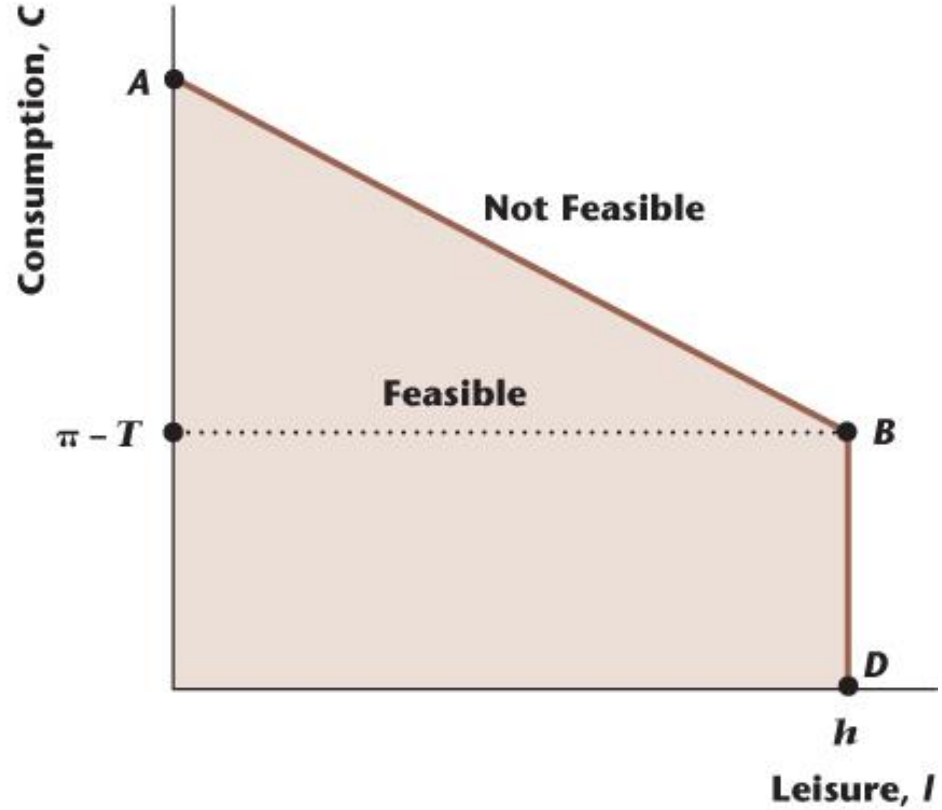
Figure 4.4

Representative Consumer's Budget Constraint $T < \pi$

FIGURE 4.4

Representative Consumer's Budget Constraint ($T < \pi$)

The figure shows the consumer's budget constraint when taxes are less than dividend income. This implies that the budget constraint is kinked. The examples we study will always deal with this case, rather than the one where taxes are greater than dividend income. Consumption bundles in the shaded region and on the budget constraint are feasible for the consumer; all other consumption bundles are not feasible.



1) pi up: more fix income, the budget line shifts up; finding a new tangent point, (the consumption goes up, leisure does not chane)<=
2) w up: more wage, the budget line becomes steeper, and the intercept of y-axis also increase, but point B does not change (if you sleep 24 hours a day, an increase in wage make no difference to you since you don't work at all!), so it looks like a clockwise rotate. Consumption increase, and change in leisure is unknown (increase, decrease, or not change at all).
increase in consumption + decrease in leisure => substitution effect (moving along the curve)
increase in consumption + increase in leisure => income effect (shifting curve)

Consumer Optimization

- The consumer chooses the consumption bundle that is on his or her highest indifference curve, while satisfying his or her budget constraint.

Figure 4.5
Consumer Optimization

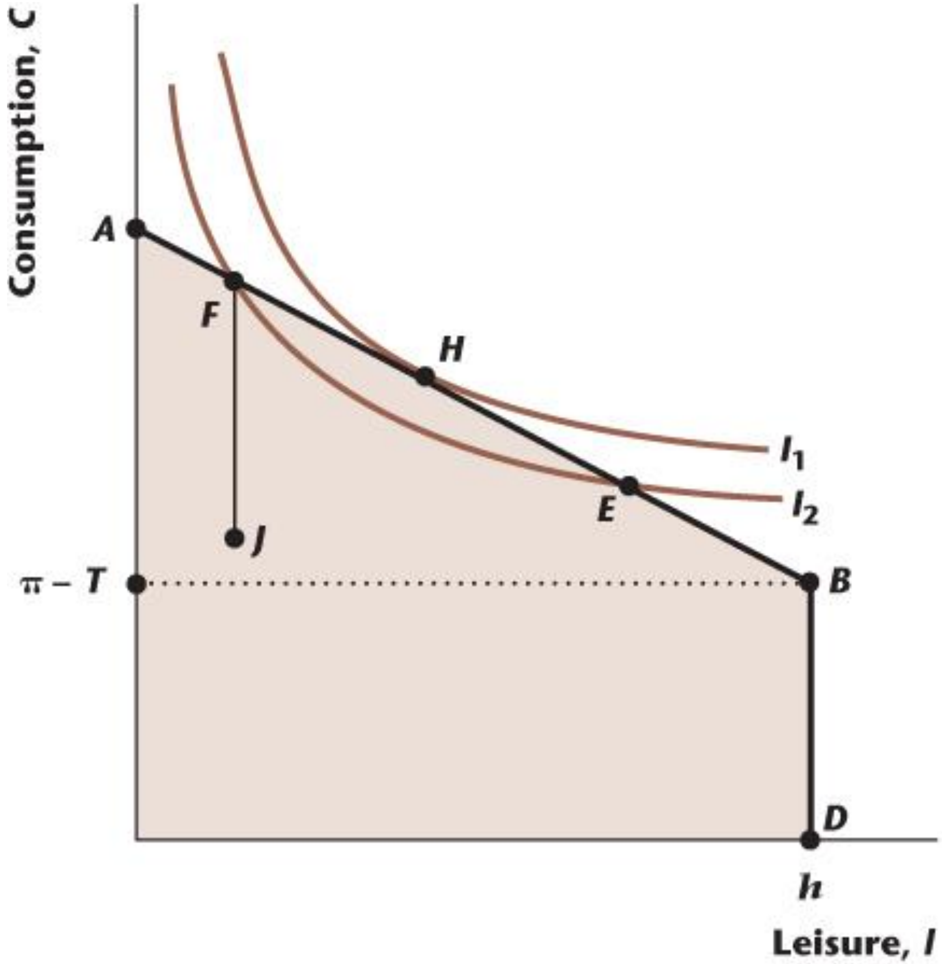


FIGURE 4.5

Consumer Optimization

The consumption bundle represented by point *H*, where an indifference curve is tangent to the budget constraint, is the optimal consumption bundle for the consumer. Points inside the budget constraint, such as *J*, cannot be optimal (more is preferred to less), and such points as *E* and *F*, where an indifference curve cuts the budget constraint, also cannot be optimal.

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Optimization Implies:

- The marginal rate of substitution of leisure for consumption equals the real wage.

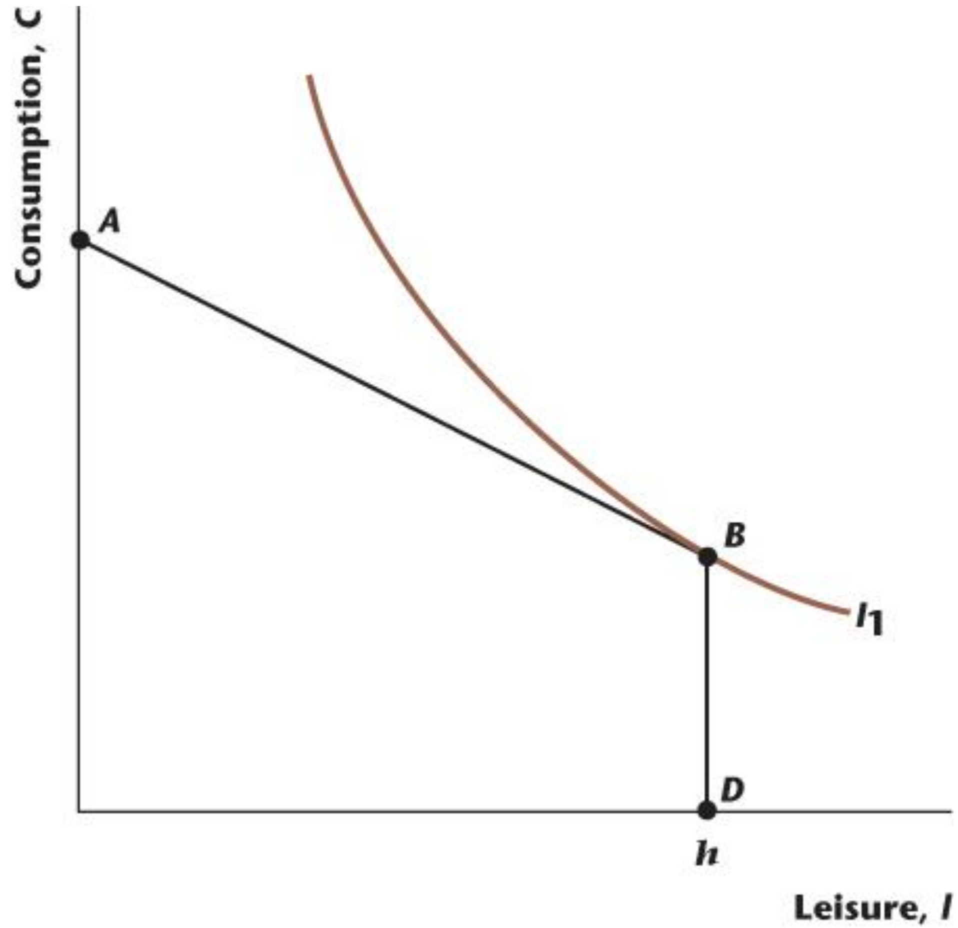
Figure 4.6

The Representative Consumer Chooses Not to Work

FIGURE 4.6

The Representative Consumer Chooses Not to Work

The consumer's optimal consumption bundle is at the kink in the budget constraint, at B, so that the consumer does not work ($l = h$). This is a situation that cannot happen, taking into account consistency between the actions of the consumer and of firms.



Real Dividends or Taxes Change for the Consumer

- Assume that consumption and leisure are both normal goods.
- An increase in dividends or a decrease in taxes will then cause the consumer to increase consumption and reduce the quantity of labour supplied (increase leisure).

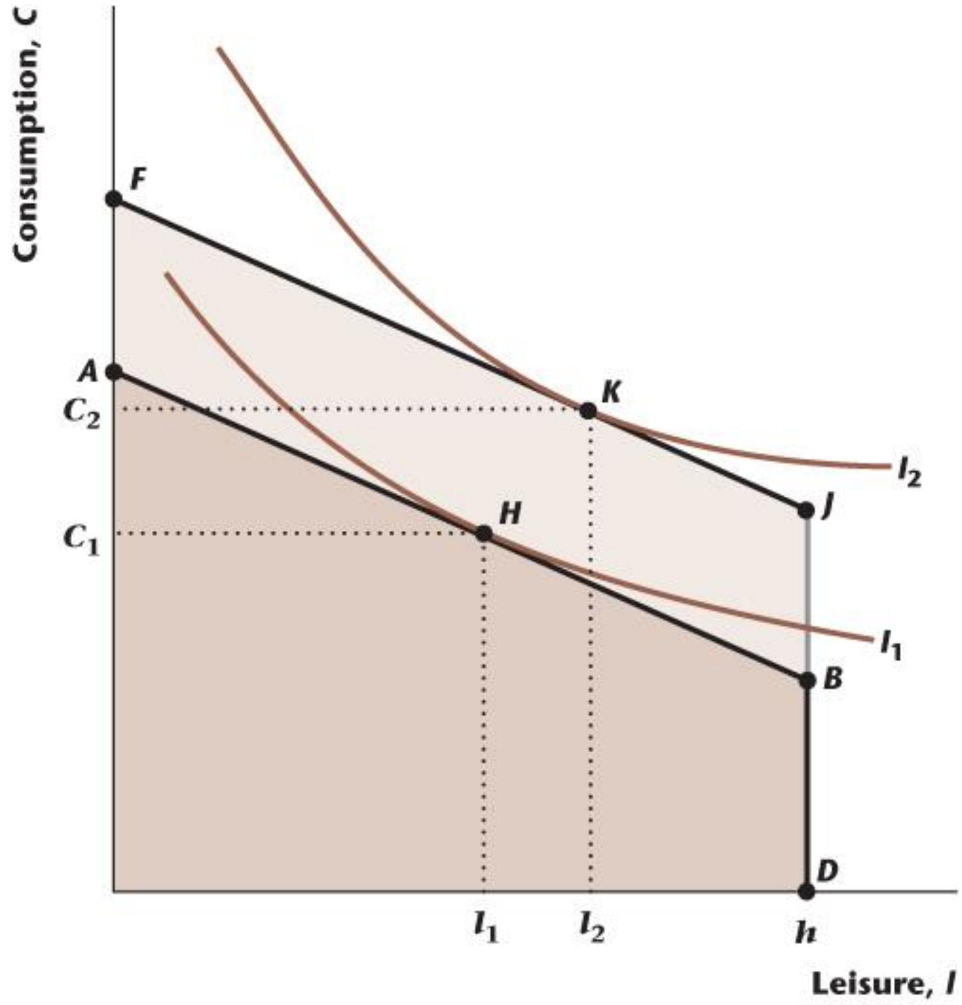
Figure 4.7

An Increase in the Consumer’s Dividend Income

FIGURE 4.7

An Increase in the Consumer’s Dividend Income

Initially the consumer chooses *H*, and when dividend income rises (or taxes fall), this shifts the budget constraint out in a parallel fashion (the real wage, which determines the slope of the budget constraint, stays constant). Consumption and leisure both increase, as both are normal goods.



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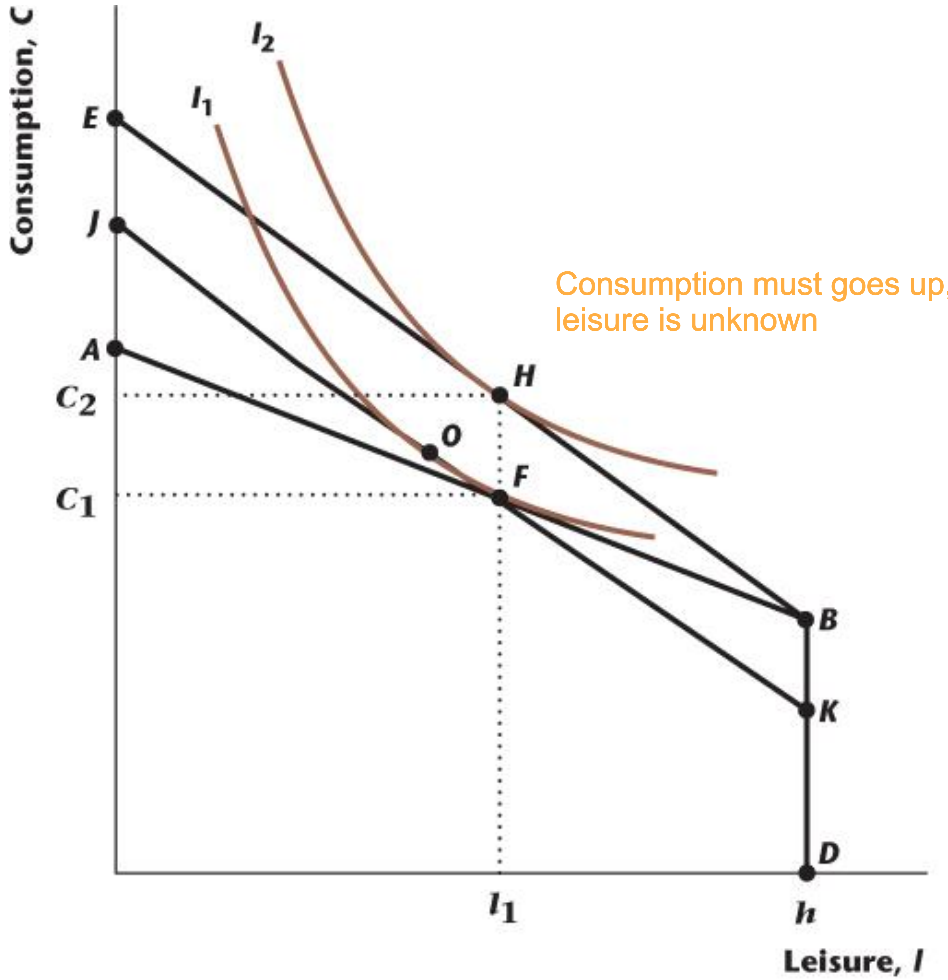
An Increase in the Market Real Wage Rate

- This has income and substitution effects.
- Substitution effect: the price of leisure rises, so the consumer substitutes from leisure to consumption.
- Income effect: the consumer is effectively more wealthy and, since both goods are normal, consumption increases and leisure increases.
- Conclusion: Consumption must rise, but leisure may rise or fall.

Figure 4.8

Increase in the Real Wage Rate–Income and Substitution Effects



Consumption must goes up, but leisure is unknown

FIGURE 4.8

Increase in the Real Wage Rate—Income and Substitution Effects

An increase in the real wage shifts the budget constraint from *ABD* to *EBD*. The kink in the constraint remains fixed, and the budget constraint becomes steeper. Consumption must increase but leisure may rise or fall because of opposing substitution and income effects. The substitution effect is the movement from *F* to *O*; the income effect is the movement from *O* to *H*.

Both c and l increase => income effect dominate substitution effect
C increase but l decrease => substitution effect dominate income effect

Give a vertical line crossing the origin tangent point:
Substitution effect => left-hand side
Income sffect => right-hand side

Figure 4.10
Labour Supply Curve

FIGURE 4.10

Labour Supply Curve

The labour supply curve tells us how much labour the consumer wants to supply for each possible value for the real wage. Here, the labour supply curve is upward-sloping, which implies that the substitution effect of an increase in the real wage is larger than the income effect for the consumer.

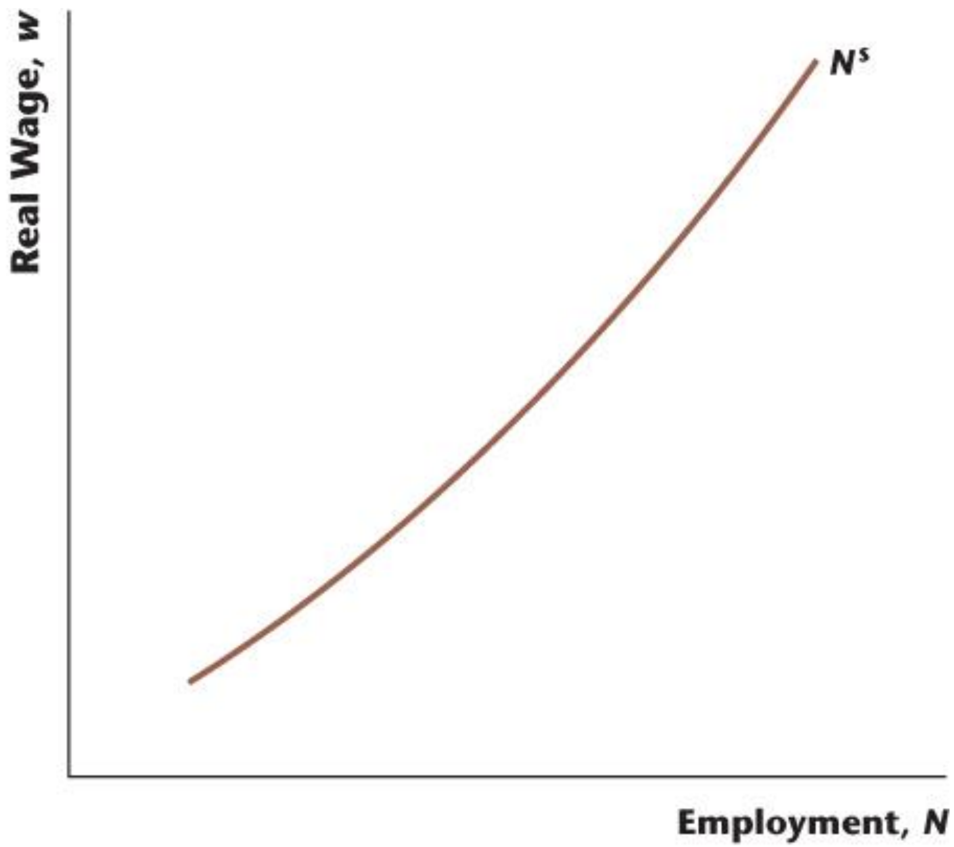


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Figure 4.11

Effect of an Increase in Dividend Income or a Decrease in Taxes

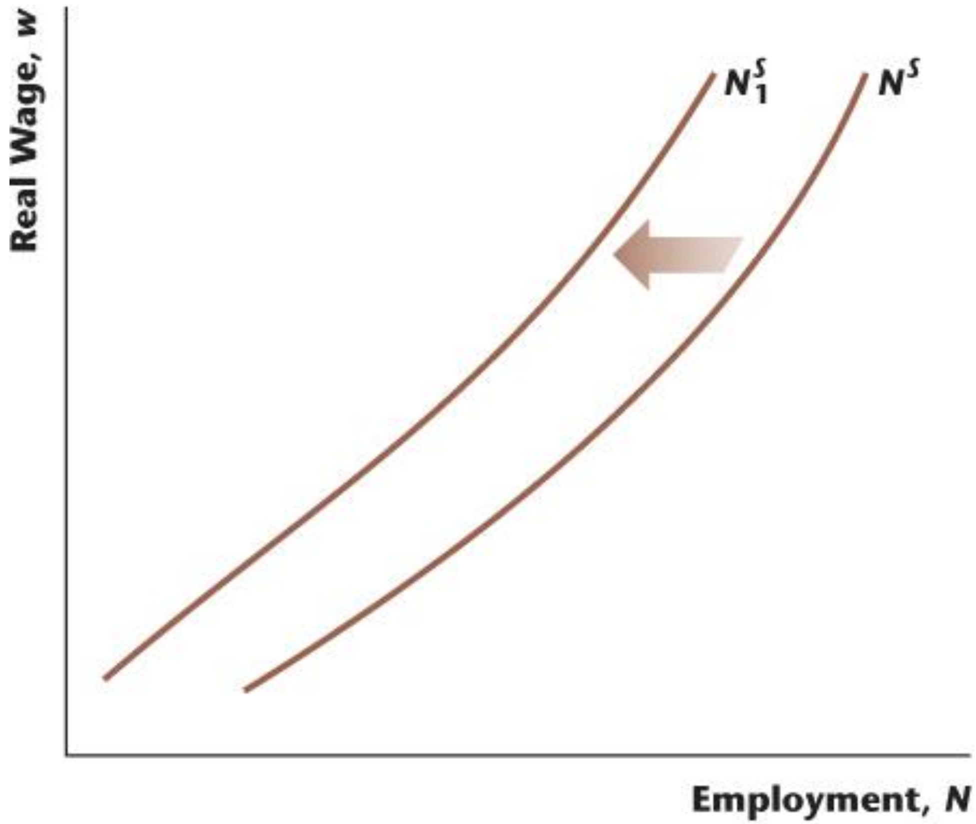


FIGURE 4.11

Effect of an Increase in Dividend Income or a Decrease in Taxes

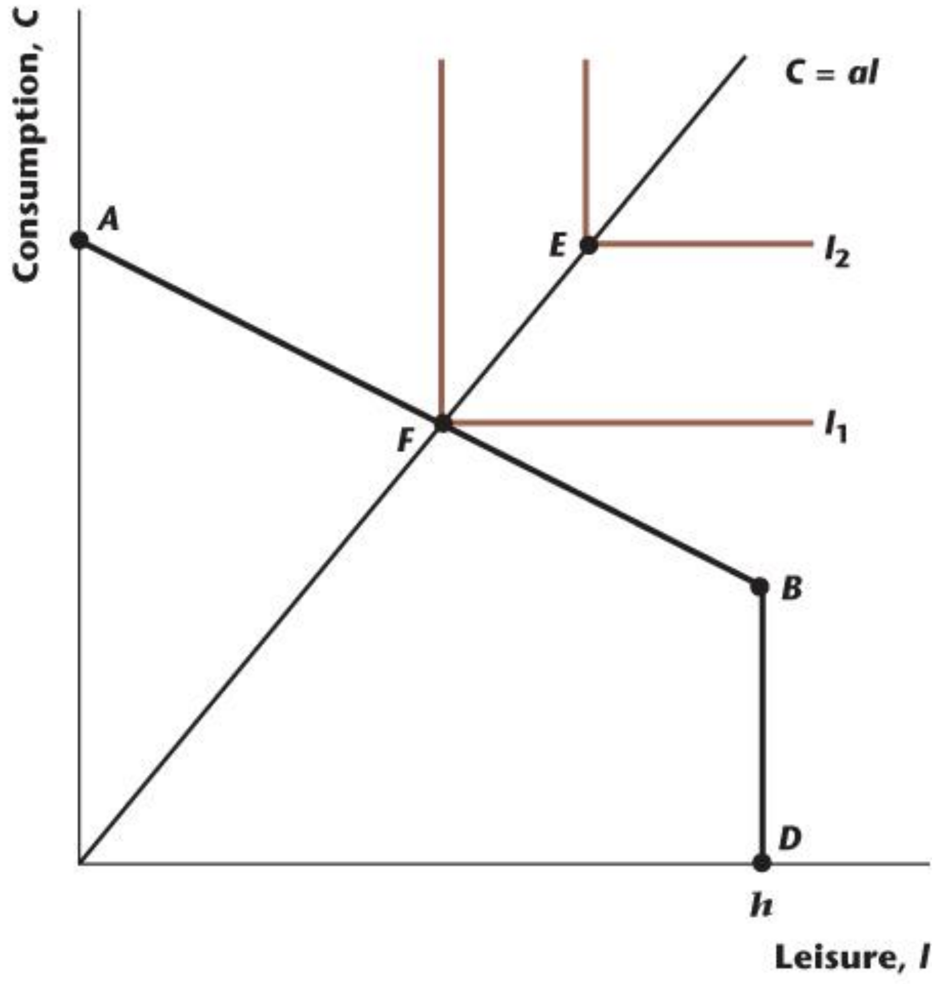
The labour supply curve shifts to the left when dividend income increases or taxes fall because of a positive income effect on leisure for the consumer.

If pi - T increase; you have more income, so there is an increase in leisure

Figure 4.12
Perfect Complements

FIGURE 4.12

Perfect Complements
When consumption and leisure are perfect complements for the consumer, indifference curves are L-shaped with right angles along the line $C = al$, where a is a constant. The budget constraint is ABD, and the optimal consumption bundle will always be on the line $C = al$.



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The Representative Firm

- The production function.
- Profit maximization and labour demand.

The Firm's Production Function

$$Y = zF(K, N^d),$$

Y = Z(factor) * F(k(capital), Nd(labour demand))

Properties of the Firm's Production Function

- Constant returns to scale.
- Output increases with increases in either the labour input or the capital input.
- The marginal product of labour decreases as the labour input increases.
- The marginal product of capital decreases as the capital input increases.
- The marginal product of labour increases as the quantity of the capital input increases.

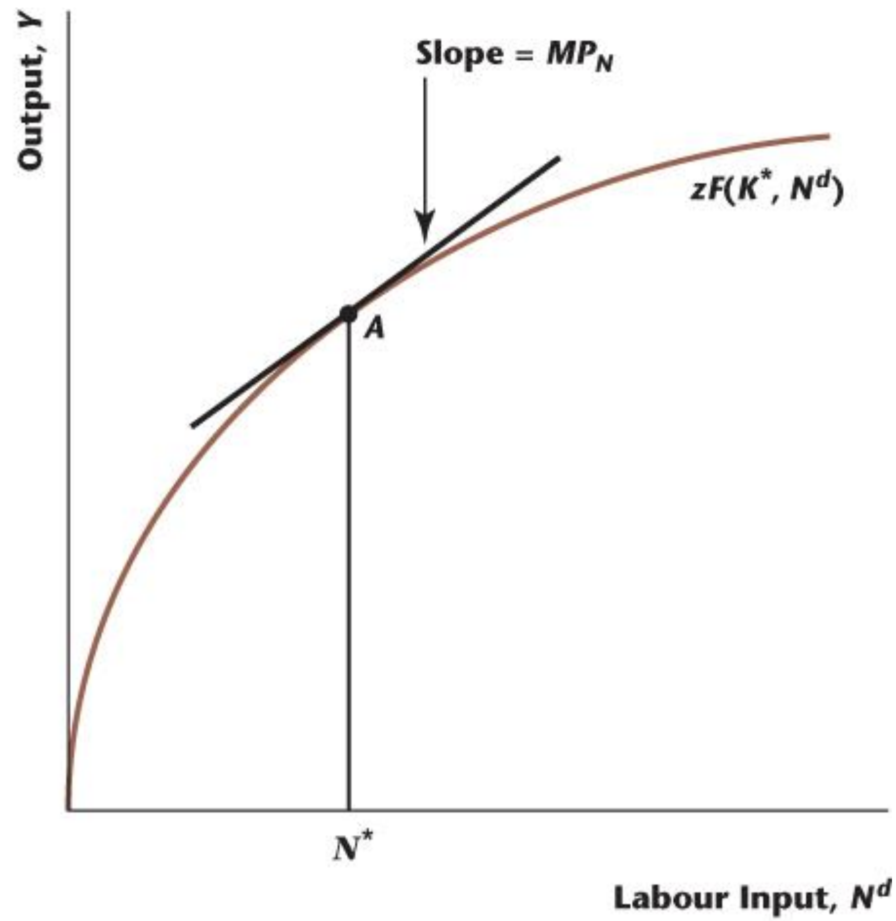
Figure 4.13

Production Function, Fixing the Quantity of Capital and Varying the Quantity of Labour

FIGURE 4.13

Production Function, Fixing the Quantity of Capital, and Varying the Quantity of Labour

The marginal product of labour is the slope of the production function at a given point. Note that the marginal product of labour declines with the quantity of labour.



MPn (marginal produtivity of labour) = dY/dN

Gross-product function: Y = Z* K^α * N^(1-α)
It indicates how the ration of labour and tech would brings to the productivity.

So we get:
MPn = (1-α) * Z* K^α * N^(-α)

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Figure 4.14

Production Function, Fixing the Quantity of Labour and Varying the Quantity of Capital

FIGURE 4.14

Production Function, Fixing the Quantity of Labour, and Varying the Quantity of Capital

The slope of the production function is the marginal product of capital, and the marginal product of capital declines with the quantity of capital.

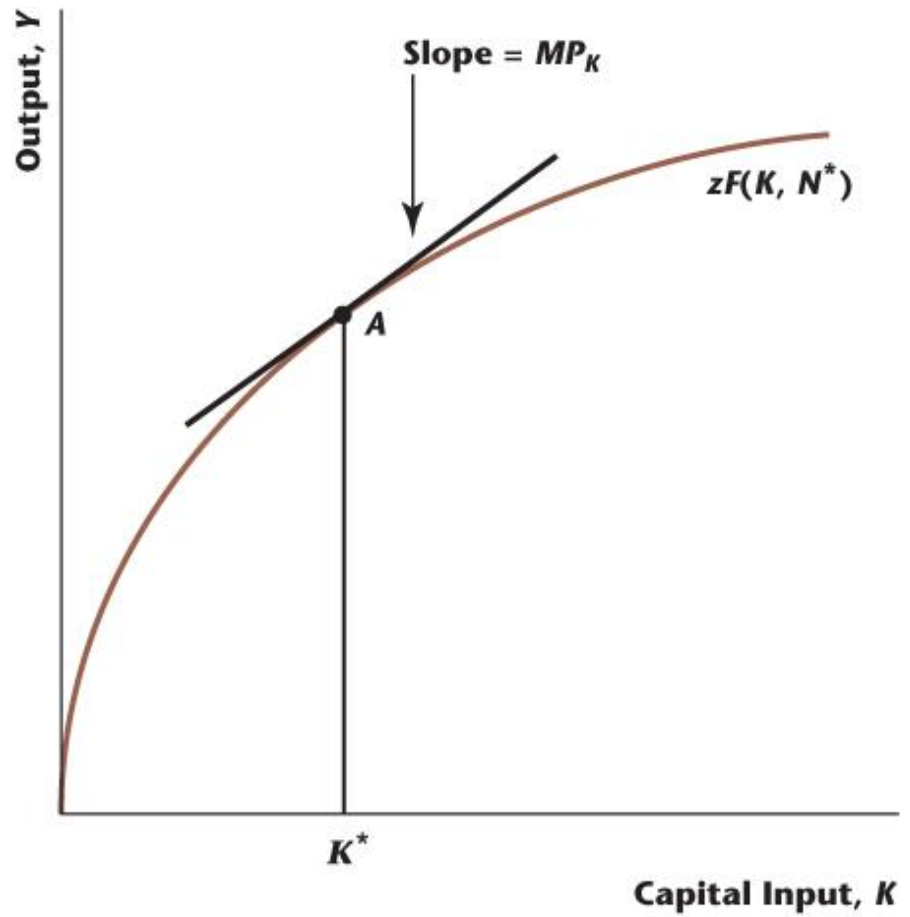

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Figure 4.15
Marginal Product of Labour Schedule for the Representative Firm

FIGURE 4.15

Marginal Product of Labour Schedule for the Representative Firm

The marginal product of labour declines as the quantity of labour used in the production process increases.

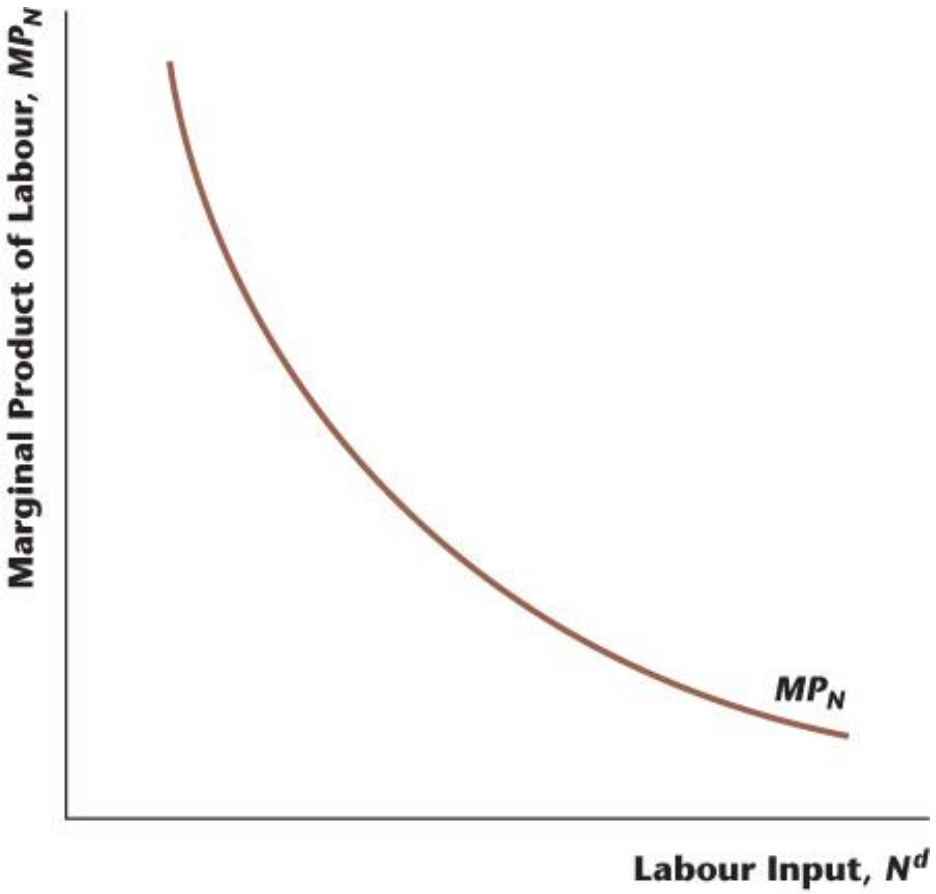

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Figure 4.16

Adding Capital Increases the Marginal Product of Labour

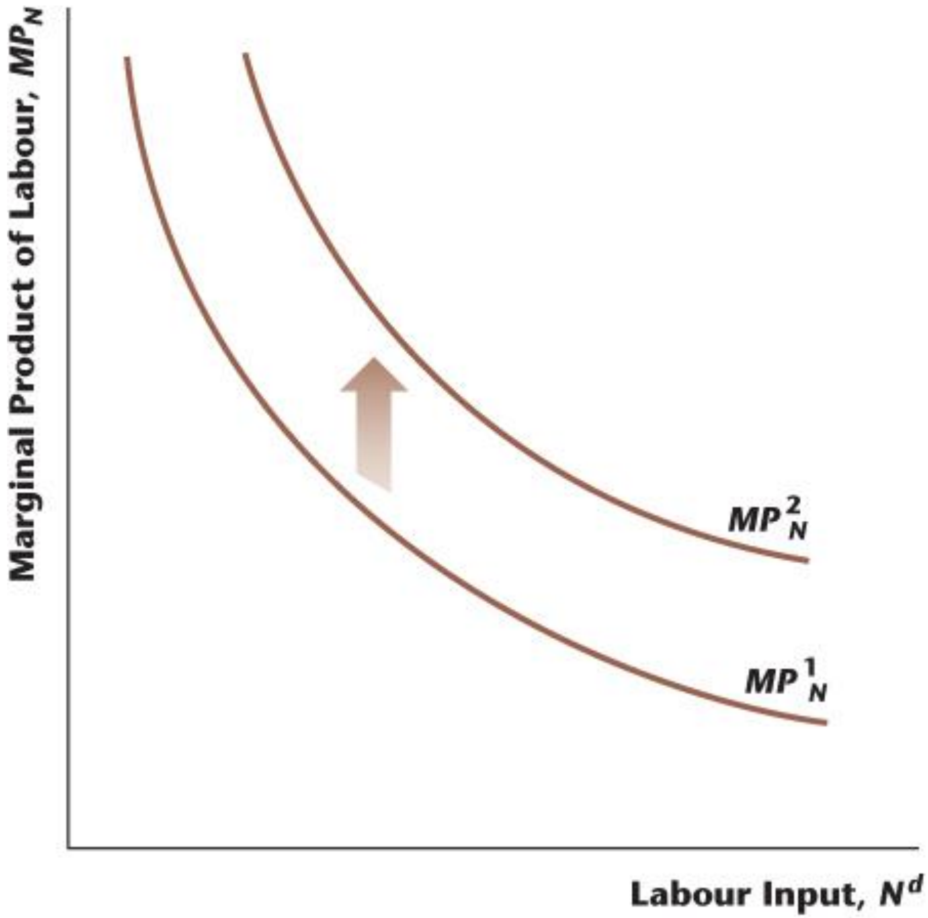

FIGURE 4.16

Adding Capital Increases the Marginal Product of Labour

For each quantity of the labour input, the marginal product of labour increases when the quantity of capital used in production increases.

Figure 4.17
Total Factor Productivity Increases

FIGURE 4.17

Total Factor Productivity Increases

An increase in total factor productivity has two effects: More output is produced given each quantity of the labour input, and the marginal product of labour increases for each quantity of the labour input.

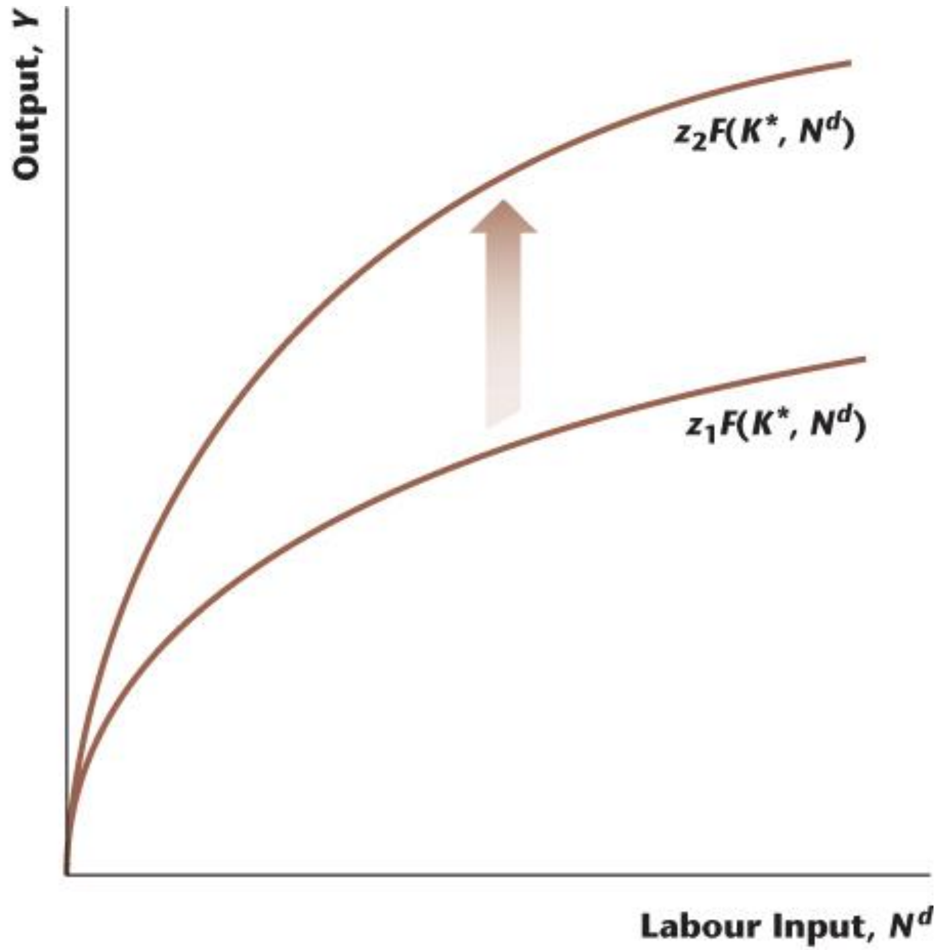

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Figure 4.18

Effect of an Increase in Total Factor Productivity on the Marginal Product of Labour

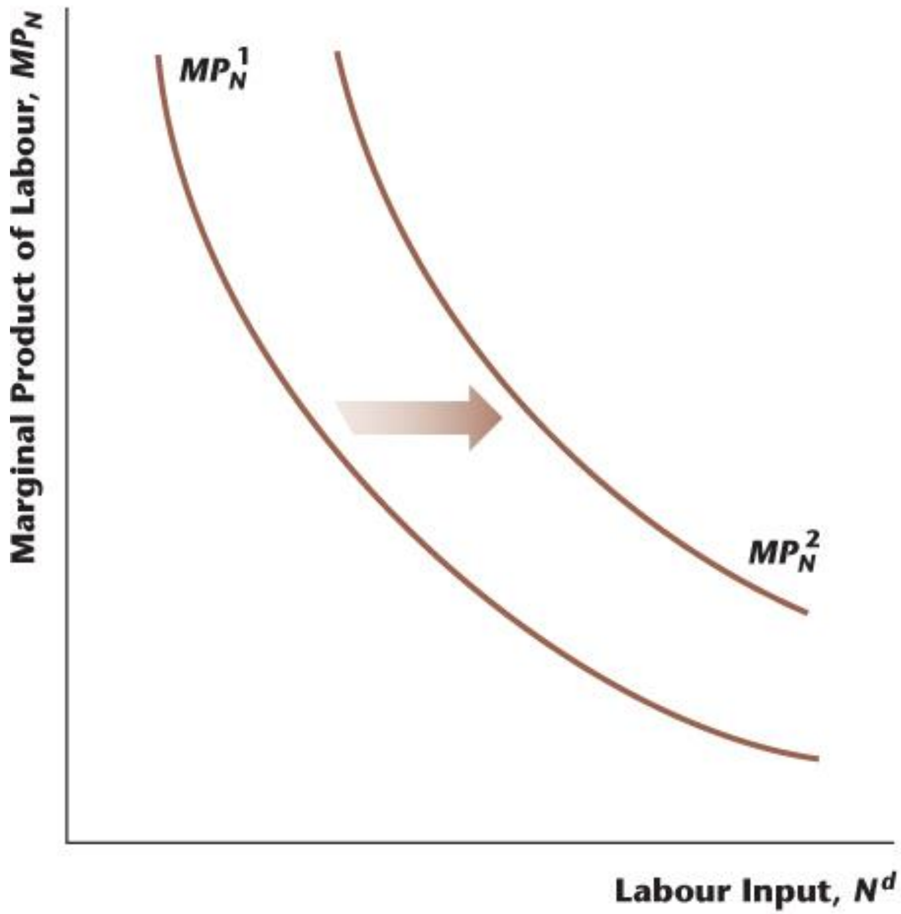

FIGURE 4.18

Effect of an Increase in Total Factor Productivity on the Marginal Product of Labour

When total factor productivity increases, the marginal product of labour schedule shifts to the right.

Profit Maximization

When the firm maximizes profits, the marginal product of labour equals the real wage.

$$MP_N = w$$

pi = Y - wN (pi here indicates the turning point)
dpi/dN = dY/dN - wdN/dN = 0

Figure 4.19

The Solow Residual for Canada, 1961–2014

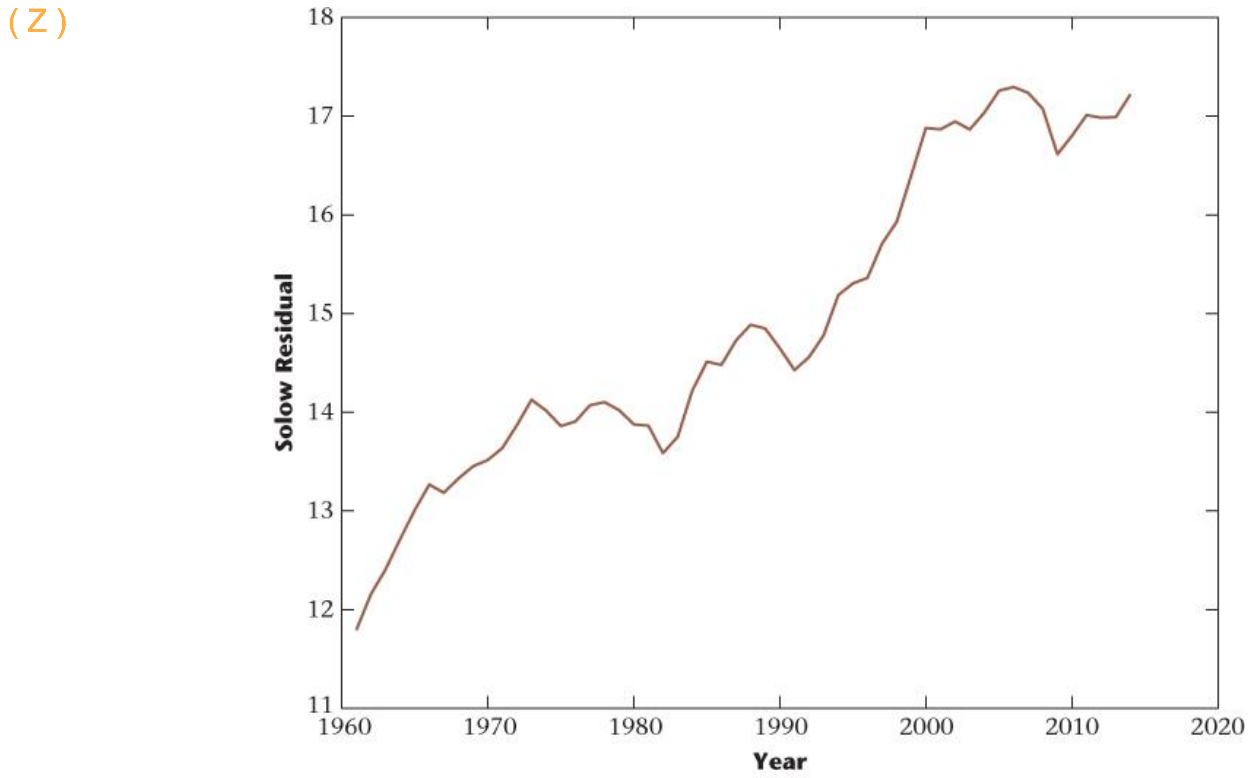

FIGURE 4.19

The Solow Residual for Canada, 1961–2014

The Solow residual is a measure of total factor productivity, and it is calculated here by using a Cobb–Douglas production function. Measured total factor productivity has increased over time, and it also fluctuates about trend, as shown.

Source: Adapted from the Statistics Canada CANSIM database, Series v3860085, v2461119, v3822183, v1078498, and from the Statistics Canada publication *Historical Statistics of Canada*, Catalogue 11-516, 1983, Series D175–189.

Figure 4.20

Revenue, Variable Costs, and Profit Maximization

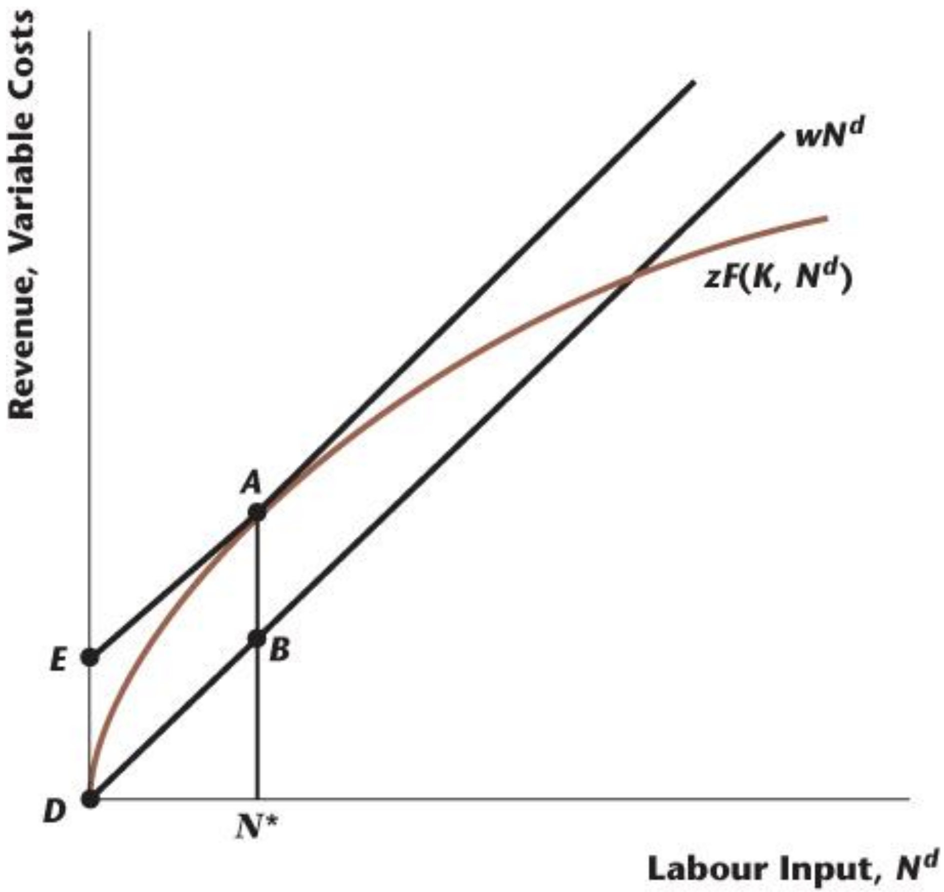

FIGURE 4.20

Revenue, Variable Costs, and Profit Maximization

$Y = zF(K, N^d)$ is the firm's revenue, while wN^d is the firm's variable cost. Profits are the difference between the former and the latter. The firm maximizes profits at the point where marginal revenue equals marginal cost, or $MP_N = w$. Maximized profits are the distance AB, or the distance ED.

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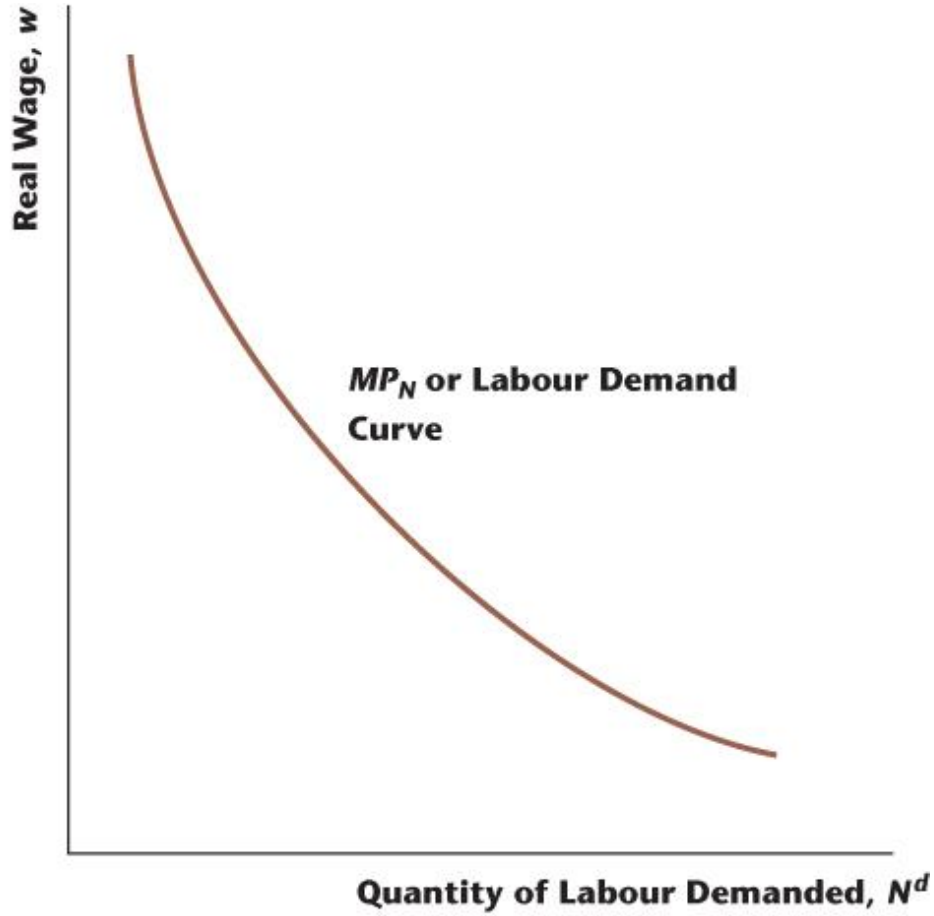
Figure 4.21

The Marginal Product of Labour Curve Is the Labour Demand Curve of the Profit-Maximizing Firm

FIGURE 4.21

The Marginal Product of Labour Curve Is the Labour Demand Curve of the Profit-Maximizing Firm

This is true because the firm hires labour up to the point where $MP_N = w$.



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