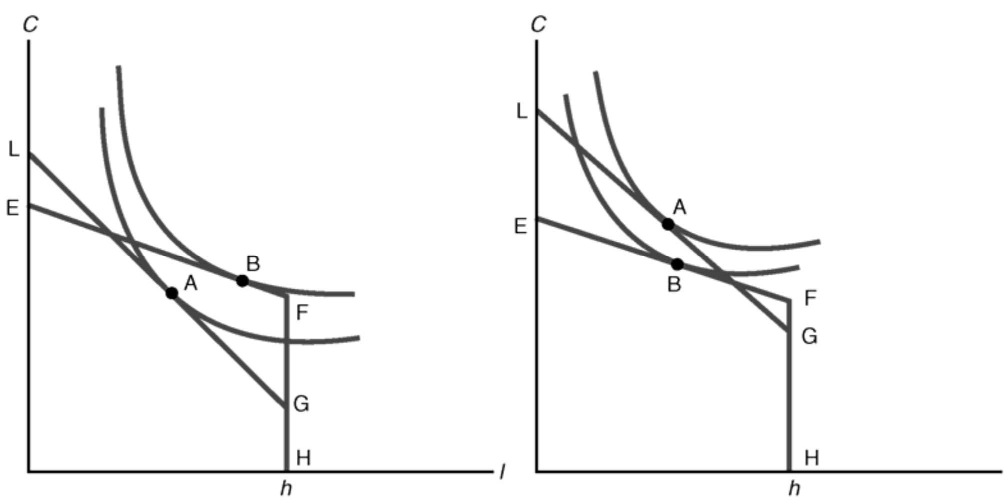
E322_Intermediate Macroeconomics
Homework_03_Solutions
Chapter_04

4. The increase in dividend income shifts the budget line upward. The reduction in the wage rate flattens the budget line. One possibility is depicted in Figure 4.4. The original budget constraint HGL shifts to HFE. There are two income effects in this case. The increase in dividend income is a positive income effect. The reduction in the wage rate is a negative income effect. The drawing in the top panel of Figure 4.4 shows the case where these two income effects exactly cancel out. In this case we are left with a pure substitution effect that moves the consumer from point A to point B. Therefore, consumption falls and leisure increases. As leisure increases, hours of work must fall. The middle panel of Figure 4.4 shows a case in which the increase in dividend income, the distance GF, is larger and so the income effect is positive. The consumer winds up on a higher indifference curve, leisure unambiguously increases, and consumption may either increase or decrease. The bottom panel of Figure 4.4 shows a case in which the increase in dividend income, the distance GF, is smaller and so the income effect is negative. The consumer winds up on a lower indifference curve, consumption unambiguously decreases, and leisure may either increase or decreases.



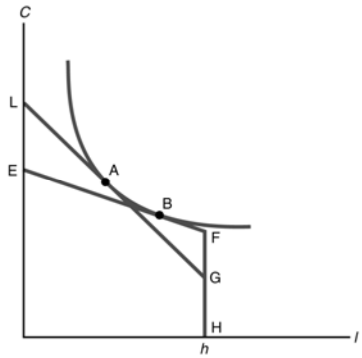


Figure 4.4

7. The firm chooses its labor input, N^d, so as to maximize profits. When there is no tax, profits for the firm are given by

$$\pi = zF(K, N^d) - wN^d .$$

That is, profits are the difference between revenue and costs. In the top panel in Figure 4.7 the revenue function is $zF(K, N^d)$ and the cost function is the straight line, wN^d. The firm maximizes profits by choosing the quantity of labor where the slope of the revenue function equals the slope of the cost function:

$$MP_N = w .$$

The firm's demand for labor curve is the marginal product of labor schedule in the bottom panel of Figure 4.7.

With a tax that is proportional to the firm's output, the firm's profits are given by:

$$\begin{aligned}\pi &= zF(K, N^d) - wN^d - tzF(K, N^d) \\ &= (1-t)zF(K, N^d),\end{aligned}$$

where the term $(1-t)zF(K, N^d)$ is the after-tax revenue function, and as before, wN^d is the cost function. In the top panel of Figure 4.7, the tax acts to shift down the revenue function for the firm and reduces the slope of the revenue function. As before, the firm will maximize profits by choosing the quantity of labor input where the slope of the revenue function is equal to the slope of the cost function, but the slope of the revenue function is $(1-t)MP_N$, so the firm chooses the quantity of labor where

$$(1-t)MP_N = w .$$

In the bottom panel of Figure 4.7, the labor demand curve is now $(1-t)MP_N$, and the labor demand curve has shifted down. The tax acts to reduce the after-tax marginal product of labor, and the firm will hire less labor at any given real wage.

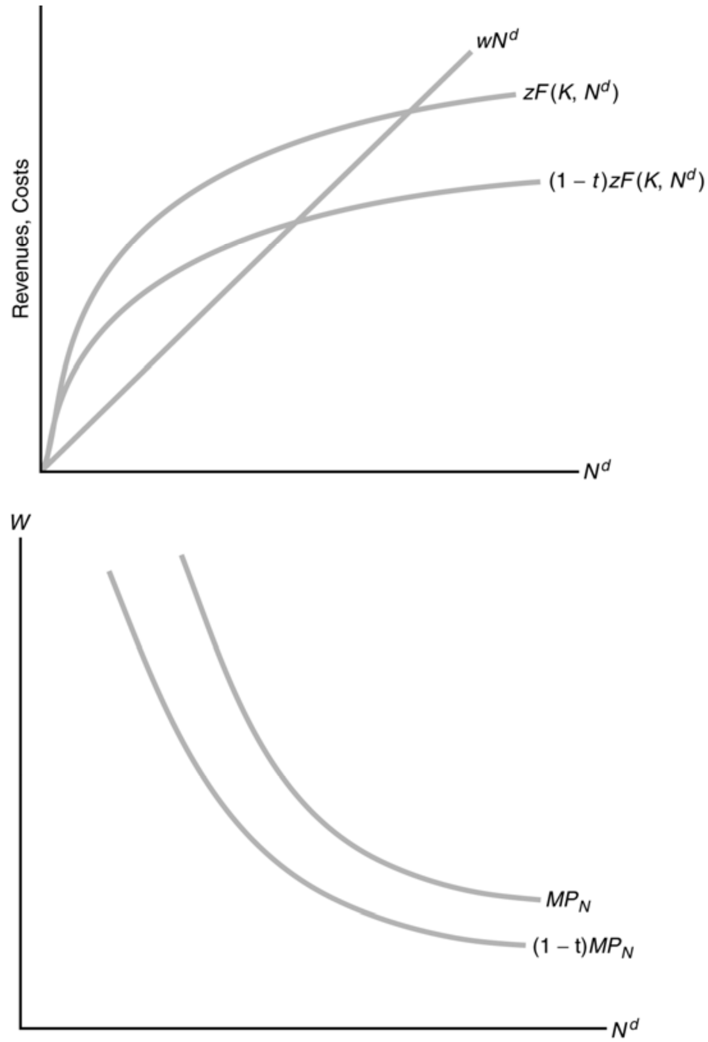


Figure 4.7

10. The level of output produced by one worker who works $h - l$ hours is given by

$$Y = zF(K, h - l).$$

This equation is plotted in Figure 4.10. The slope of this production possibilities frontier is simply $-MP_N$.

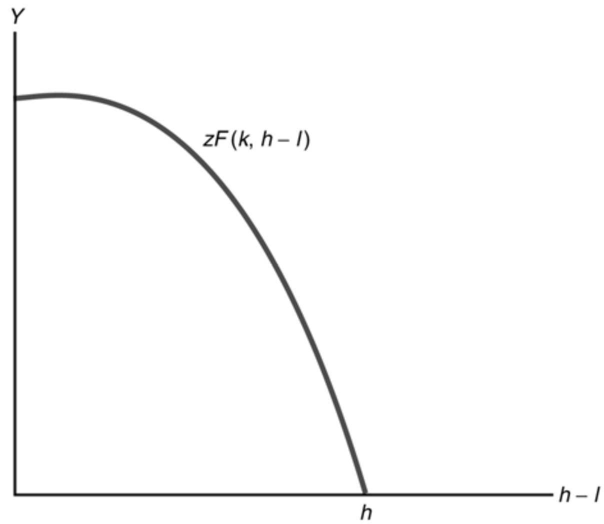


Figure 4.10

11. $Y = zK^{0.3}n^{0.7}$

(a) $Y = n^{0.7}$. See the top panel in Figure 4.11. The marginal product of labor is positive and diminishing.

(b) $Y = 2n^{0.7}$. See Figure 4.11.

(c) $Y = 2^{0.3}n^{0.7} \approx 1.23n^{0.7}$. See Figure 4.11.

(d) See the bottom panel of Figure 4.11.

$$z = 1, K = 1 \Rightarrow MP_N = 0.7n^{-0.3}$$
$$z = 2, K = 1 \Rightarrow MP_N = 1.4n^{-0.3}$$
$$z = 1, K = 2 \Rightarrow MP_N = 2^{0.3} \times 0.7n^{-0.3} \approx 0.86n^{-0.3}$$

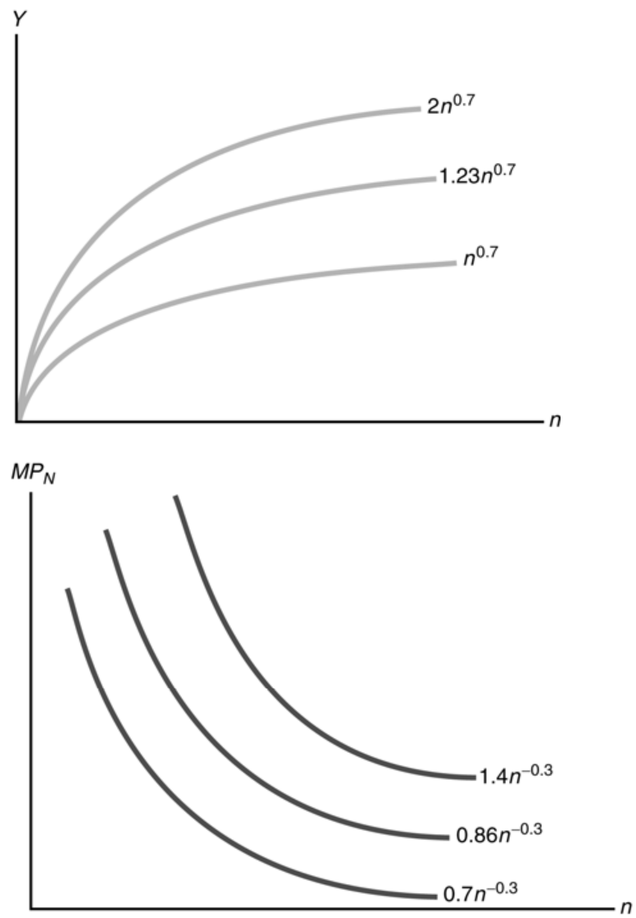


Figure 4.11