

Suggested Solutions to Practice Problems (Chapter 09)

1. Given information:

$$y = 100$$

$$y' = 120$$

$$t = 20$$

$$t' = 10$$

$$r = 0.1$$

a) To calculate wealth, we compute:

$$we = y - t + \frac{y' - t'}{1 + r} = 80 + \frac{110}{1.1} = 180$$

b) In the perfect complements case, the indifference curves are like I_1 and I_2 in Figure 9.1.

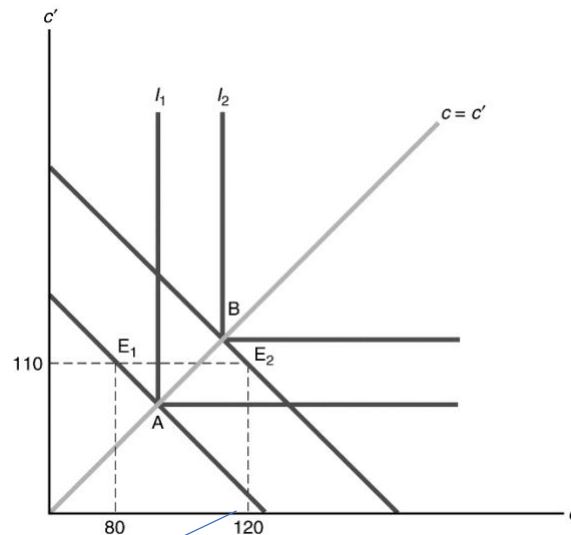


Figure 9.1

c) The consumer's optimal consumption bundle is at point A. Point A simultaneously solves:

$$c = c', \text{ and}$$

$$c + \frac{c'}{1 + r} = c + .91c' = 180$$

Upon solving, we find that $c = c' = 94.2$. Savings is therefore given by:

$$s = y - t - c = 80 - 94.2 = -14.2 .$$

The consumer is a borrower. In Figure 9.1, the endowment point is E_1 and the consumer chooses A.

- d) First-period income rises from 100 to 140. We now recompute $w = 220$. Solving as in part c, we find that $c = c' = 115.2$ and $s = 4.8$. In Figure 9.1, the endowment point is E_2 and the consumer chooses B.
- e) In part c), the consumer is a borrower. In part d), first-period income increases and savings has consequently increased enough that the consumer is now a lender.

3. Temporary and Permanent Tax Increases.

- a) The increase in first-period taxes induces a parallel leftward shift in the budget line. The original budget line passes through the initial endowment, E_1 . The new budget line passes through E_2 . The consumer reduces both current and future consumption. In Figure 9.3 the consumer's optimum point moves from point A to point B. First-period consumption falls by less than the increase in taxes and so savings falls.

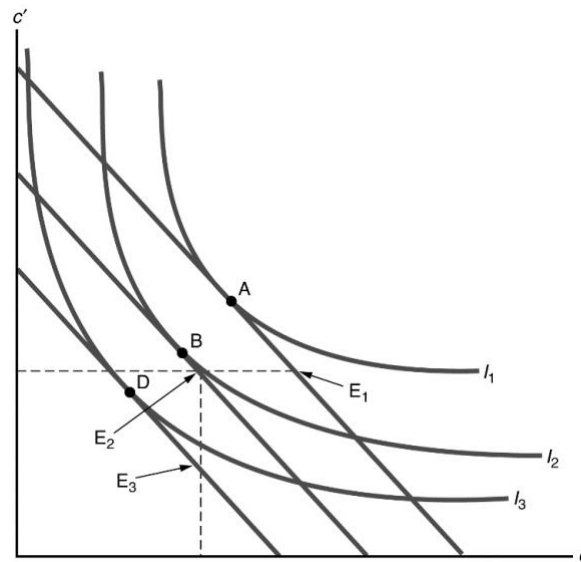


Figure 9.3

- b) Next consider a permanent increase in taxes. A permanent tax increase adds a second tax increase to the first tax increase, the current-period tax increase. The increase in second-period taxes induces a parallel downward shift in the budget line. The new budget line passes through E_2 in Figure 9.3. The second part of the tax increase also reduces both first-period and second-period consumption. The consumer moves from point B to point D. Because the second tax increase reduces first-period consumption holding first-period disposable income fixed, savings must rise. Since the permanent tax increase is the sum of the two individual tax increases, the permanent tax increase reduces both first-period

and second-period consumption; however, on net, savings may either rise, fall, or remain unchanged.

8. Given information:

$$y = 200$$

$$y' = 150$$

$$t = 40$$

$$t' = 50$$

$$r = 0.05$$

- a) If the consumer could borrow and lend at the real interest rate, $r = 0.05$, then the consumer's lifetime budget constraint would be given by:

$$c + \frac{c'}{(1+r)} = y - t + \frac{y' - t'}{(1+r)}.$$

Plugging in the numbers from this problem, we obtain:

$$c + 0.95c' = 255.2.$$

In the left panel of Figure 9.7, the initial budget constraint is given by BE_1D . The budget constraint has a kink at the initial endowment point $E_1 = (160, 100)$, because the consumer cannot borrow, and therefore cannot consume, more than 160 in the first period. Because the consumer has perfect-complements preferences, the indifference curves are kinked at $c = c'$.

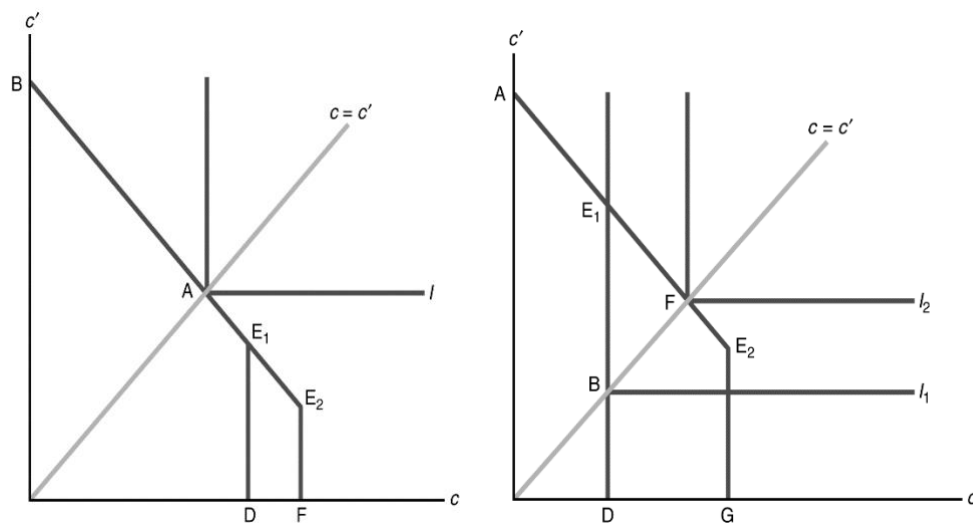


Figure 9.7

- b) With perfect-complements preferences, the consumer picks point A in the left panel of Figure 9.8. Plugging $c = c'$ into the budget constraint and solving, we find that $c = c' =$

130.9 and so $s = y - t - c = 160 - 130.7 = 29.3$. In this case, the fact that the consumer cannot borrow does not matter for the consumer's choice, as the consumer decides to be a lender.

- c) When $t = 20$ and $t' = 71$, the consumer's lifetime wealth remains unchanged at 255.2. However, the budget constraint shifts to BE_2F , in the left panel of Figure 8.8, with the new endowment point at $E_2 = (180, 79)$. This change does not matter for the consumer's choice, again because he or she chooses to be a lender. Consumption is still 130.9, but now savings is $s = y - t - c = 180 - 130.9 = 49.1$.
- d) Now first-period income falls to 100. Wealth is now equal to $w = 155.2$. In the right panel of Figure 9.7, the budget constraint for the consumer is AE_1D , so when the consumer chooses the point on his or her budget constraint which is on the highest indifference curve, any point on the line segment BE_1 will do. Suppose that the consumer chooses the endowment point E_1 , where $c = 60$ and $c' = 100$. This implies that $s = 0$, and the consumer is credit-constrained in that he or she would like to borrow, but cannot. Now with the tax change, the budget constraint shifts to AE_2G , with the endowment point $E_2 = (80, 79)$. Thus the consumer can choose $c = c'$ on the new budget constraint, and solving for consumption in each period using the budget constraint

$$c + 0.95c' = 155.2,$$

we get $c = c' = 79.6$, and $s = 0.4$. Here, notice that first-period consumption increased by almost the same amount as the tax cut, although lifetime wealth remains unchanged at 155.2. Effectively, the budget constraint for the consumer is relaxed. Therefore, for tax cuts that leave lifetime wealth unchanged, lenders will not change their current consumption, but credit-constrained borrowers will increase current consumption.

11. Given information:

$$y = 50$$

$$y' = 60$$

$$t = 10$$

$$t' = 20$$

$$r = 0.08$$

- a) First consider the consumers' budget constraint. All consumers receive identical amounts of income and pay identical amounts of taxes. Therefore, all consumers face:

$$c = y - t + \frac{y' - t' - c'}{1.08} = 50 - 10 + \frac{60 - 20 - c'}{1.08}.$$

For the consumers who consume 60 in the second period:

$$c = 40 - \frac{20}{1.08} = 21.48 \Rightarrow s = 40 - 21.48 = 18.52 .$$

For the consumers who consume 20 in the second period:

$$c = 40 + \frac{20}{1.08} = 58.52 \Rightarrow s = 40 - 58.52 = -18.52 .$$

b) Aggregate first-period consumption is given by:

$$C = 500 \times 21.48 + 500 \times 58.52 = 40,000.$$

Total GDP for the first period is equal to 50 000. Therefore, $G = 10\,000$. Since aggregate disposable income (40 000) is exactly equal to aggregate consumption, aggregate private savings is equal to zero. First-period government spending and first-period taxes are equal, so the government budget deficit is also zero. To satisfy the government budget constraint, second-period government spending must equal second-period taxes minus principal and interest on first-period government debt. The government has no debt to repay, and so second-period taxes and second-period government spending both equal 20 000.

c) Assuming that consumers do not change their spending plans, we modify the calculation from part a to obtain:

$$c = y - t + \frac{y' - t' - c'}{1.08} = 35 + \frac{40 - c'}{1.08} .$$

The consumers who save now consume 16.48 (rationale: $c = 35 + ((40 - 60)/1.08) = 16.48$) in the first period. The consumers who borrow now consume 53.52 in the first period. Disposable income and consumption fall by the same amount, so first-period private savings is unchanged. Since private savings is unchanged, the government continues to issue no debt, and so government spending must equal 15 000.