

Continued from page 526

EFFECTS OF CHANGES IN INCOME

A change in income will shift the budget constraint bb' in Figure E-6. Consider only increases in income and no changes in price. The budget constraint will shift outward. Each new budget line will be parallel to the original one because we are not allowing a change in the relative prices of golf outings and restaurant meals. We would now like to find out how an individual consumer responds to successive increases in income when relative prices remain constant. We do this in Figure E-7. We start out with an income that is represented by a budget line bb' . Consumer optimum is at point E , where the consumer attains the highest indifference curve I_1 , given the budget constraint bb' . Now we let income increase. This is shown by a shift outward in the budget line to cc' . The consumer attains a new optimum at point E' . That is where a higher indifference curve I_2 is reached. Again, the consumer's income is increased so that the new budget line is dd' . The new optimum now moves to E'' . This is where indifference curve I_3 is reached. If we connect the three consumer optimum points, E , E' , and E'' , we have what is called an income-consumption curve. The **income-consumption curve** shows the optimum consumption points that would occur if income for that consumer were increased continuously, holding the prices of golf outings and restaurant meals constant.

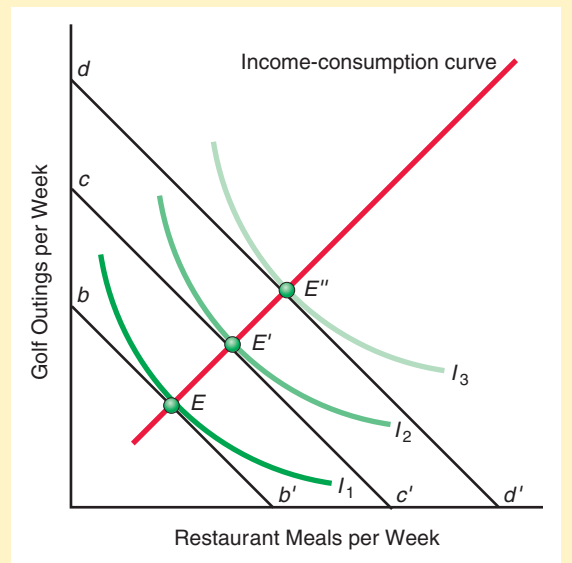
Income-consumption curve

The set of optimal consumption points that would occur if income were increased, relative prices remaining constant.

FIGURE E-7

Income-Consumption Curve

We start off with income sufficient to yield budget constraint bb' . The highest attainable indifference curve is I_1 , which is just tangent to bb' at E . Next we increase income. The budget line moves outward to cc' , which is parallel to bb' . The new highest indifference curve is I_2 , which is just tangent to cc' at E' . We increase income again, which is represented by a shift in the budget line to dd' . The new tangency point of the highest indifference curve, I_3 with dd' , is at point E'' . When we connect these three points, we obtain the income-consumption curve., which we draw as a straight line as a simplification.



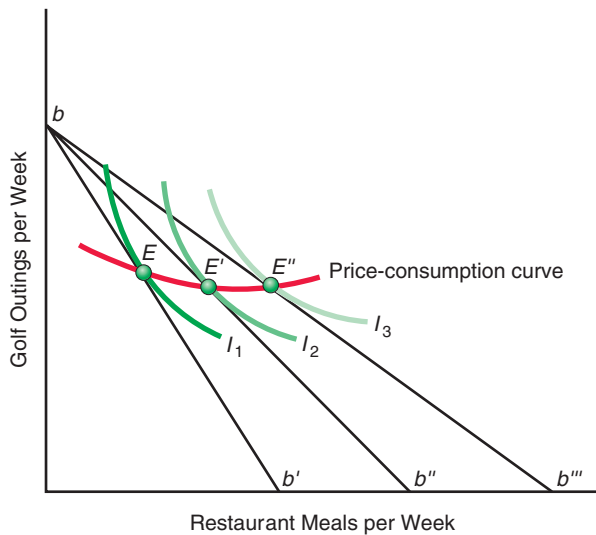


FIGURE E-8

Price-Consumption Curve

As we lower the price of restaurant meals, income measured in terms of restaurant meals per week increases. We show this by rotating the budget constraint from bb' to bb'' and finally to bb''' . We then find the highest indifference curve that is attainable for each successive budget constraint. For budget constraint bb' , the highest indifference curve is I_1 , which is tangent to bb' , at point E . We do this for the next two budget constraints. When we connect the optimum points, E , E' , and E'' , we derive the price-consumption curve, which shows the combinations of the two commodities that a consumer will purchase when money income and the price of one commodity remain constant while the other commodity's price changes.

THE PRICE-CONSUMPTION CURVE

In Figure E-8, we hold money income and the price of golf outings constant while we lower the price of restaurant meals. As we keep lowering the price of restaurant meals, the quantity of meals that could be purchased if all income were spent on restaurant meals increases; thus, the extreme points for the budget constraint keep moving outward to the right as the price of restaurant meals falls. In other words, the budget line rotates outward from bb' to bb'' and bb''' . Each time the price of restaurant meals falls, a new budget line is formed. There has to be a new optimum point. We find it by locating on each new budget line the highest attainable indifference curve. This is shown at points E , E' , and E'' . We see that as price decreases for restaurant meals, the consumer purchases more restaurant meals per week. We call the line connecting points E , E' , and E'' the **price-consumption curve**. It connects the tangency points of the budget constraints and indifference curves, thus showing the amounts of two goods that a consumer will buy when money income and the price of one commodity are held constant while the price of the remaining good changes.

Price-consumption curve

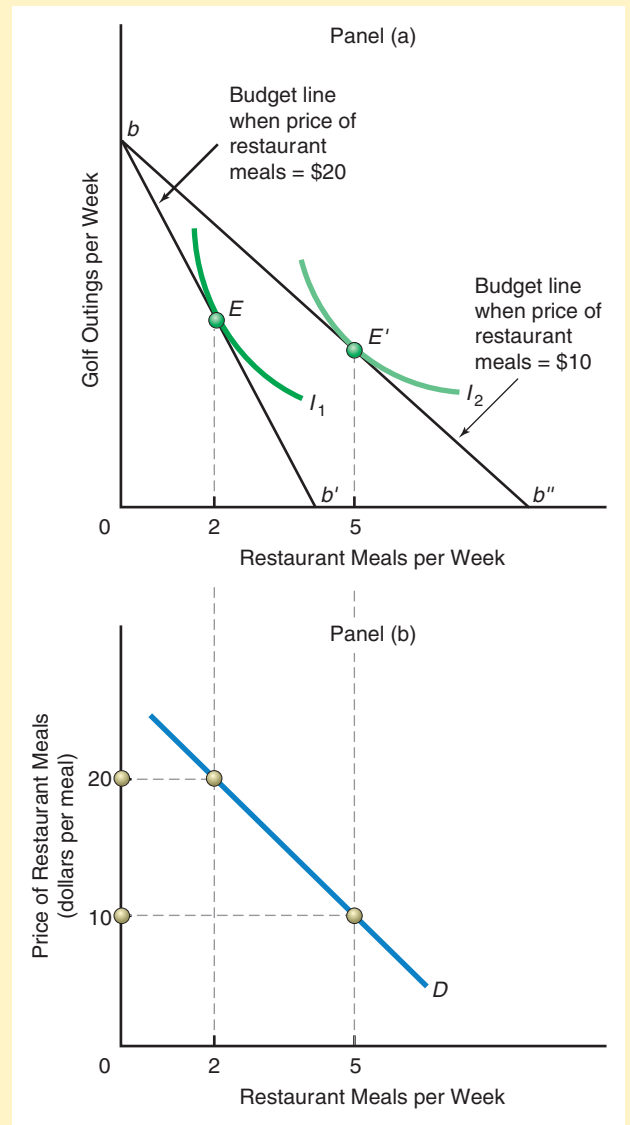
The set of consumer-optimum combinations of two goods that the consumer would choose as the price of one good changes, while money income and the price of the other good remain constant.

DERIVING THE DEMAND CURVE

We are now in a position to derive the demand curve using indifference curve analysis. In panel (a) of Figure E-9, we show what happens when the price of restaurant meals decreases, holding both the price of golf outings and income constant. If the price of restaurant meals decreases, the budget line rotates from b' to bb'' . The two optimum points are given by the tangency at the highest indifference curve that just touches those two budget lines. This is at E and E' . But those two points give us two price-quantity pairs. At point E , the price of restaurant meals is \$20; the quantity demanded is 2. Thus, we have one point that we can transfer to panel (b) of Figure E-9. At point E' , we have another price-quantity pair. The price has fallen to \$10; the quantity demanded has increased to 5. We therefore transfer this other point to panel (b). When we connect these two points (and all the others in between), we derive the demand curve for restaurant meals; it slopes downward.

FIGURE E-9
Deriving the Demand Curve

In panel (a), we show the effects of a decrease in the price of restaurant meals from \$20 to \$10. At \$20, the highest indifference curve touches the budget line bb' at point E . The quantity of restaurant meals consumed is two. We transfer this combination—price, \$20; quantity demanded, 2—down to panel (b). Next we decrease the price of restaurant meals to \$10. This generates a new budget line, or constraint, which is bb'' . Consumer optimum is now at E' . The optimum quantity of restaurant meals demanded at a price of \$10 is five. We transfer this point—price, \$10; quantity demanded, 5—down to panel (b). When we connect these two points, we have a demand curve, D , for restaurant meals.





Here is what you should know after reading this chapter. MyEconLab will help you identify what you know, and where to go when you need to practice.

WHAT YOU SHOULD KNOW

WHERE TO GO TO PRACTICE

On Being Indifferent Along an indifference curve, the consumer experiences equal levels of satisfaction. That is to say, along any indifference curve, every combination of the two goods in question yields exactly the same level of satisfaction.

indifference curve, 521

- **MyEconLab** Study Plan 20.8

Properties of Indifferent Curves Indifference curves typically slope downward and are usually convex to the origin.

- **MyEconLab** Study Plan 20.9

The Marginal Rate of Substitution To measure the marginal rate of substitution, we find out how much of one good has to be given up in order to allow the consumer to consume one more unit of the other good while still remaining on the same indifference curve. The marginal rate of substitution falls as one moves down an indifference curve.

Key figure
Figure E-1, 523

- **MyEconLab** Study Plans 20.10, 20.11

The Budget Constraint Indifference curves represent preferences. A budget constraint represents opportunities—how much can be purchased with a given level of income. Consumer optimum is obtained when the highest feasible indifference curve is just tangent to the budget constraint line; at that point, the consumer reaches the highest feasible indifference curve.

budget constraint, 524

Key figure
Figure E-4, 524

- **MyEconLab** Study Plans 20.11, 20.12, 20.13

Slope of the Budget Constraint When income increases, the budget constraint shifts outward to the right, parallel to the previous budget constraint line.

Key figure
Figure E-5, 525

- **MyEconLab** Study Plan 20.12

Log in to MyEconLab, take a chapter test, and get a personalized Study Plan that tells you which concepts you understand and which ones you need to review. From there, MyEconLab will give you further practice, tutorials, animations, videos, and guided solutions.

Log in to www.myeconlab.com

PROBLEMS

Answers to the odd-numbered problems appear at the back of the book.

- E-1.** Explain why the indifference curve in Figure E-1 on page 520 is convex to the origin.
- E-2.** Your classmate is indifferent between three soft drinks and two hamburgers or two soft drinks and three hamburgers.
- Draw a rough diagram of an indifference curve containing your classmate's consumption choices.
 - Suppose that your classmate is also indifferent between two soft drinks and three hamburgers or one soft drink and four hamburgers. He prefers three soft drinks and two hamburgers to one soft drink and four hamburgers. Can he have these preferences?
- E-3.** The table shows bottled water and soft drinks among which Sue is indifferent.

Combination of Bottled Water and Soft Drinks	Bottled Water per Month	Soft Drinks per Month
A	5	11
B	10	7
C	15	4
D	20	2
E	25	1

Calculate Sue's marginal rate of substitution, and it to marginal utility.

- E-4.** Using the information provided in Problem E-3, illustrate Sue's indifference curve, with water on the horizontal axis and soft drinks on the vertical axis.
- E-5.** Sue's monthly budget for bottled water and soft drinks is \$23. The price of bottled water is \$1 per bottle, and the price of soft drinks is \$2 per bottle. Calculate the slope of Sue's budget constraint. Given this information and the data in Problem E-3, what combination of goods maximizes Sue's utility given her budget constraint?
- E-6.** Using the indifference curve diagram you constructed in Problem E-4, add in Sue's budget constraint given the information in Problem E-5. Illustrate the utility-maximizing combination of bottled water and soft drinks.
- E-7.** Using the information provided in Problem E-5, suppose now that the price of a soft drink falls to \$1. Now Sue's constant-utility preferences are as follows:

Combination of Bottled Water and Soft Drinks	Bottled Water per Month	Soft Drinks per Month
A	5	22
B	10	14
C	15	8
D	20	4
E	25	2

Calculate the slope of Sue's new budget constraint. Next, find the combination of goods that now satisfies Sue's utility maximization problem.

- E-8.** Illustrate Sue's new budget constraint and indifference curve in the diagram you constructed for Problem E-6. Draw the utility-maximizing combination and the price-consumption curve.
- E-9.** Given your answers to Problems E-5 and E-7, are Sue's preferences for soft drinks consistent with the law of demand? Draw Sue's demand curve for soft drinks.