Economics

6th edition

Chapter 10

Consumer Choice and Behavioral Economics

Modified by Yulin Hou
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Florida International University
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Utility: measuring happiness

Economists refer to the enjoyment or satisfaction that people obtain from consuming goods and services as **utility**.

Utility cannot be directly measured; but for now, suppose that it could. What would we see?

- As people consumed more of an item (say, pizza) their total utility would change.

The amount by which total utility would change when consuming an extra unit of a good or service is called the **marginal utility (MU)**.

- Remember: in economics, “marginal” means “additional”.

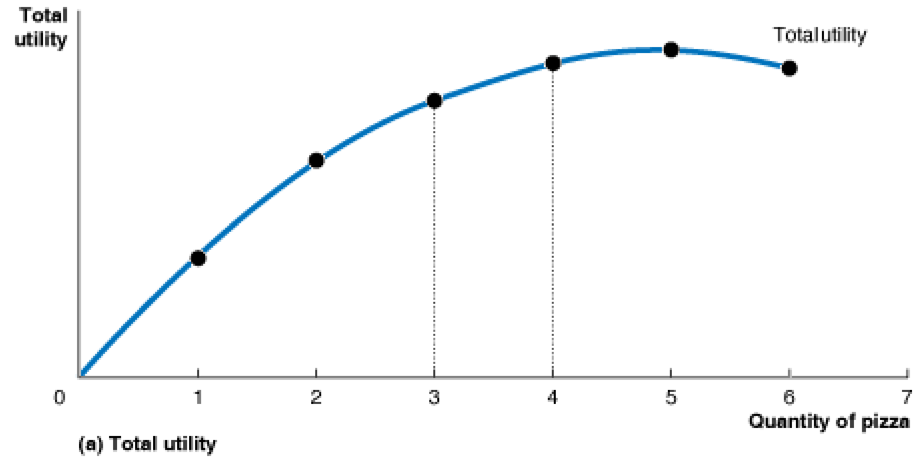
Diminishing marginal utility and budgets

We generally expect to see the first items consumed produce the most marginal utility, so that subsequent items give *diminishing marginal utility*.

Law of diminishing marginal utility: The principle that consumers experience diminishing additional satisfaction as they consume more of a good or service during a given period of time.

Figure 10.1 Total and marginal utility from eating pizza on Super Bowl Sunday (1 of 2)

Number of Slices	Total Utility from Eating Pizza
0	0
1	20
2	36
3	46
4	52
5	54
6	51



The table shows the total utility you might derive from eating pizza on Super Bowl Sunday.

The numbers, in *utils*, represent happiness: higher is better.

A graph of this utility is initially rising quickly, then more slowly; and eventually, it turns downward (as you get sick of pizza).

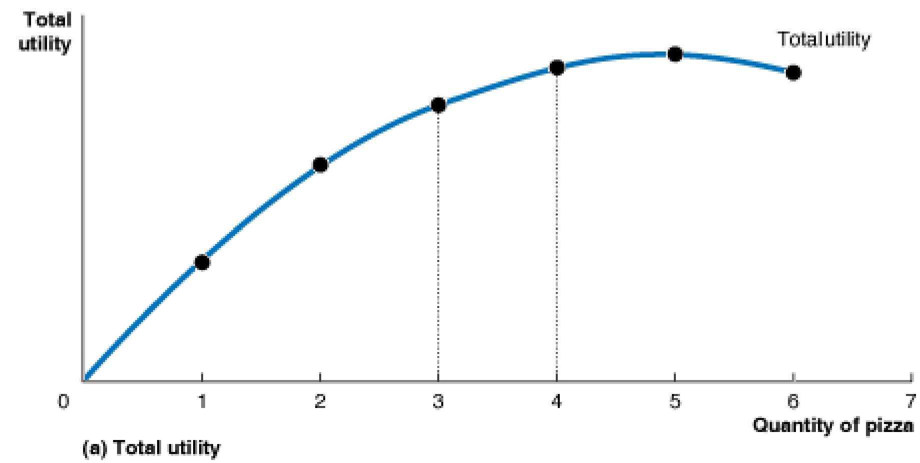
Figure 10.1 Total and marginal utility from eating pizza on Super Bowl Sunday (2 of 2)

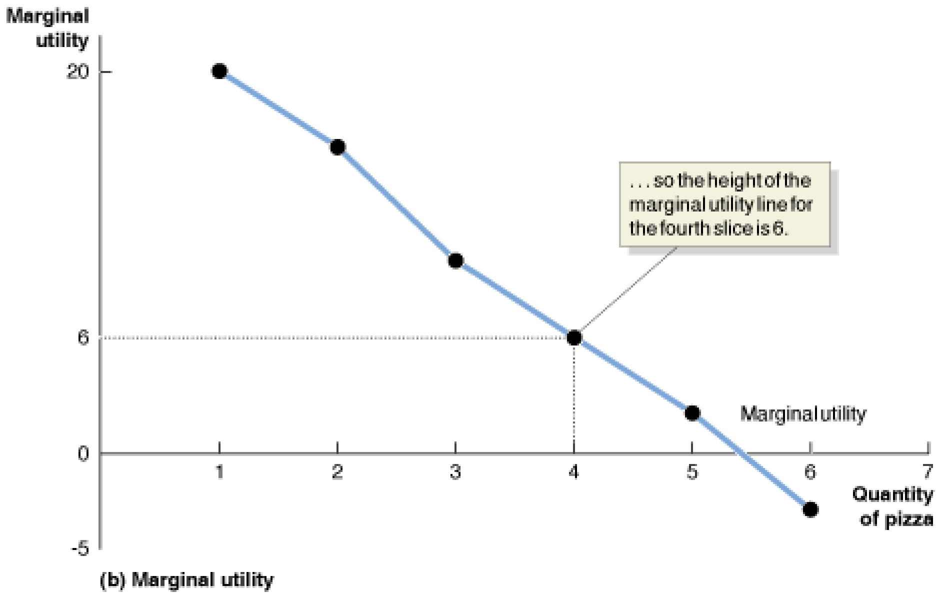
Number of Slices	Total Utility from Eating Pizza	Marginal Utility from the Last Slice Eaten
0	0	--
1	20	20
2	36	16
3	46	10
4	52	6
5	54	2
6	51	-3

The increase in utility from one slice to the next is the *marginal utility* of a slice of pizza.

We can calculate marginal utility for every slice of pizza…

… then graph the results. The graph of marginal utility is decreasing, showing the Law of Diminishing Marginal Utility directly.





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Allocating your resources

Given unlimited resources, a consumer would consume every good and service up until the maximum total utility.

- But resources are scarce; consumers have a budget constraint.

Budget constraint: The limited amount of income available to consumers to spend on goods and services.

The concept of utility can help us figure out how much of each item to purchase.

- Each item purchased gives some (possibly negative) marginal utility; by dividing by the price of the item, we obtain the *marginal utility per dollar spent*; that is, the rate at which that item allows the consumer to transform money into utility.

Table 10.1 Total utility and marginal utility from eating pizza and drinking Coke

Number of Slices of Pizza	Total Utility from Eating Pizza	Marginal Utility from the Last Slice	Number of Cups of Coke	Total Utility from Drinking Coke	Marginal Utility from the Last Cup
0	0	—	0	0	—
1	20	20	1	20	20
2	36	16	2	35	15
3	46	10	3	45	10
4	52	6	4	50	5
5	54	2	5	53	3
6	51	−3	6	52	−1

Suppose you can now obtain utility by eating pizza and drinking Coke.

The table gives the total and marginal utility derived from each activity.

Table 10.2 Converting marginal utility to marginal utility per dollar

(1) Slices of Pizza	(2) Marginal Utility (MU_{Pizza})	(3) Marginal Utility per Dollar $\left(\frac{MU_{Pizza}}{P_{Pizza}}\right)$	(4) Cups of Coke	(5) Marginal Utility (MU_{Coke})	(6) Marginal Utility per Dollar $\left(\frac{MU_{Coke}}{P_{Coke}}\right)$
1	20	10	1	20	20
2	16	8	2	15	15
3	10	5	3	10	10
4	6	3	4	5	5
5	2	1	5	3	3
6	−3	−1.5	6	−1	−1

Suppose that pizza costs $2 per slice, and Coke $1 per cup.

- Marginal utility of pizza per dollar is just marginal utility of pizza divided by the price, $2.
- Similarly for Coke: divide by $1.

Table 10.3 Equalizing marginal utility per dollar spent (1 of 2)

Combinations of Pizza and Coke with Equal Marginal Utilities per Dollar	Marginal Utility per Dollar (*MU/P*)	Total Spending	Total Utility
1 slice of pizza and 3 cups of Coke	10	\$2 + \$3 = \$5	20 + 45 = 65
3 slices of pizza and 4 cups of Coke	5	\$6 + \$4 = \$10	46 + 50 = 96
4 slices of pizza and 5 cups of Coke	3	\$8 + \$5 = \$13	52 + 53 = 105

Suppose the marginal utility per dollar obtained from pizza was greater than that obtained from Coke.

- Then you should eat more pizza, and drink less Coke.

This implies the *Rule of Equal Marginal Utility per Dollar Spent*: consumers should seek to equalize the “bang for the buck”.

- Some combinations satisfying this rule are given above.

Table 10.3 Equalizing marginal utility per dollar spent (2 of 2)

Combinations of Pizza and Coke with Equal Marginal Utilities per Dollar	Marginal Utility per Dollar (*MU/P*)	Total Spending	Total Utility
1 slice of pizza and 3 cups of Coke	10	\$2 + \$3 = \$5	20 + 45 = 65
3 slices of pizza and 4 cups of Coke	5	\$6 + \$4 = \$10	46 + 50 = 96
4 slices of pizza and 5 cups of Coke	3	\$8 + \$5 = \$13	52 + 53 = 105

The actual combination to purchase would depend on your budget constraint:

- With \$5 to spend, you would purchase 1 slice of pizza and 3 cups of Coke.
- With \$10 to spend, you would purchase 3 slices of pizza and 4 cups of Coke.

In each case, you seek to exhaust your budget, since spending additional money gives more utility.

Conditions for maximizing utility

This gives us two conditions for maximizing utility:

1. **Satisfy the Rule of Equal Marginal Utility per Dollar Spent:**

$$\frac{MU_{Pizza}}{P_{Pizza}} = \frac{MU_{Coke}}{P_{Coke}}$$

2. **Exhaust your budget:**

   Spending on pizza + Spending on Coke = Budget

What if prices change?

If the price of pizza changes from $2 to $1.50, then the Rule of Equal Marginal Utility per Dollar Spent will no longer be satisfied.

- You must adjust your purchasing decision.

We can think of this adjustment in two ways:

1. You can afford more than before; this is like having a higher income.
2. Pizza has become cheaper relative to Coke.

We refer to the effect from 1. as the *income effect*, and the effect from 2. as the *substitution effect*.

1. Income effect

Income effect: The change in the quantity demanded of a good that results from the effect of a change in price on consumer purchasing power, holding all other factors constant.

We know that some goods are *normal* (goods that we consume more of as our income rises) and some are *inferior* (goods that we consume less of as our income rises).

- If pizza is a normal good, the *income effect* of its price decreasing will cause you to consume more pizza.
- If pizza is an inferior good, the *income effect* of its price decreasing will cause you to consume less pizza.

2. Substitution effect

Substitution effect: The change in the quantity demanded of a good that results from a change in price making the good more or less expensive relative to other goods, holding constant the effect of the price change on consumer purchasing power.

If the price of pizza falls, pizza becomes cheaper *relative to Coke*.

- The opportunity cost of consuming a slice of pizza falls.
- This suggests eating more pizza.

Income effect and substitution effect of a price change

When price …	consumer purchasing power …	The income effect causes quantity demanded to …	The substitution effect causes the opportunity cost of consuming a good to …
decreases,	increases.	increase, for a normal good, and decrease, for an inferior good.	decrease when the price decreases, which causes the quantity of the good demanded to increase.
increases,	decreases.	decrease, for a normal good, and increase, for an inferior good.	increase when the price increases, which causes the quantity of the good demanded to decrease.

The table summarizes the income and substitution effects.

Using Indifference Curves and Budget Lines to Understand Consumer Behavior

Consumption Bundle A	Consumption Bundle B
2 slices of pizza and 1 can of Coke	1 slice of pizza and 2 cans of Coke

Suppose Dave is faced with the choice of the above two weekly "consumption bundles".

It seems reasonable to assume that either:

- Dave prefers bundle B to bundle F
- Dave prefers bundle F to bundle B
- Dave is *indifferent* between bundles B and F; that is, Dave would be equally happy with either B or F.

In the first situation, we would say Dave gets *higher utility* from B than from F; in the third, that the utility from B and F was the same.

Figure 10A.1 Plotting Dave's preferences for pizza and Coke (1 of 4)

Suppose Dave is indeed indifferent between B and F, and suppose we could find all of the bundles that Dave liked exactly as much.

- Perhaps bundle E: 2 slices of pizza and 8 cans of Coke would make Dave just as happy.

The curve marked I_3 is an **indifference curve** for Dave: a curve showing the combinations of consumption bundles that give the consumer the same utility.

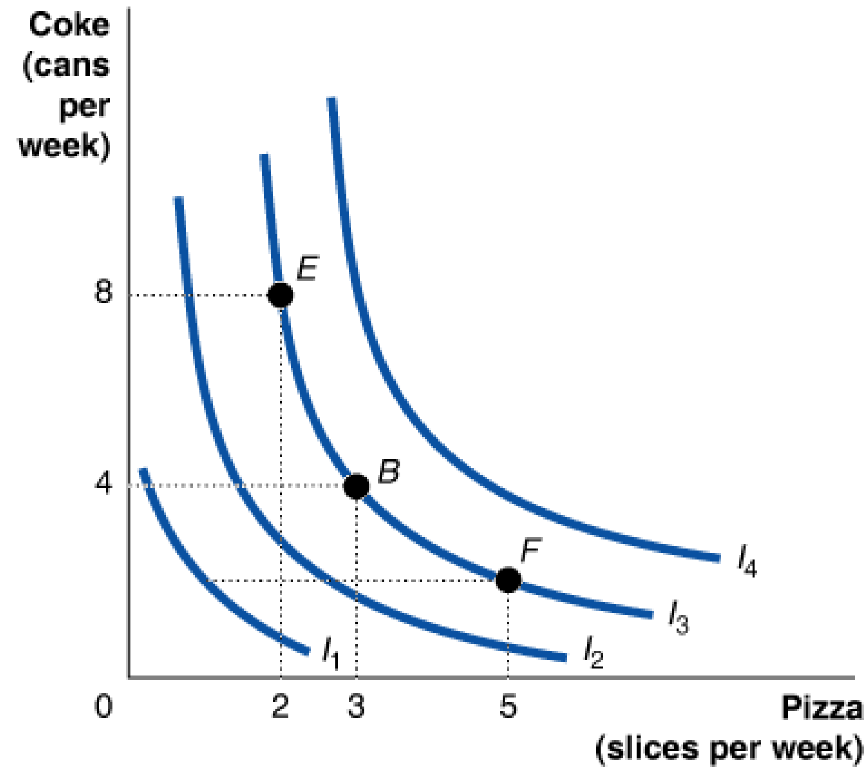

Figure 10A.1 Plotting Dave's preferences for pizza and Coke (2 of 4)

Lower indifference curves represent lower levels of utility; higher indifference curves represent higher levels of utility.

Bundle A is on I_1, a lower indifference curve; and it is clearly worse than E, B, or F, since it has less pizza and Coke than any of those bundles.

Bundle C is on a higher indifference curve, and is clearly better than B (more pizza and Coke).

Consumption Bundle	Slices of Pizza	Cans of Coke
A	1	2
B	3	4
C	4	5
D	1	6
E	2	8
F	5	2

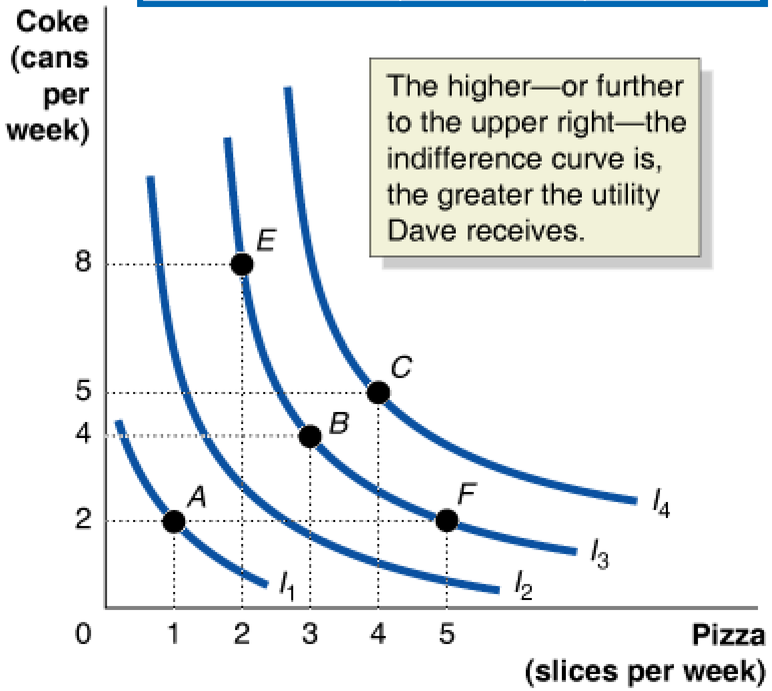

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Figure 10A.1 Plotting Dave's preferences for pizza and Coke (3 of 4)

Consumption Bundle	Slices of Pizza	Cans of Coke
A	1	2
B	3	4
C	4	5
D	1	6
E	2	8
F	5	2

Comparing B and D is a little trickier.

- A reasonable person could prefer D to B, say if he only cared about how much Coke he received.
- But the indifference curves reveal that Dave prefers B to D, since D is on a lower indifference curve to B.

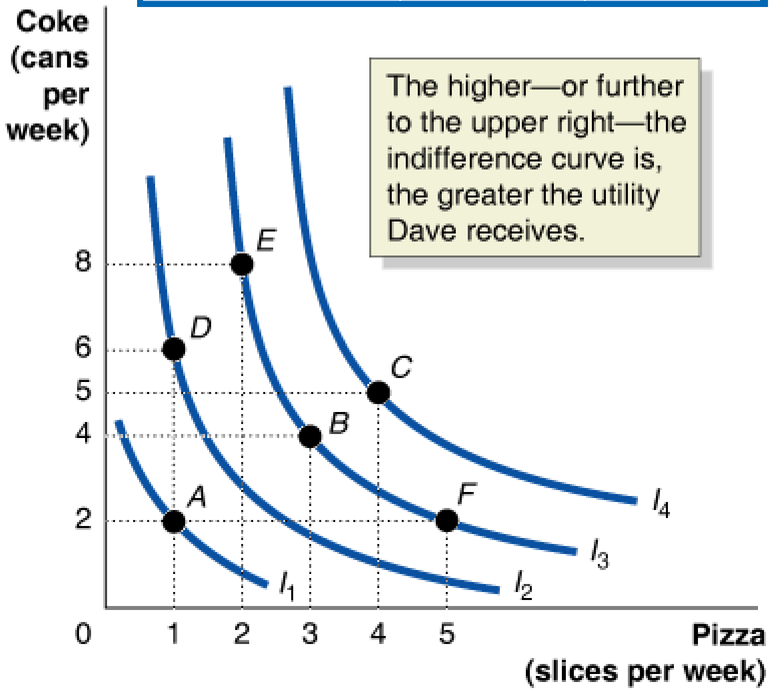

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Figure 10A.1 Plotting Dave's preferences for pizza and Coke (4 of 4)

Marginal Rate of Substitution (MRS) is the rate at which the consumer is willing to trade off one product for another, while keeping the consumer's utility constant.

- Graphically, this is the slope of the indifference curve.
- From E to B, Dave is willing to trade 4 cans of Coke for 1 slide of pizza; his MRS is 4 between E and B.
- MRS tends to decrease as we move to the right, giving indifference curves a convex shape.

Consumption Bundle	Slices of Pizza	Cans of Coke
A	1	2
B	3	4
C	4	5
D	1	6
E	2	8
F	5	2

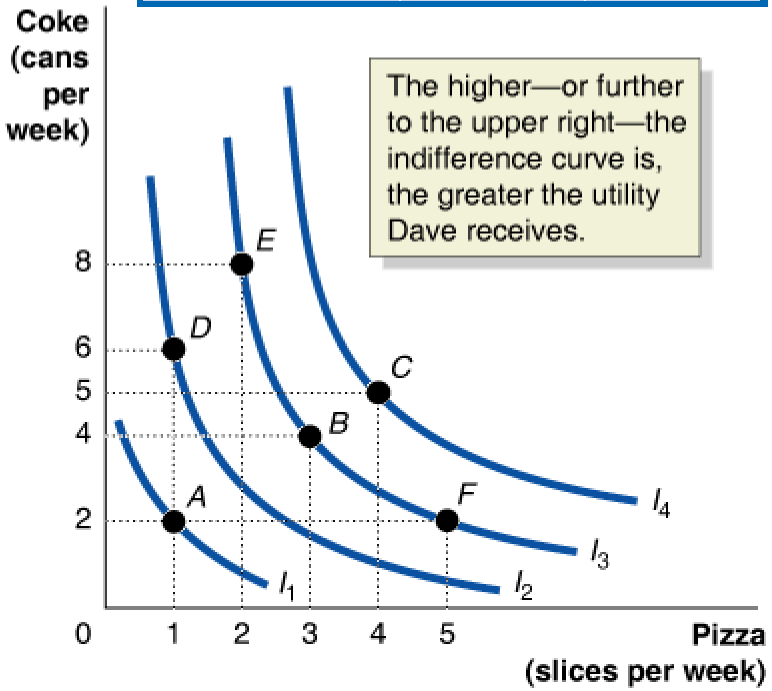

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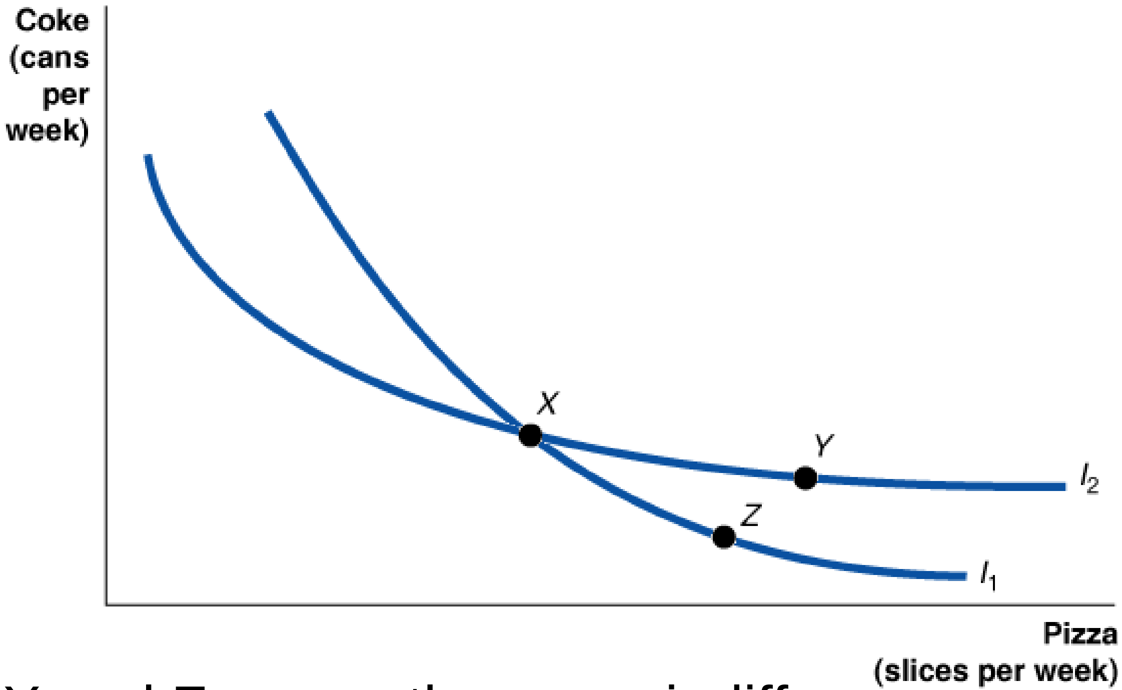
Figure 10A.2 Indifference curves cannot cross (1 of 2)

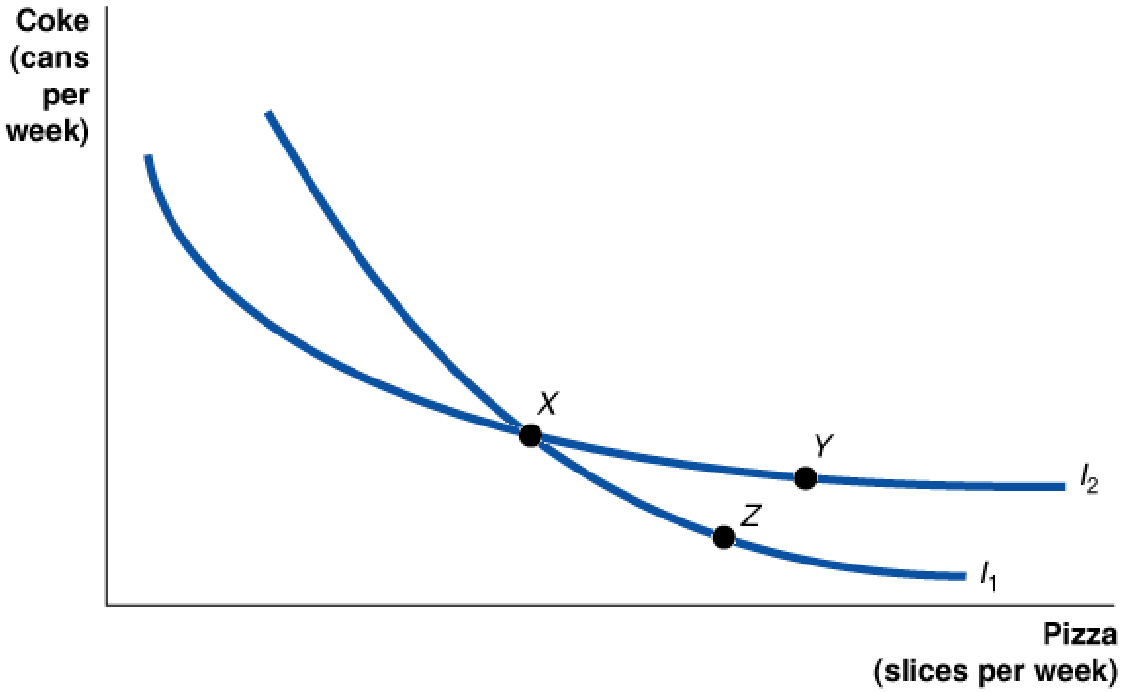


Bundles X and Z are on the same indifference curve, so Dave is indifferent between them.

- Similarly for bundles X and Y.

We generally assume that preferences are *transitive*, so that if a consumer is indifferent between X and Z, and X and Y, then he must also be indifferent between Y and Z.

Figure 10A.2 Indifference curves cannot cross (2 of 2)



But Dave will prefer Y to Z, since Y has more pizza and Coke.

Since transitivity is such an intuitively sensible assumption, we conclude that indifference curves will never cross.

Figure 10A.3 Dave's budget constraint

A consumer's *budget constraint* is the amount of income he or she has available to spend on goods and services.

The table shows bundles Dave can buy with $10, if pizza costs $2 per slice and Coke costs $1 per can.

The slope of the budget constraint is the (negative of the) ratio of prices; it represents the rate at which Dave is *allowed* to trade Coke for pizza: 2 cans of Coke per 1 slice of pizza.

Combinations of Pizza and Coke Dave Can Buy with $10

Consumption Bundle	Slices of Pizza	Cans of Coke	Total Spending
G	0	10	$10.00
H	1	8	10.00
I	2	6	10.00
J	3	4	10.00
K	4	2	10.00
L	5	0	10.00

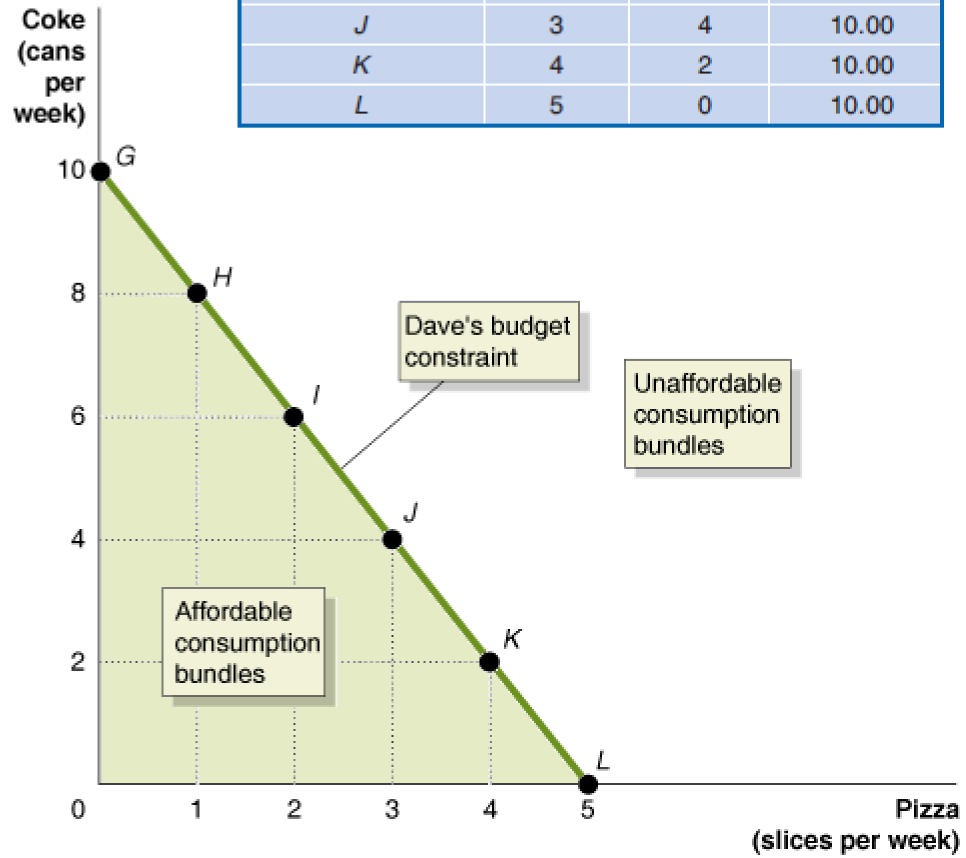


Figure 10A.4 Finding optimal consumption (1 of 2)

Dave would like to reach the highest indifference curve that he can.

He cannot reach I_4; no bundle on I_4 is within his budget constraint.

The highest indifference curve he can reach is I_3; bundle B is Dave’s best choice, given his budget constraint.

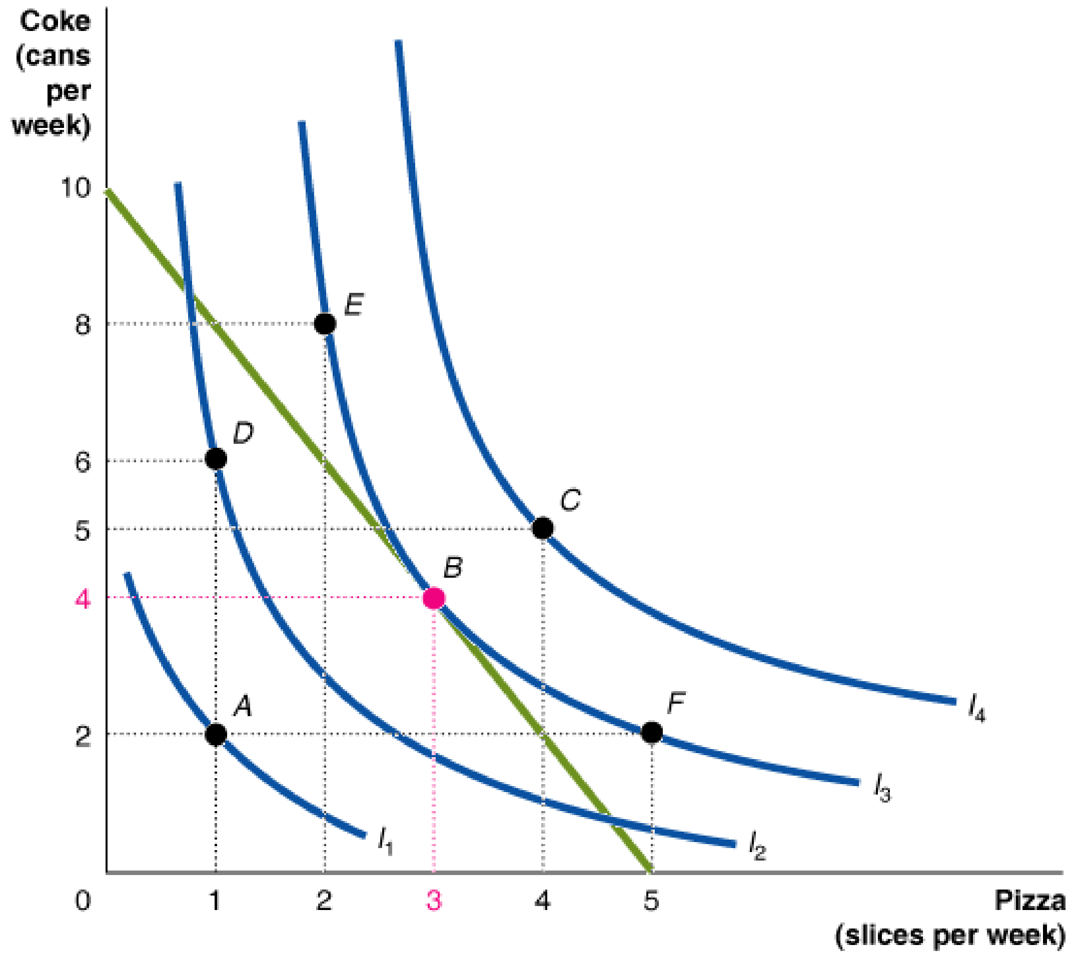


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Figure 10A.4 Finding optimal consumption (2 of 2)

To maximize utility, a consumer needs to be on the highest indifference curve, given his budget constraint.

Notice that at this point, the indifference curve is just tangent to the budget line.

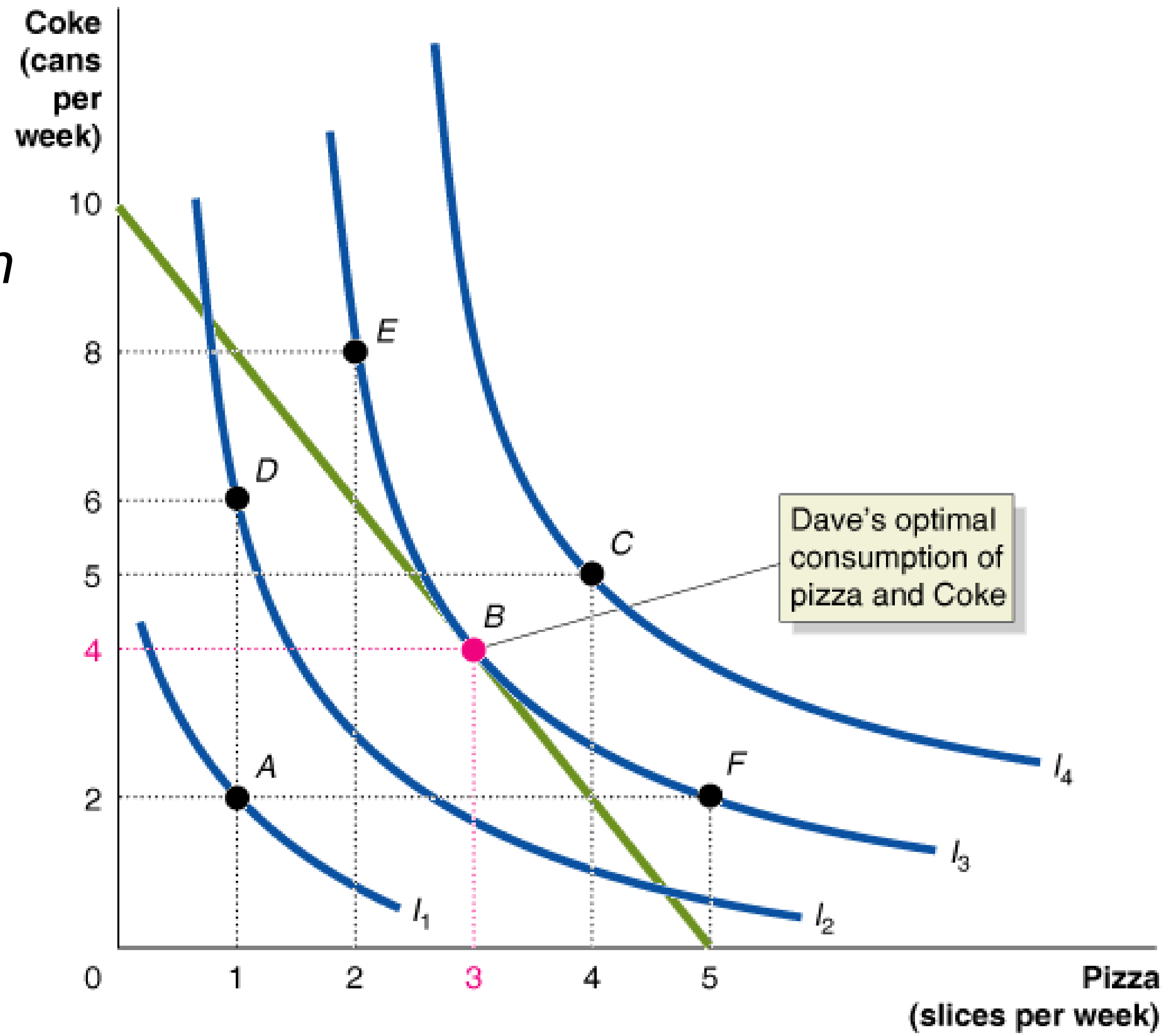

Figure 10A.5 How a price decrease affects the budget constraint

When the price of pizza falls, Dave can buy more pizza than before.

If pizza falls to $1.00 per slice, Dave can buy 10 slices of pizza per week; he can still afford 10 cans of Coke per week.

The budget constraint rotates out along the pizza-axis to reflect this increase in purchasing power.

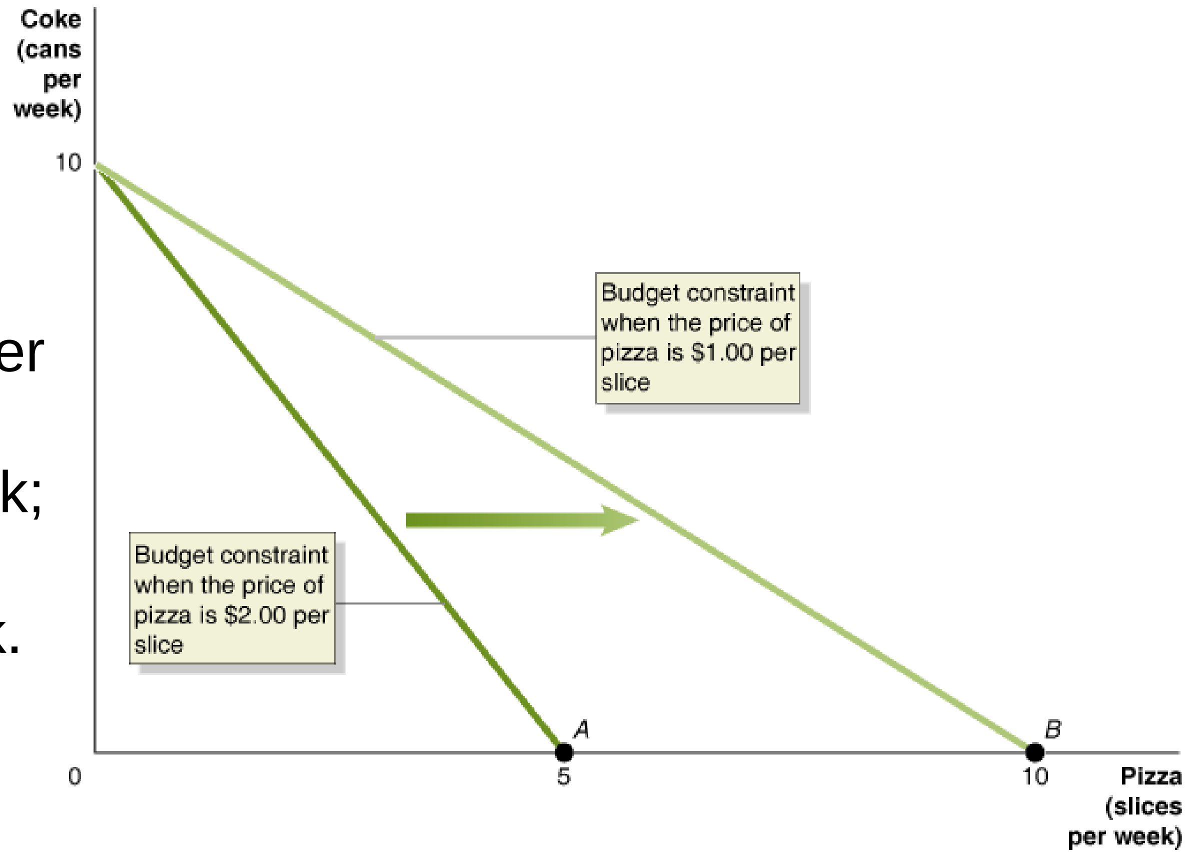

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Figure 10A.6 How a price change affects optimal consumption

As the price of pizza falls and the budget constraint rotates out, Dave's optimal bundle will change.

When pizza cost $2.00 per slice, Dave bought 3 slices.

- Now that pizza costs $1.00 per slice, Dave buys 7 slices.

These are two points on Dave's demand curve for pizza (assuming he has $10, and Coke costs $1 per can).

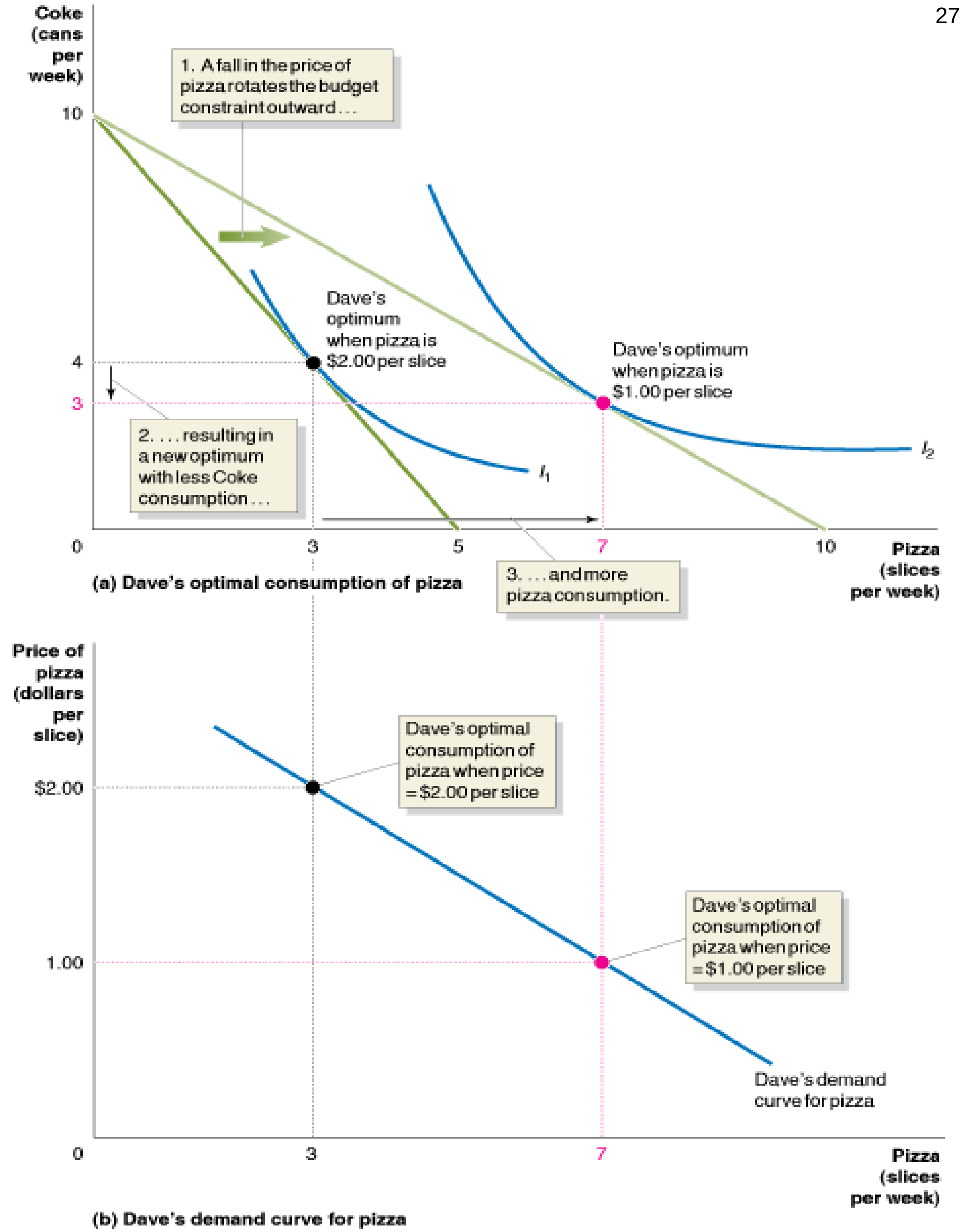

Figure 10A.7 Income and substitution effects of a price change (1 of 2)

When the price of pizza falls, Dave changes his consumption from A to C.

We can think of this as two separate effects:

1. A change in relative price keeping utility constant, causing a movement along indifference curve I_1; this is the *substitution effect*.

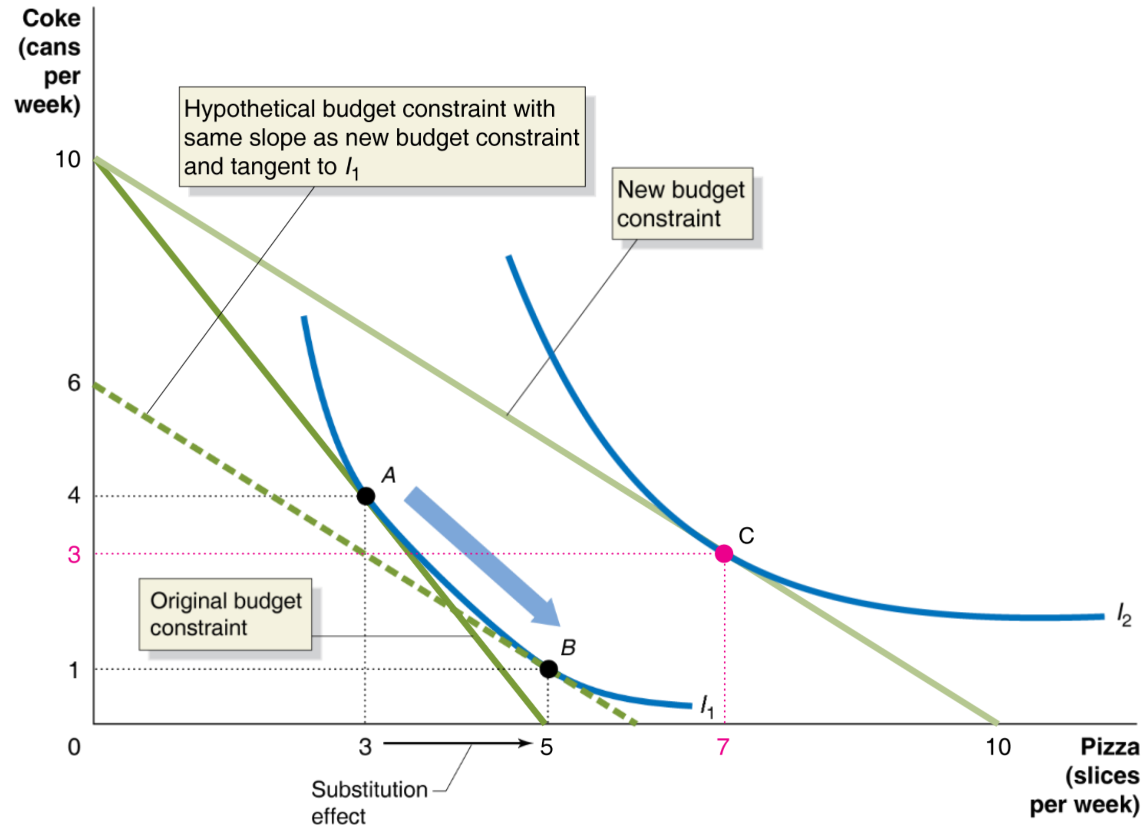

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Figure 10A.7 Income and substitution effects of a price change (2 of 2)

When the price of pizza falls, Dave changes his consumption from A to C.

We can think of this as two separate effects:

2. An increase in purchasing power, causing a movement from B to C; this is the *income effect*.

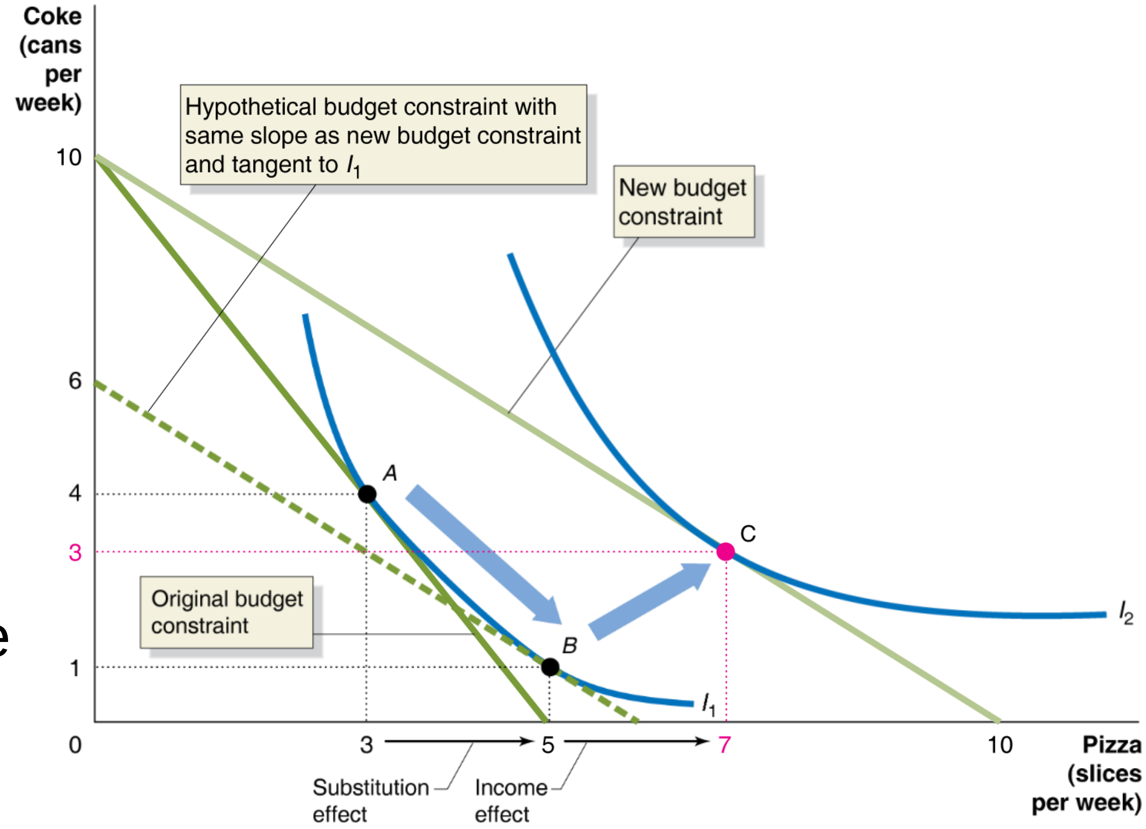

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Figure 10A.8 How a change in income affects the budget constraint

When the income Dave has to spend on pizza and Coke increases from $10 to $20, his budget constraint shifts outward.

With $10, Dave could buy a maximum of 5 slices of pizza or 10 cans of Coke.

With $20, he can buy a maximum of 10 slices of pizza or 20 cans of Coke.

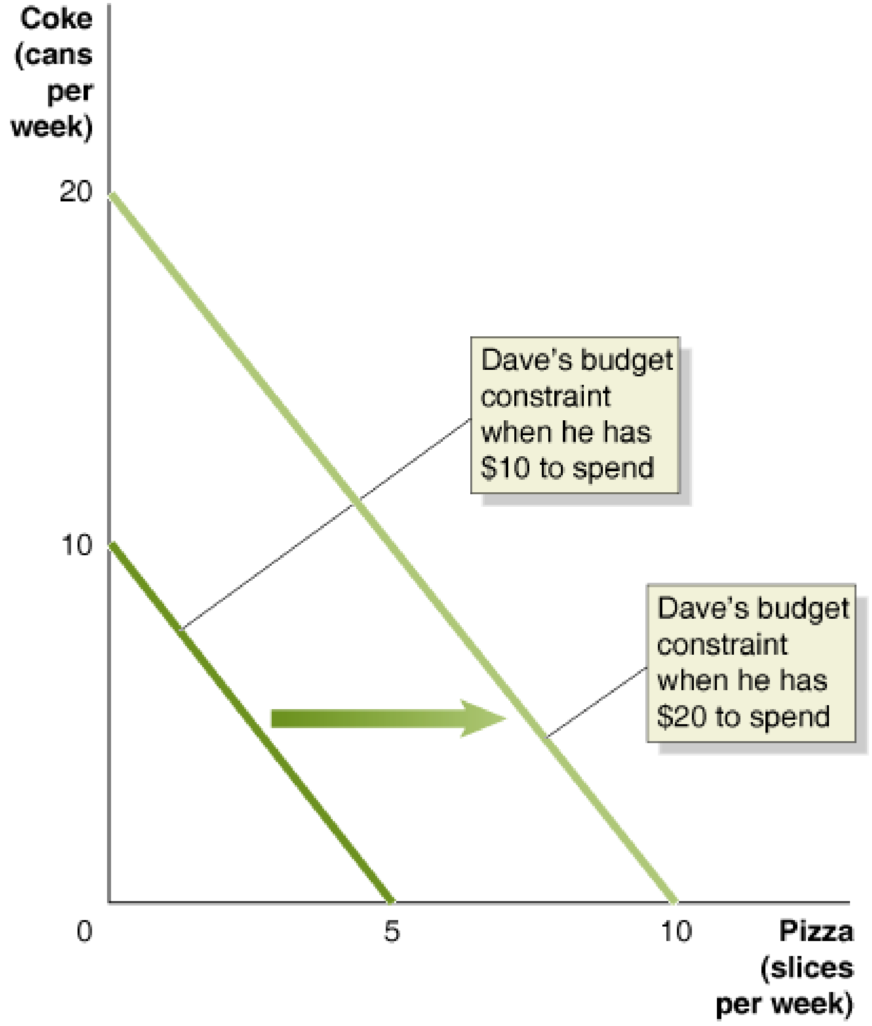

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Figure 10A.9 How a change in income affects optimal consumption

An increase in income leads Dave to consume more Coke…

… and more pizza.

For Dave, both Coke and pizza are *normal goods*.

A different consumer might have different preferences, and an increase in income might *decrease* the demand for Coke, for example; in this case, Coke would be an *inferior good*.

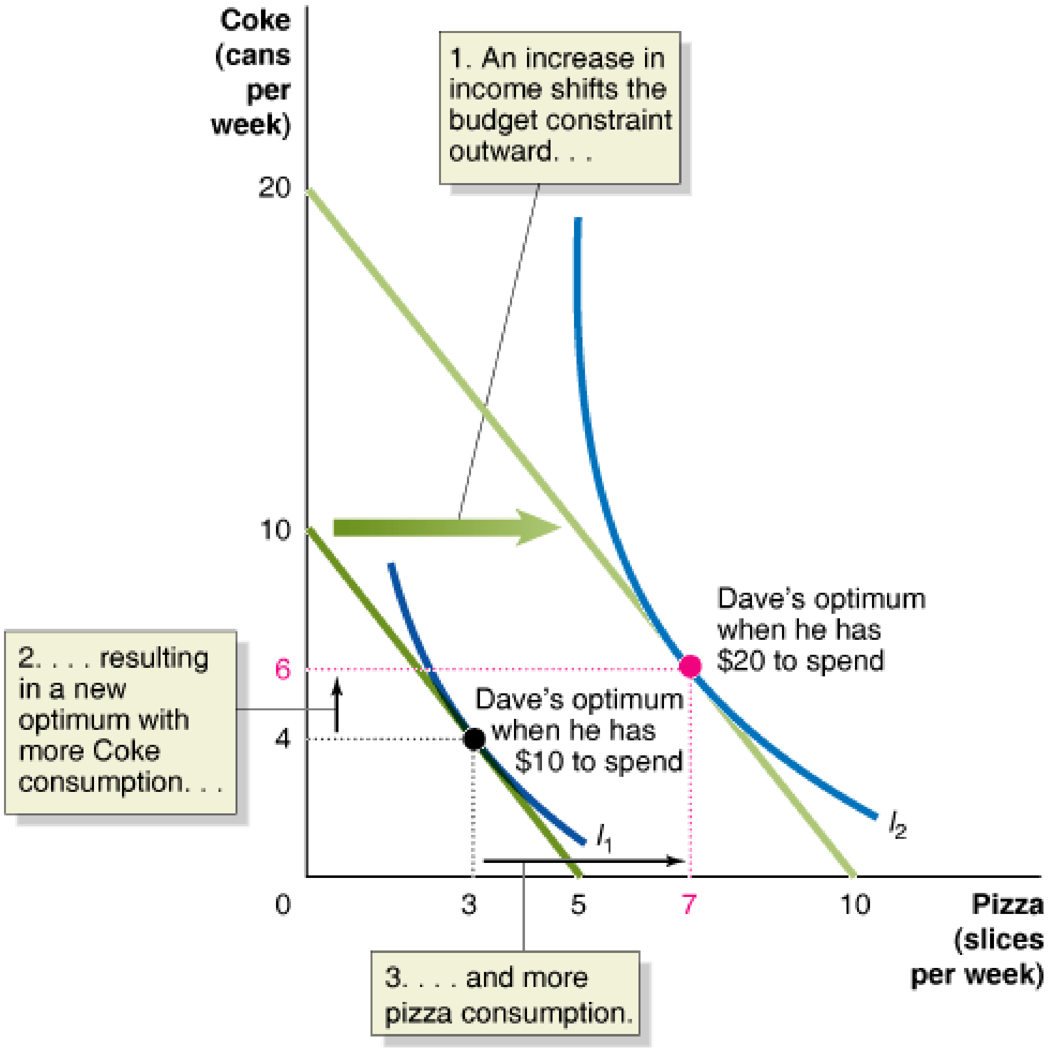

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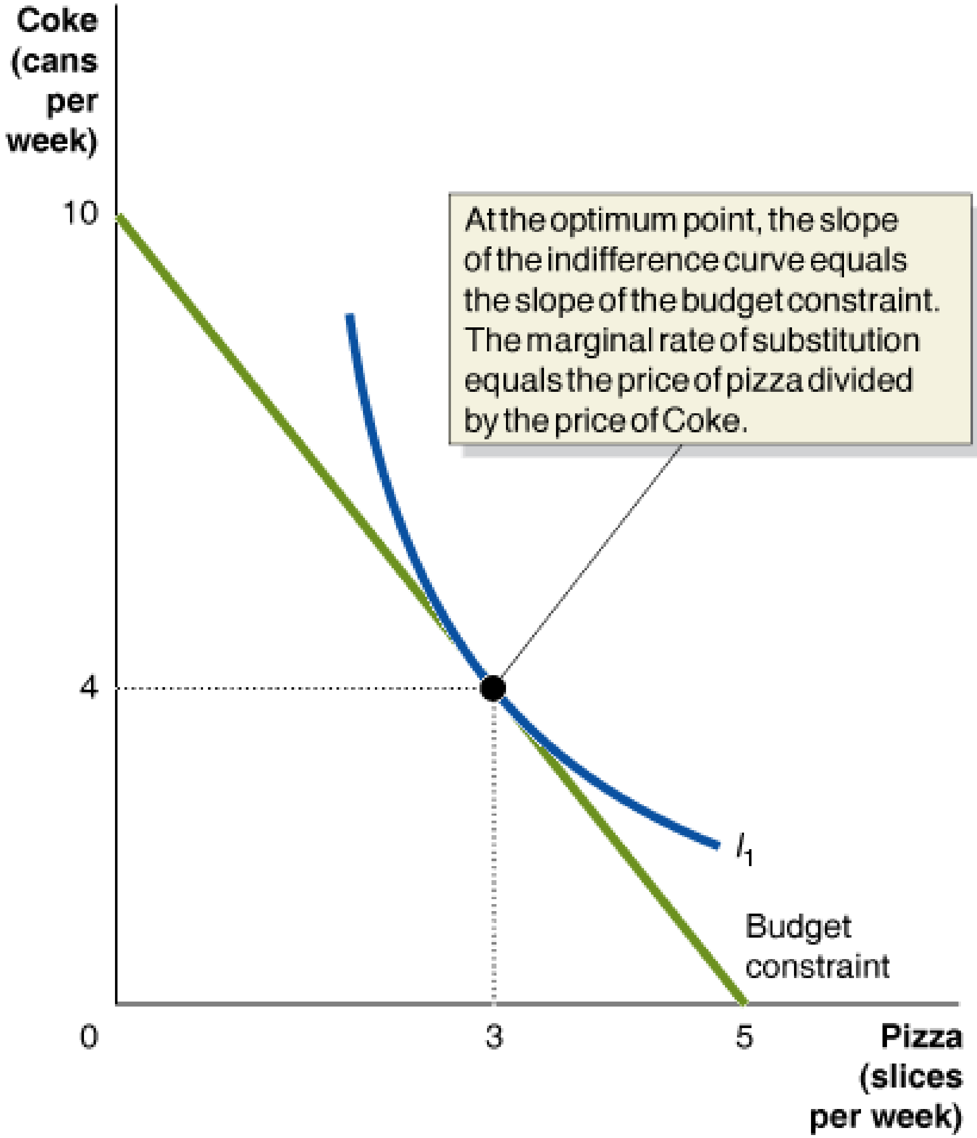
Figure 10A.10 At the optimum point, the slopes of the indifference curve and the budget constraint are the same

consumption, the indifference curve is just tangent to the budget line; their slopes are equal.

- The slope of the indifference curve is the (negative of the) marginal rate of substitution.
- The slope of the budget line is the (negative of the) ratio of the price of the horizontal axis good to the price of the vertical axis good.
- So at the optimum,

$$MRS = \frac{P_{Pizza}}{P_{Coke}}$$



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Relating MRS and marginal utility

Suppose Dave is indifferent between two bundles, A and B. A has more Coke than B, so B must have more pizza than A.

As Dave moves from A to B, the loss (in utility) from consuming less coke must be just offset by the gain (in utility) from consuming more pizza. We can write:

$$-(\text{Change in the quantity of Coke} \times MU_{Coke}) = (\text{Change in the quantity of pizza} \times MU_{Pizza})$$

Rearranging terms gives:

$$\frac{-\text{Change in the quantity of Coke}}{\text{Change in the quantity of pizza}} = \frac{MU_{Pizza}}{MU_{Coke}}$$

And this first term is the slope of the indifference curve: the MRS.

$$\frac{-\text{Change in the quantity of Coke}}{\text{Change in the quantity of pizza}} = MRS = \frac{MU_{Pizza}}{MU_{Coke}}$$

The rule of equal marginal utility per dollar spent

The last two slides have given us:

$$MRS = \frac{P_{Pizza}}{P_{Coke}}$$

and

$$MRS = \frac{MU_{Pizza}}{MU_{Coke}}$$

So now we know:

$$\frac{P_{Pizza}}{P_{Coke}} = \frac{MU_{Pizza}}{MU_{Coke}}$$

Rearrange to obtain our desired rule:

$$\frac{MU_{Coke}}{P_{Coke}} = \frac{MU_{Pizza}}{P_{Pizza}}$$