



UNIwersytet Warszawski  
**Wydział Nauk Ekonomicznych**

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# **Introduction to economics for PhD Students of The Institute of Physical Chemistry, PAS**

## **Lecture 3 Consumer's choice**

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*Based on: Mankiw G., Taylor R,  
Economics, Cengage, 2011*

# In this lecture you will learn:

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- How does the budget constraint represent the choices a consumer can afford?
  - How do indifference curves represent the consumer's preferences?
  - What determines how a consumer divides her resources between two goods?
  - How does the theory of consumer choice explain decisions such as how much a consumer saves, or how much labor she supplies?
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# Introduction

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- Recall one of the Ten Principles from Lecture 1:  
*People face tradeoffs.*
    - Buying more of one good leaves less income to buy other goods.
    - Working more hours means more income and more consumption, but less leisure time.
    - Reducing saving allows more consumption today but reduces future consumption.
  - This lecture explores how consumers make choices like these.
  - For today we will keep neoclassical assumption of consumer's choice theory. We will relax them later.
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# The Budget Constraint: What the Consumer Can Afford

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- Example:  
Hurley divides his income between two goods: fish and mangos.
- A “consumption bundle” is a particular combination of the goods, *e.g.*, 40 fish & 300 mangos.
- **Budget constraint:** the limit on the consumption bundles that a consumer can afford

# Budget Constraint

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Hurley's income: \$1200

Prices:  $P_F = \$4$  per fish,  $P_M = \$1$  per mango

- A.** If Hurley spends all his income on fish, how many fish does he buy?
- B.** If Hurley spends all his income on mangos, how many mangos does he buy?
- C.** If Hurley buys 100 fish, how many mangos can he buy?
- D.** Plot each of the bundles from parts **A** – **C** on a graph that measures fish on the horizontal axis and mangos on the vertical, connect the dots.

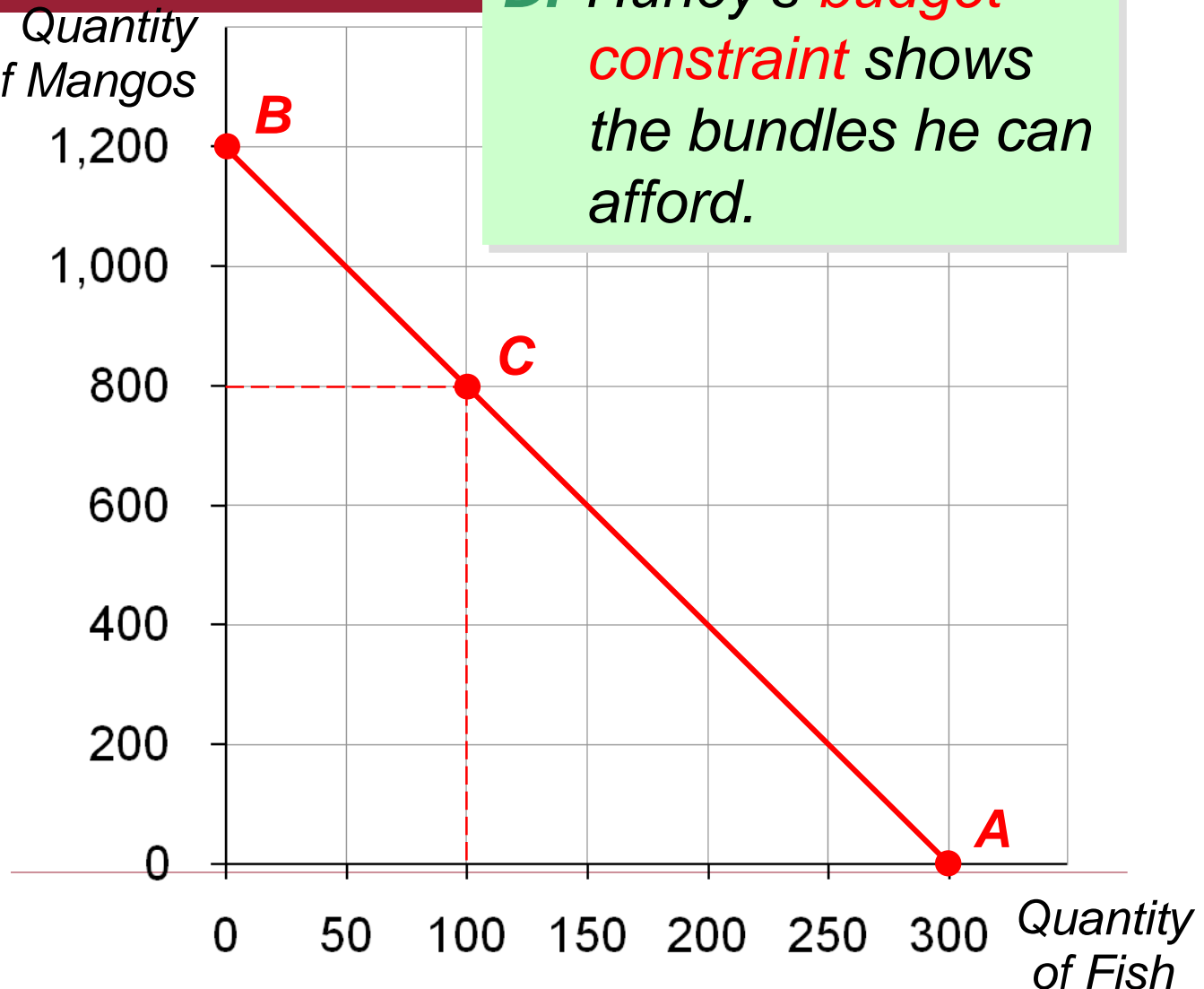
# Answers

**A.**  $\$1200/\$4$   
= 300 fish

**B.**  $\$1200/\$1$   
= 1200 mangos

**C.** 100 fish  
cost  
\$400,  
\$800 left  
buys 800  
mangos

Quantity  
of Mangos



**D.** Hurley's *budget constraint* shows the bundles he can afford.

# The Slope of the Budget Constraint

From **C** to **D**, *Quantity of Mangos*

“rise” =

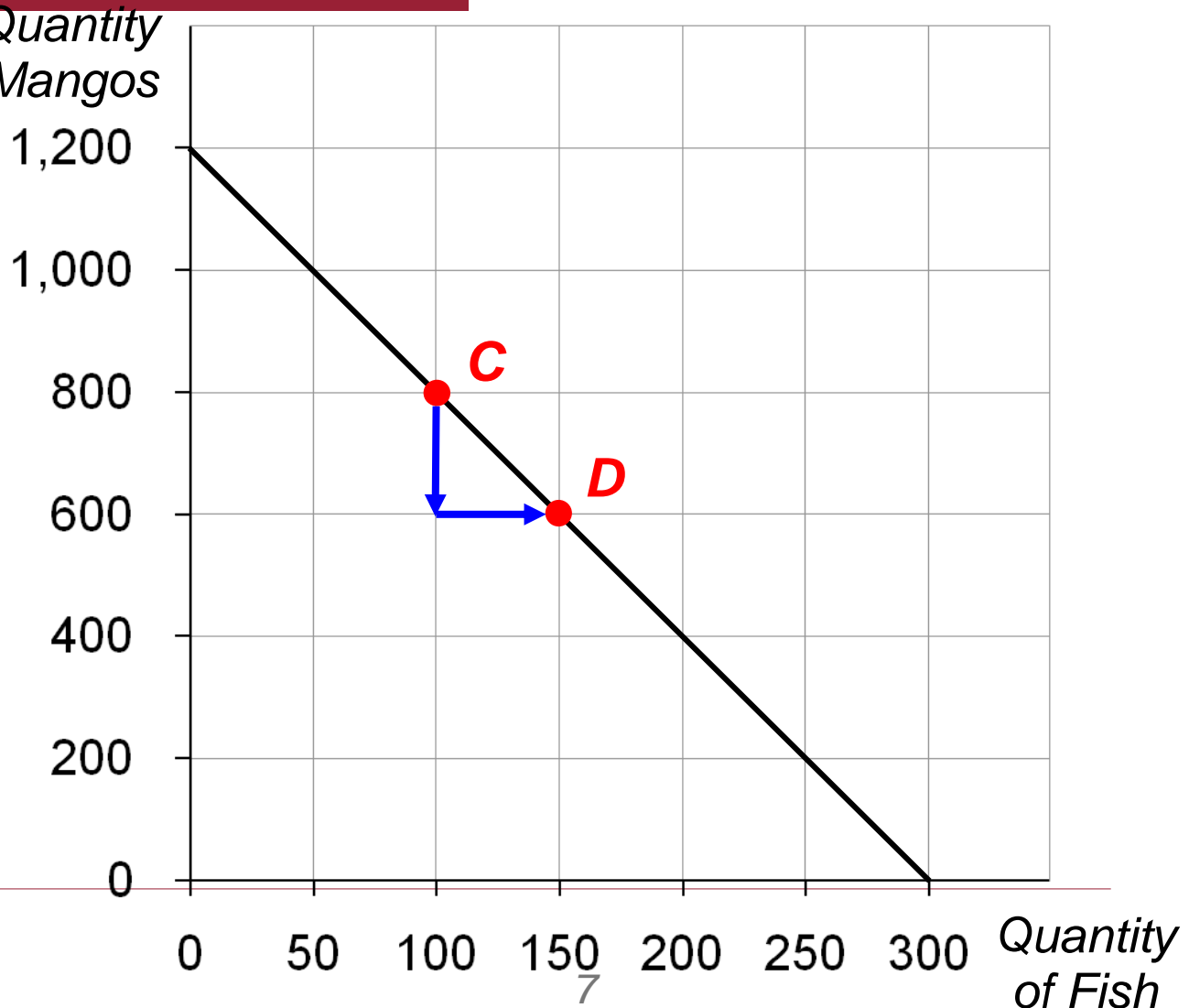
*−200 mangos*

“run” =

*+50 fish*

*Slope = − 4*

*Hurley must  
give up  
4 mangos  
to get one fish.*



# The Slope of the Budget Constraint

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The slope of the budget constraint equals

- the rate at which Hurley can trade mangos for fish
- the opportunity cost of fish in terms of mangos
- the relative price of fish:

$$\frac{\text{price of fish}}{\text{price of mangos}} = \frac{\$4}{\$1} = 4 \text{ mangos per fish}$$



## Budget constraint, *continued*.

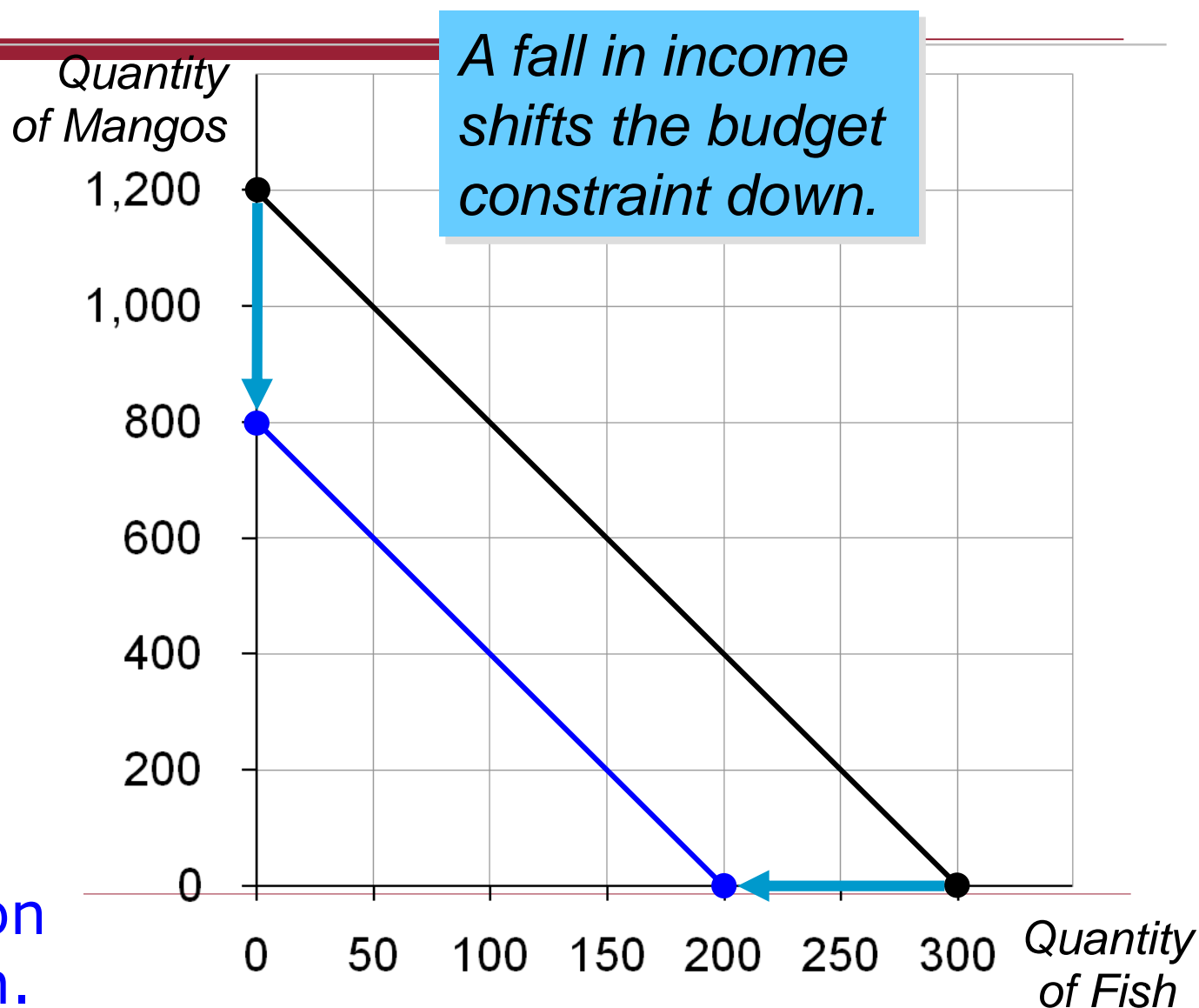
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Show what happens to Hurley's budget constraint if:

- A.** His income falls to \$800.
- B.** The price of mangos rises to  $P_M = \$2$  per mango

# Answers, part A

Now,  
Hurley  
can buy  
 $\$800/\$4$   
 $= 200$  fish  
  
or  
 $\$800/\$1$   
 $= 800$   
mangos  
  
or any  
combination  
in between.



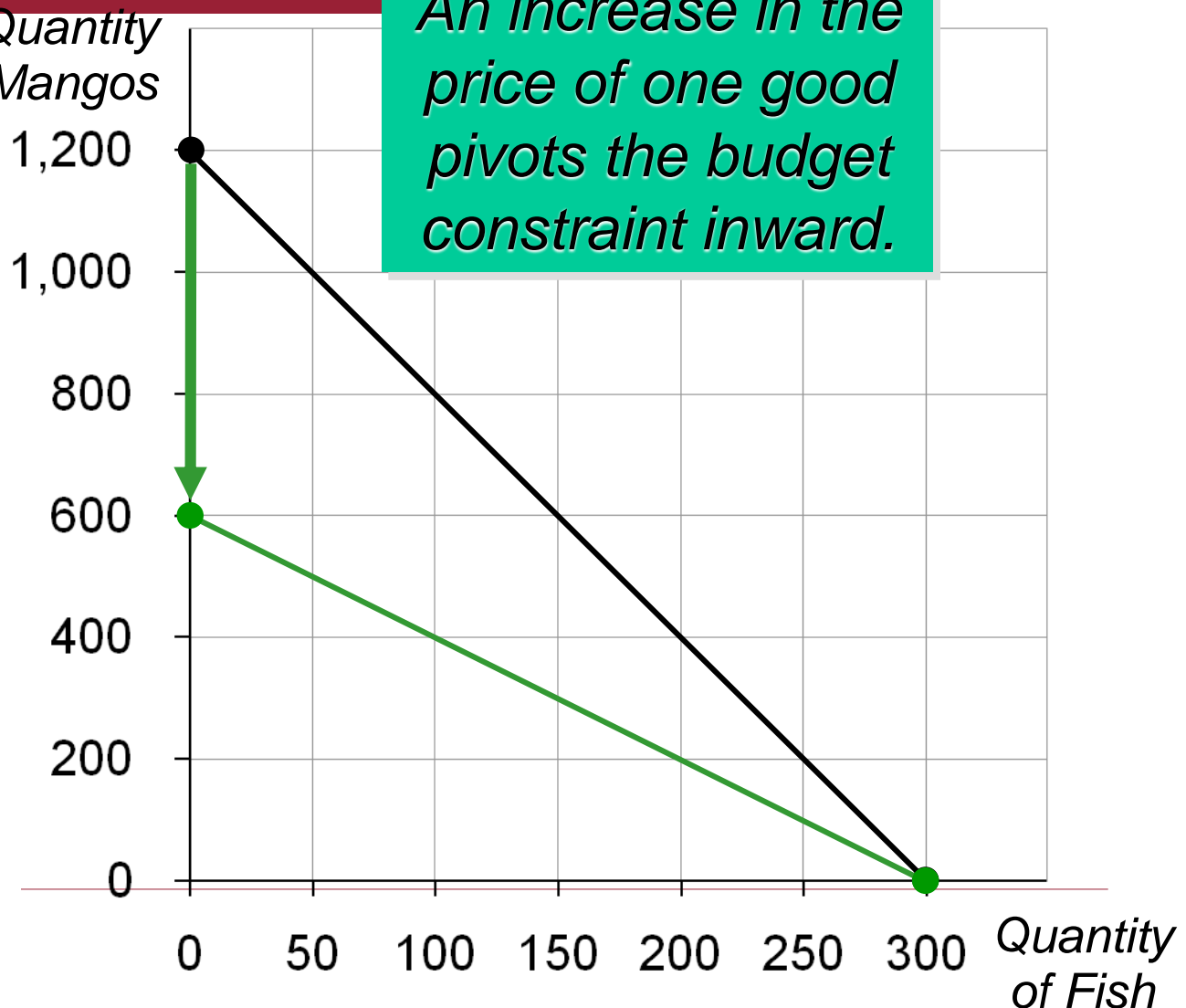
# Answers, part B

Hurley  
can still buy  
300 fish.

But now he  
can only buy  
 $\$1200/\$2 =$   
600 mangos.

Notice:  
slope is smaller,  
relative price of  
fish is now only 2  
mangos.

Quantity  
of Mangos

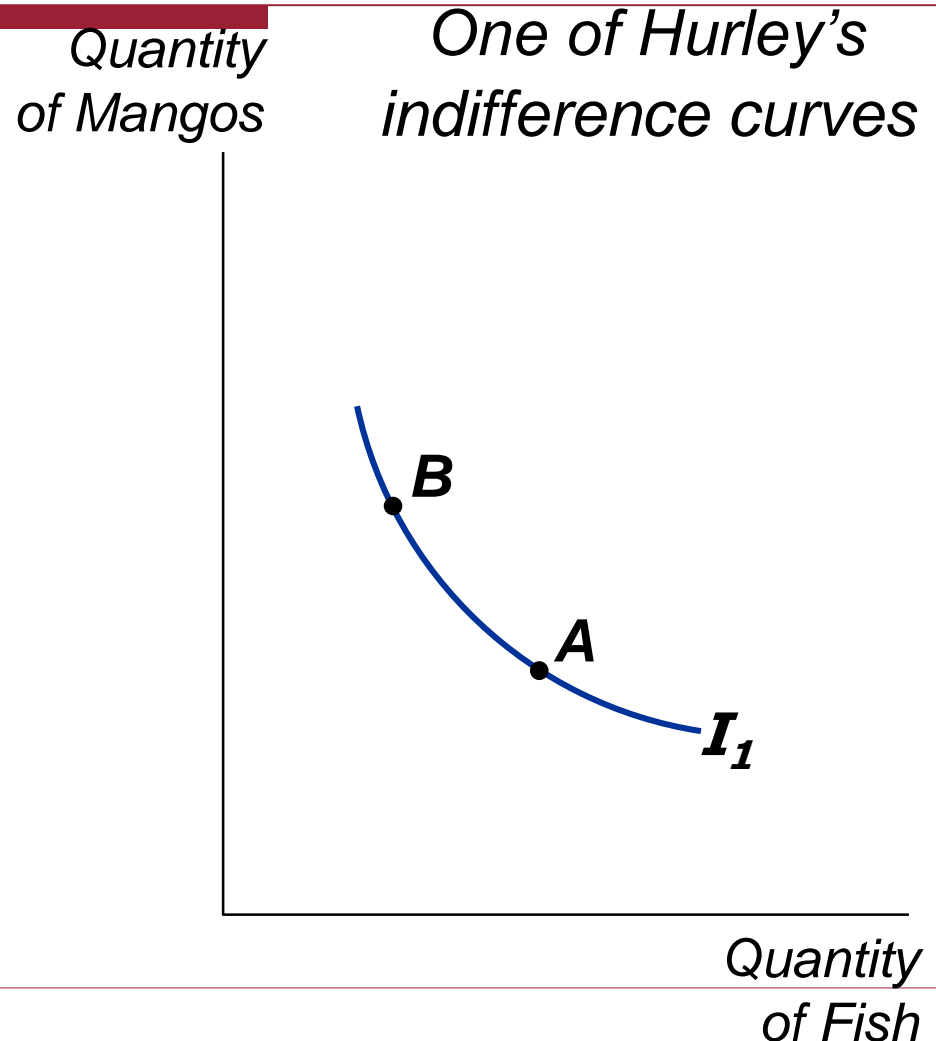


# Preferences: What the Consumer Wants

## **Indifference curve:**

*shows consumption bundles that give the consumer the same level of satisfaction*

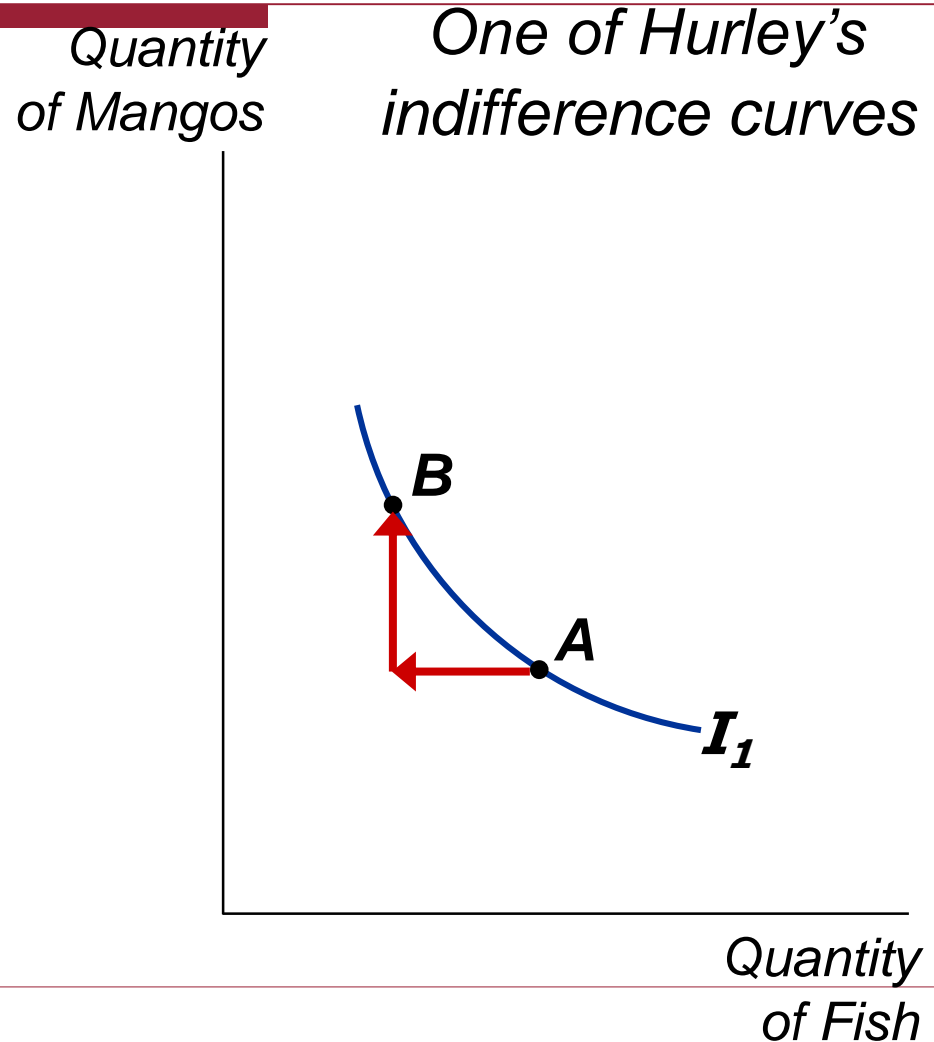
***A**, **B**, and all other bundles on  $I_1$  make Hurley equally happy – he is indifferent between them.*



# Four Properties of Indifference Curves

1. Indifference curves are downward-sloping.

*If the quantity of fish is reduced, the quantity of mangos must be increased to keep Hurley equally happy.*

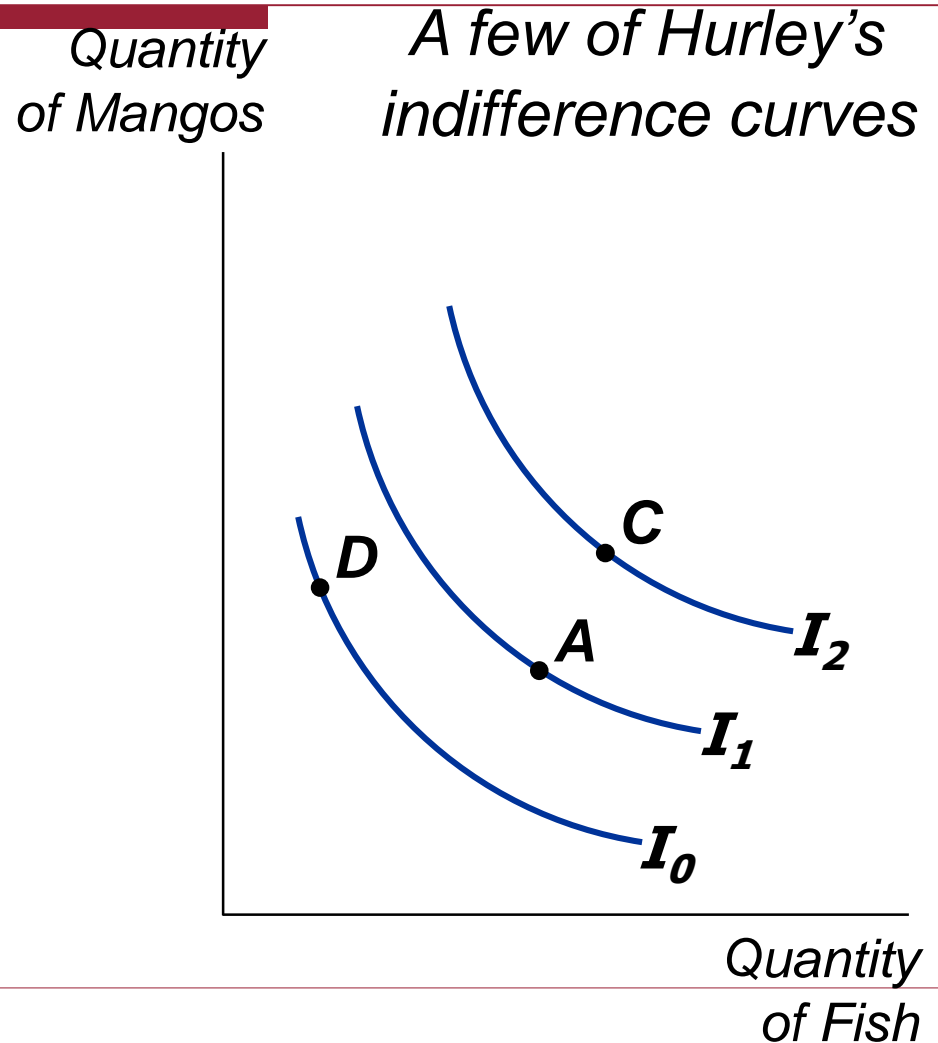


# Four Properties of Indifference Curves

2. Higher indifference curves are preferred to lower ones.

*Hurley prefers every bundle on  $I_2$  (like **C**) to every bundle on  $I_1$  (like **A**).*

*He prefers every bundle on  $I_1$  (like **A**) to every bundle on  $I_0$  (like **D**).*



# Four Properties of Indifference Curves

## 3. Indifference curves cannot cross.

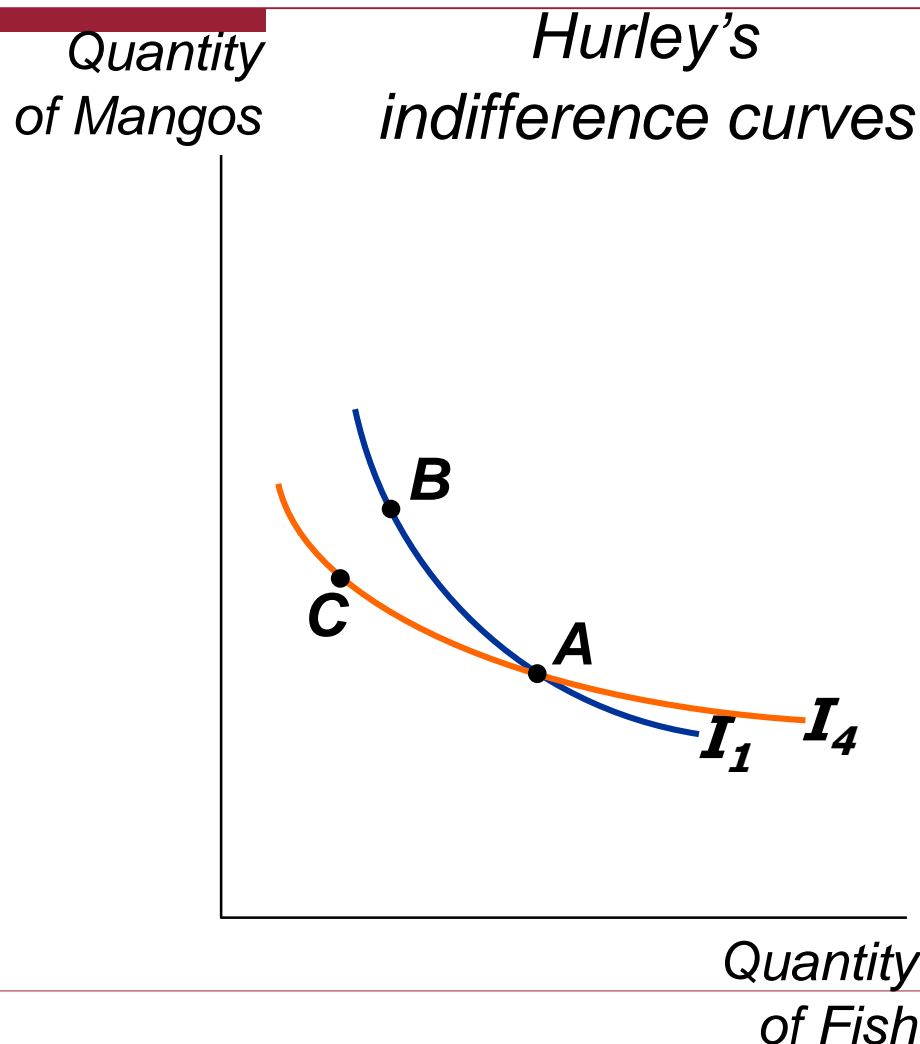
*Suppose they did.*

*Hurley should prefer **B** to **C**, since **B** has more of both goods.*

*Yet, Hurley is indifferent between **B** and **C**:*

*He likes **C** as much as **A** (both are on  $I_4$ ).*

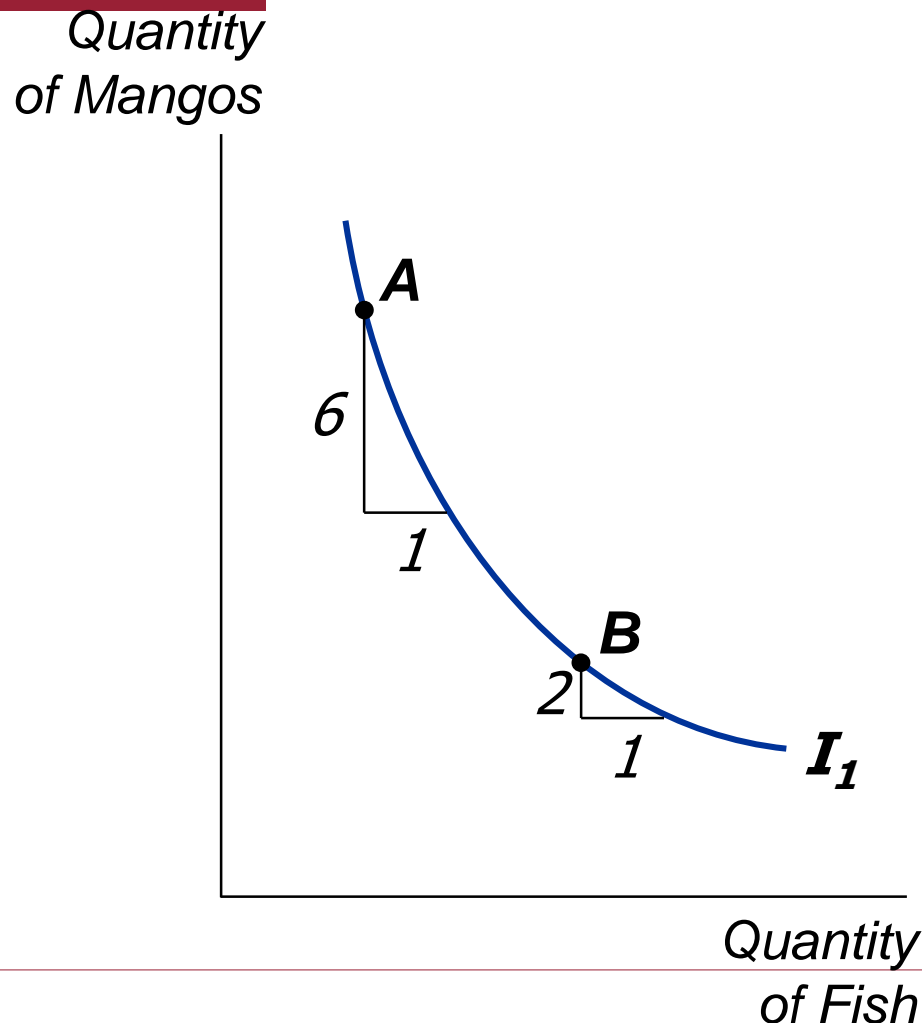
*He likes **A** as much as **B** (both are on  $I_1$ ).*



# Four Properties of Indifference Curves

**4.** Indifference curves are bowed inward.

*Hurley is willing to give up more mangos for a fish if he has few fish (**A**) than if he has many (**B**).*





# The Marginal Rate of Substitution

## **Marginal rate of substitution (MRS):**

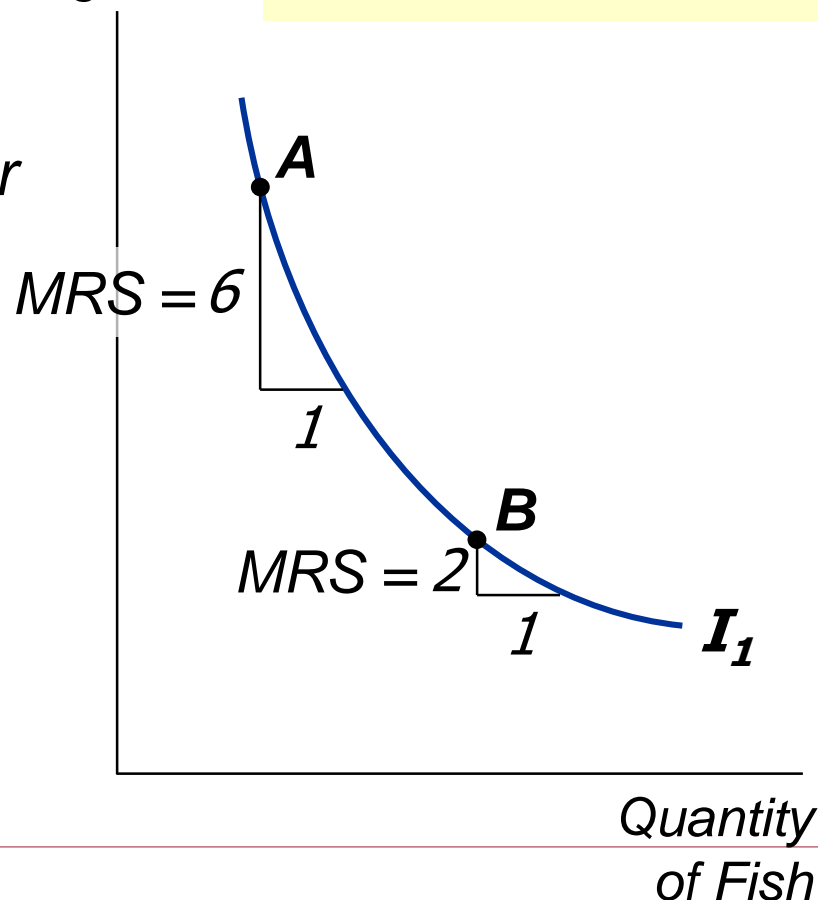
*the rate at which a consumer is willing to trade one good for another.*

*Hurley's MRS is the amount of mangos he would substitute for another fish.*

*MRS falls as you move down along an indifference curve.*

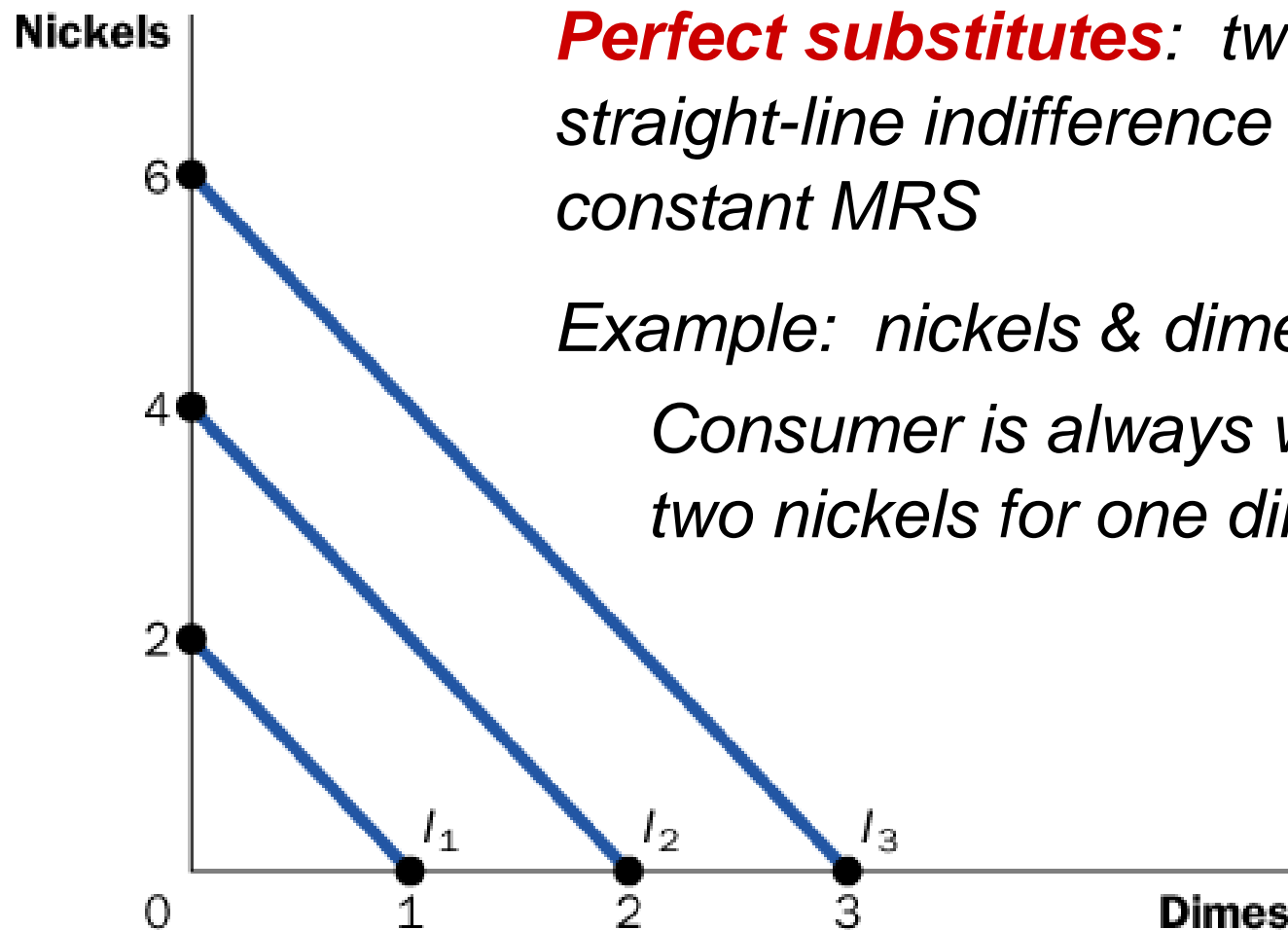
Quantity  
of Mangos

*MRS = slope of  
indifference curve*



# One Extreme Case: Perfect Substitutes

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**Perfect substitutes:** two goods with straight-line indifference curves, constant MRS

*Example: nickels & dimes*

*Consumer is always willing to trade two nickels for one dime.*

# Another Extreme Case: Perfect Complements

**Perfect complements:** two goods with right-angle indifference curves

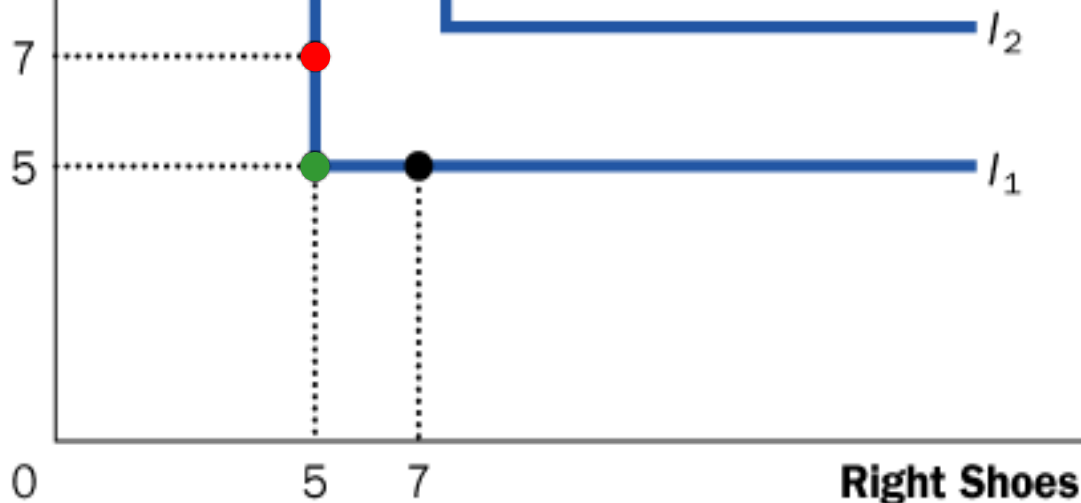
Left Shoes

Example: Left shoes, right shoes

**{7 left shoes, 5 right shoes}**

is just as good as

**{5 left shoes, 5 right shoes}**

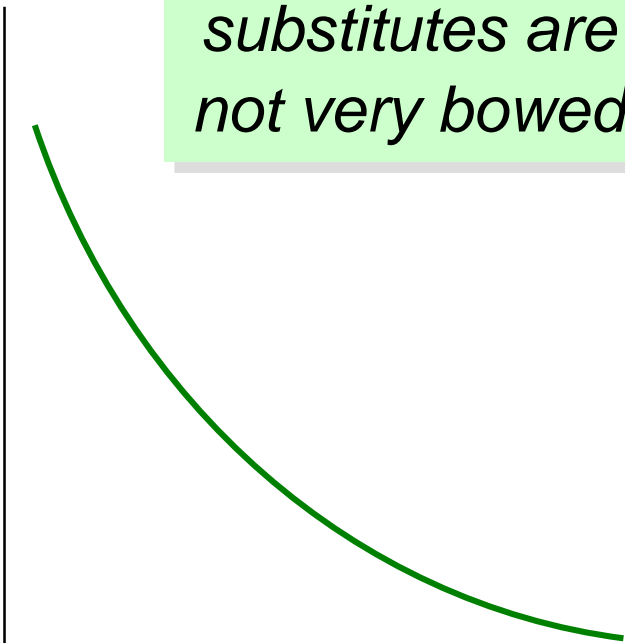


# Less Extreme Cases: Close Substitutes and Close Complements

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Quantity  
of Pepsi

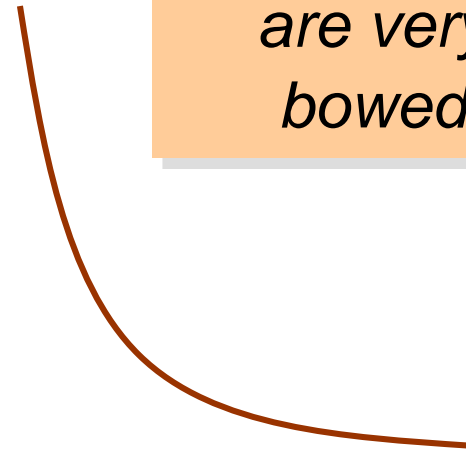
*Indifference  
curves for close  
substitutes are  
not very bowed*



Quantity  
of Coke

Quantity  
of hot  
dog buns

*Indifference  
curves for close  
complements  
are very  
bowed*



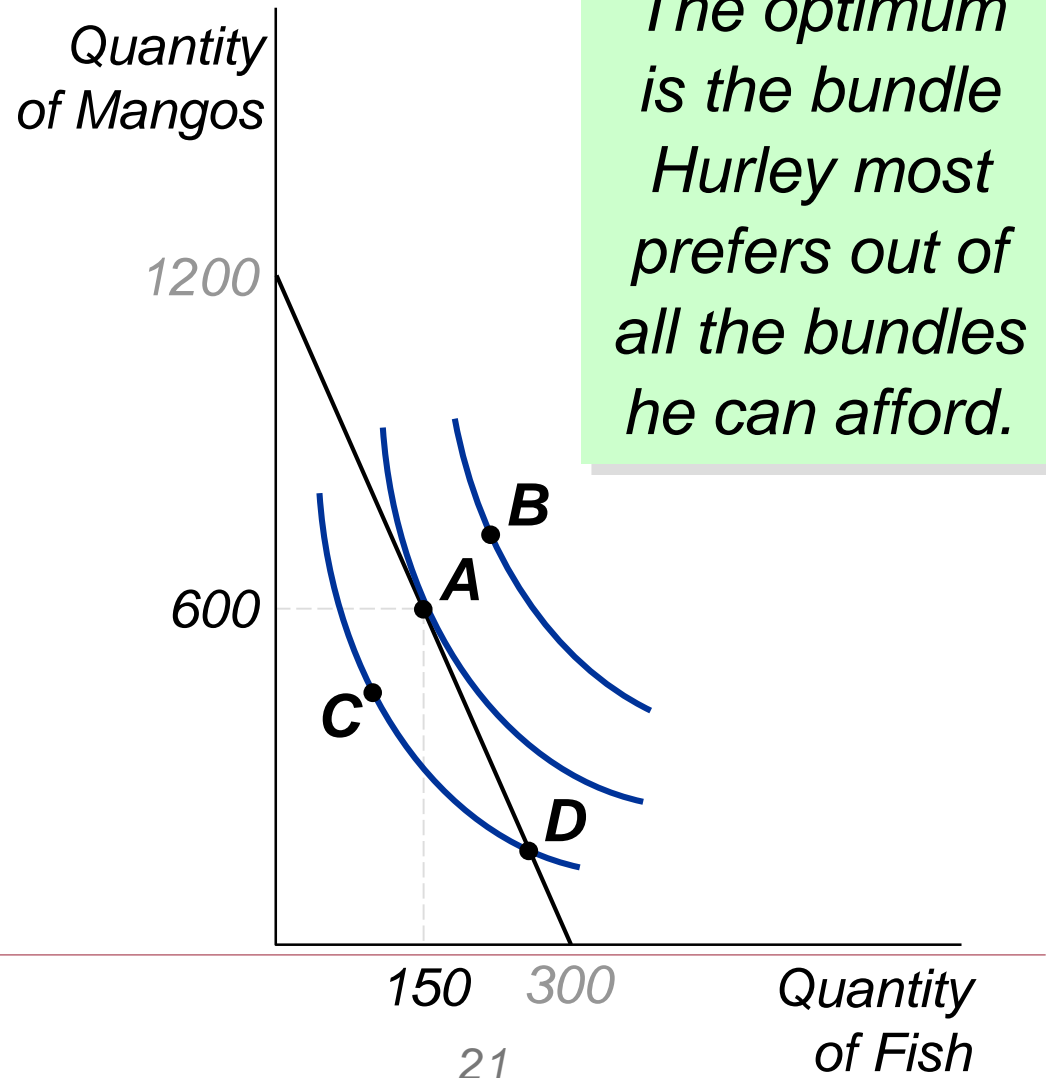
Quantity  
of hot dogs

# Optimization: What the Consumer Chooses

***A** is the optimum: the point on the budget constraint that touches the highest possible indifference curve.*

*Hurley prefers **B** to **A**, but he cannot afford **B**.*

*Hurley can afford **C** and **D**, but **A** is on a higher indifference curve.*



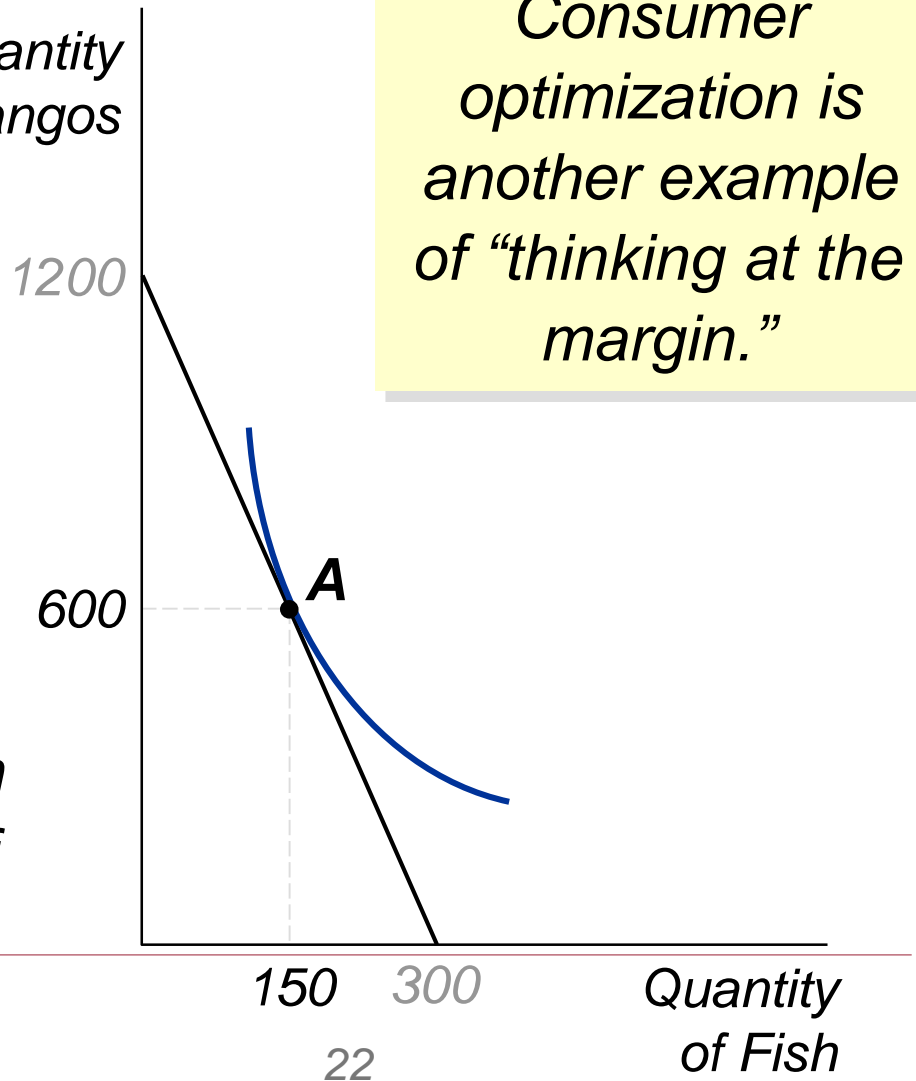
# Optimization: What the Consumer Chooses

*At the optimum,  
slope of the  
indifference curve  
equals  
slope of the budget  
constraint:*

$$MRS = P_F/P_M$$

*marginal  
value of fish  
(in terms of  
mangos)*

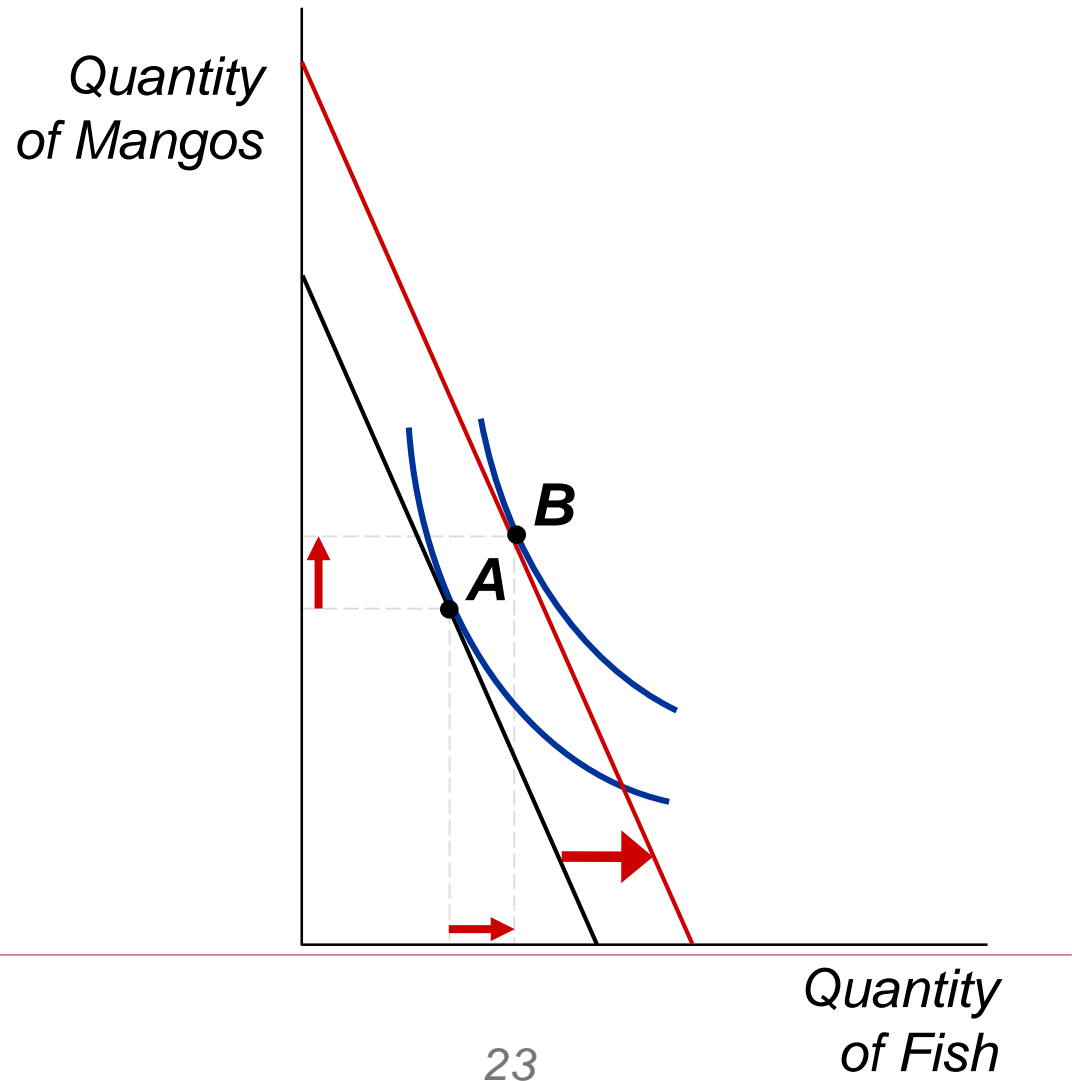
*price of fish  
(in terms of  
mangos)*



# The Effects of an Increase in Income

*An increase in income shifts the budget constraint outward.*

*If both goods are “normal,” Hurley buys more of each.*



# Inferior vs. normal goods

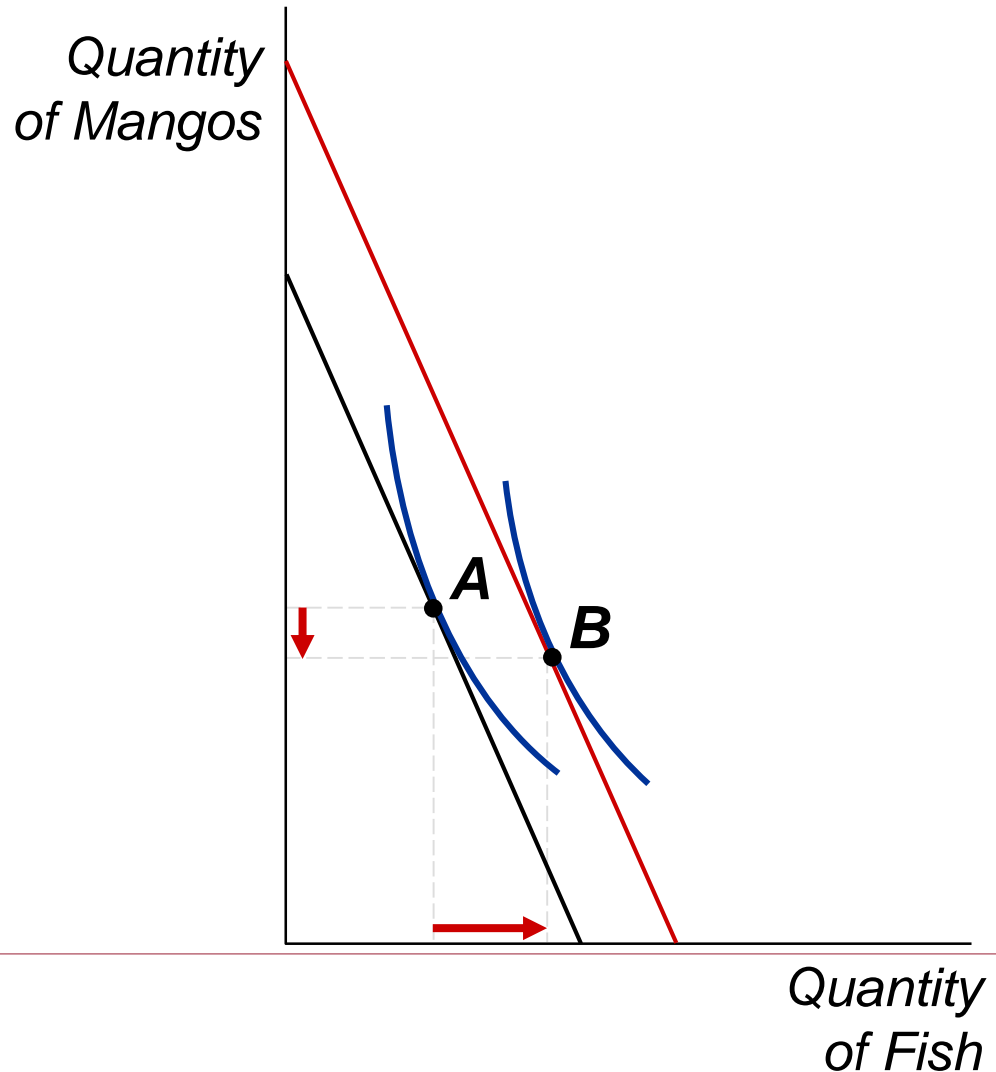
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- An increase in income increases the quantity demanded of **normal goods** and reduces the quantity demanded of **inferior goods**.
- Suppose fish is a normal good but mangos are an inferior good.
- Use a diagram to show the effects of an increase in income on Hurley's optimal bundle of fish and mangos.



# Answers

*If mangos are inferior, the new optimum will contain fewer mangos.*



# The Effects of a Price Change

*Initially,*

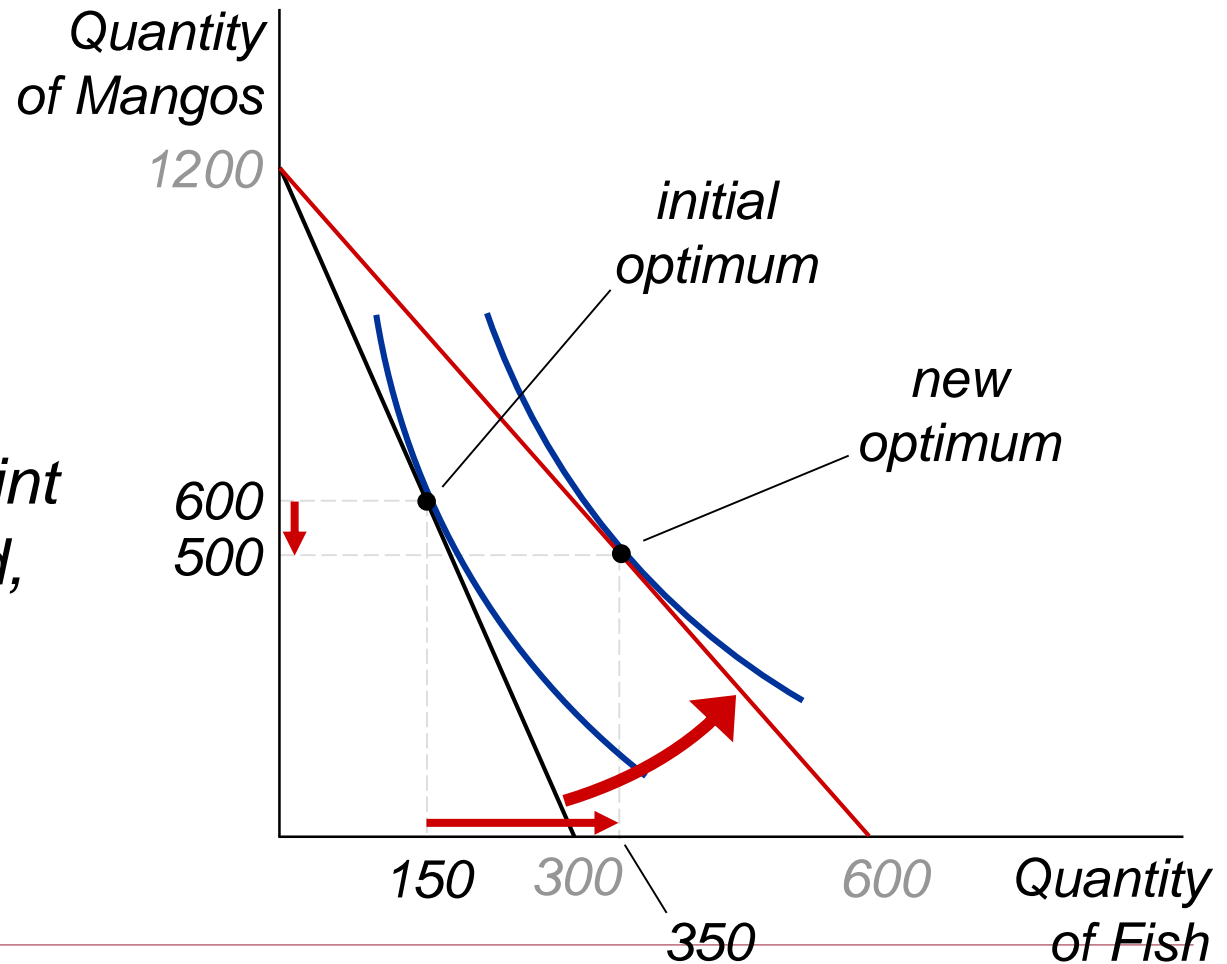
$$P_F = \$4$$

$$P_M = \$1$$

$P_F$  falls to \$2

*budget constraint rotates outward,*

*Hurley buys more fish and fewer mangos.*



# The Income and Substitution Effects

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A fall in the price of fish has two effects on Hurley's optimal consumption of both goods.

- **Income effect**

A fall in  $P_F$  boosts the purchasing power of Hurley's income, allows him to buy more mangos and more fish.

- **Substitution effect**

A fall in  $P_F$  makes mangos more expensive relative to fish, causes Hurley to buy fewer mangos & more fish.

Notice: *The net effect on mangos is ambiguous.*

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# The Income and Substitution Effects

Initial optimum at **A**.

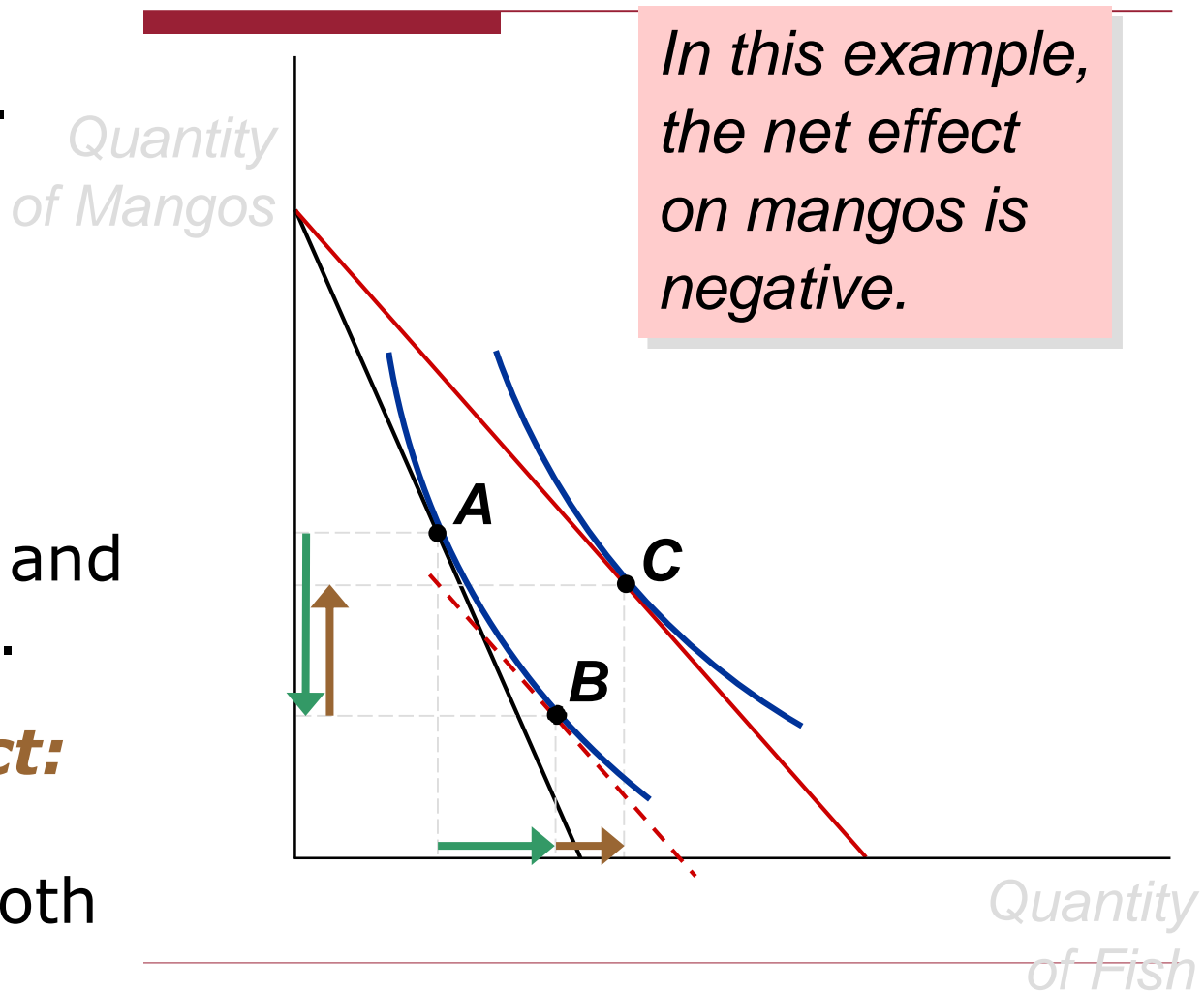
$P_F$  falls.

**Substitution effect:**

from **A** to **B**,  
buy more fish and  
fewer mangos.

**Income effect:**

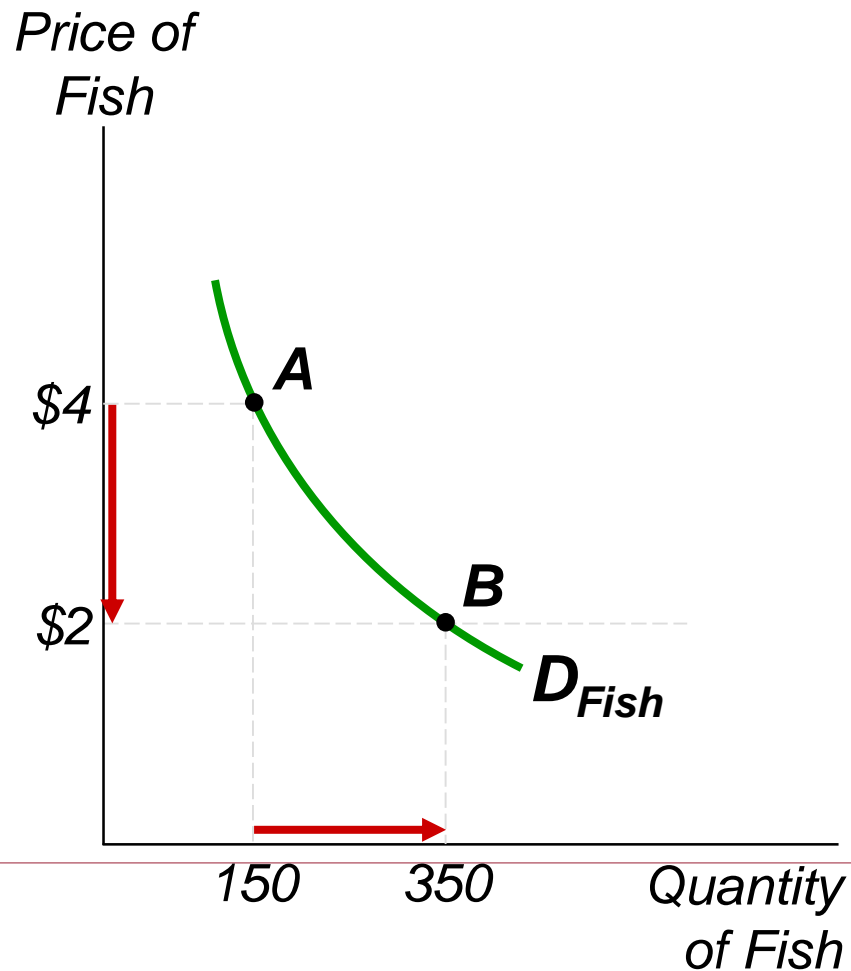
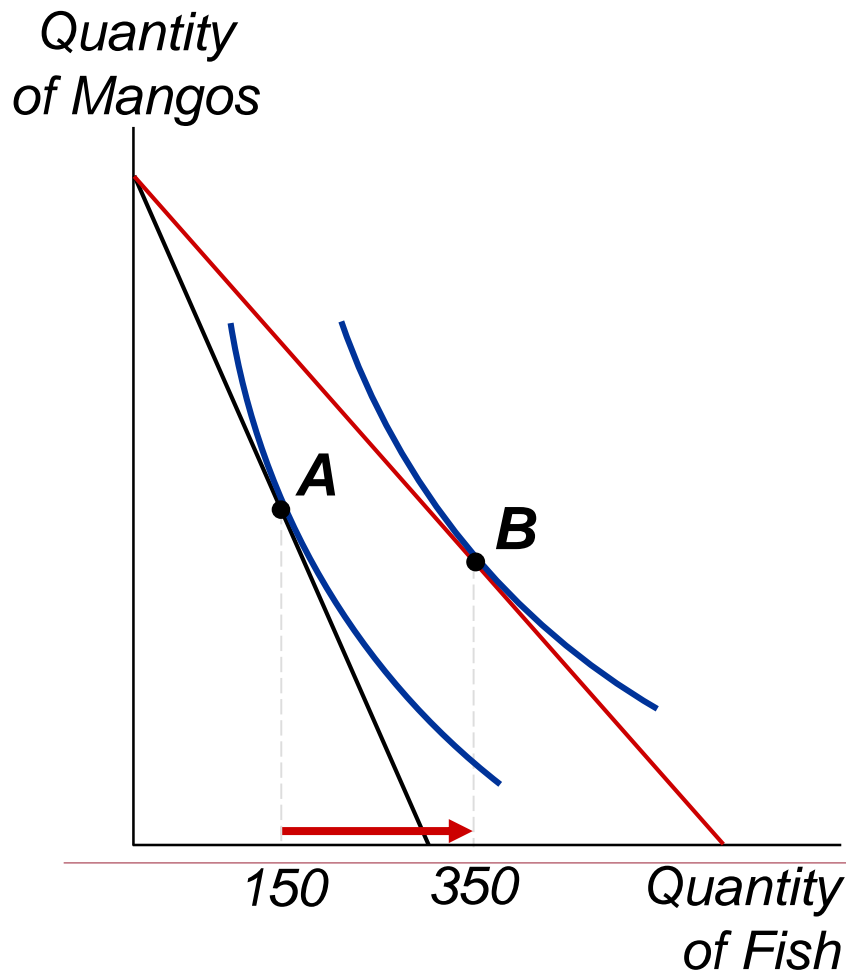
from **B** to **C**,  
buy more of both  
goods.



# Deriving Hurley's Demand Curve for Fish

**A:** When  $P_F = \$4$ , Hurley demands 150 fish.

**B:** When  $P_F = \$2$ , Hurley demands 350 fish.

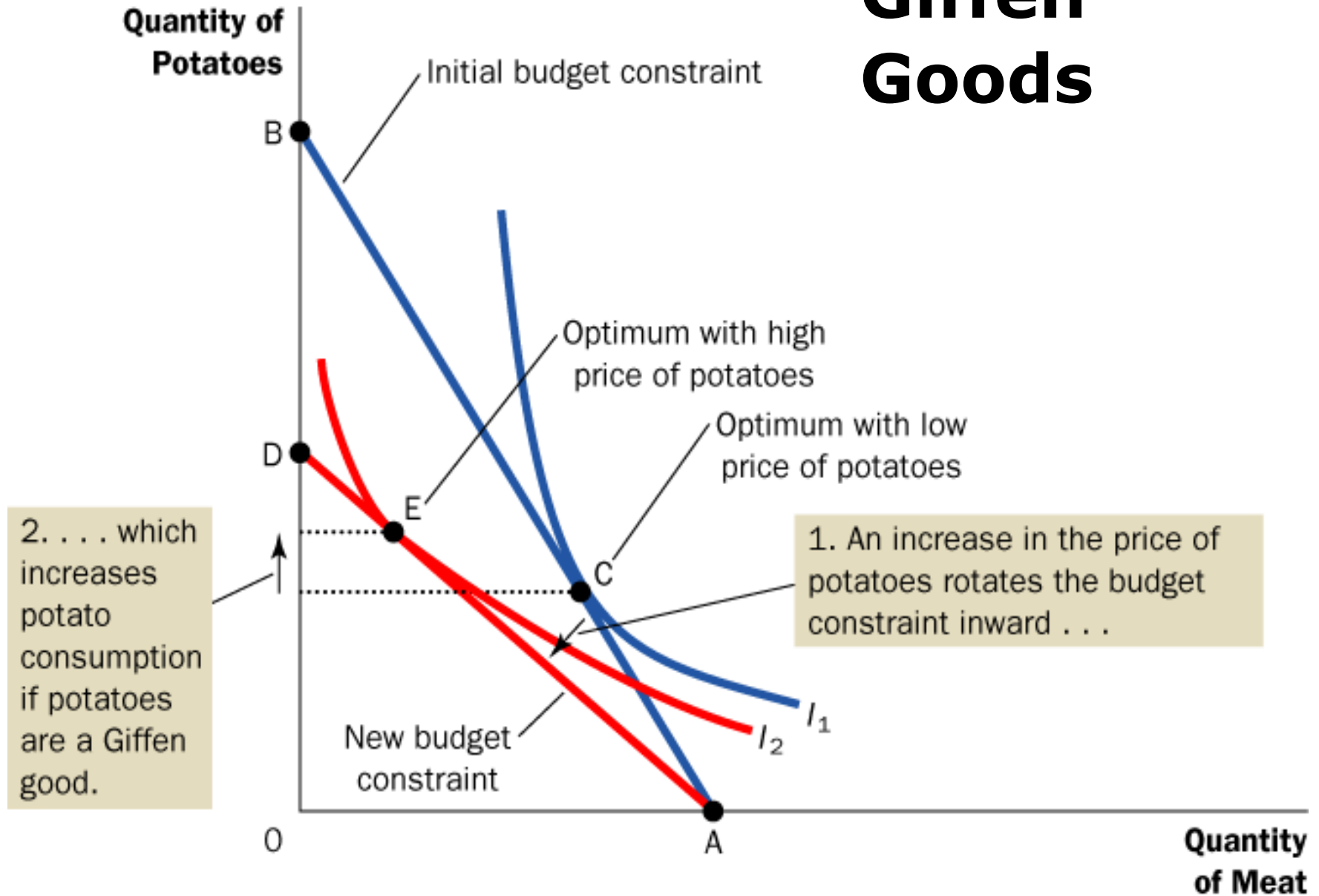


# Application 1: Giffen Goods

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- Do all goods obey the *Law of Demand*?
- Suppose the goods are potatoes and meat, and potatoes are an inferior good.
- If price of potatoes rises,
  - substitution effect: buy less potatoes
  - income effect: buy more potatoes
- If income effect  $>$  substitution effect, then potatoes are a **Giffen good**, a good for which an increase in price raises the quantity demanded.

# Giffen Goods



# Application 2:

## Wages and Labor Supply

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### *Budget constraint*

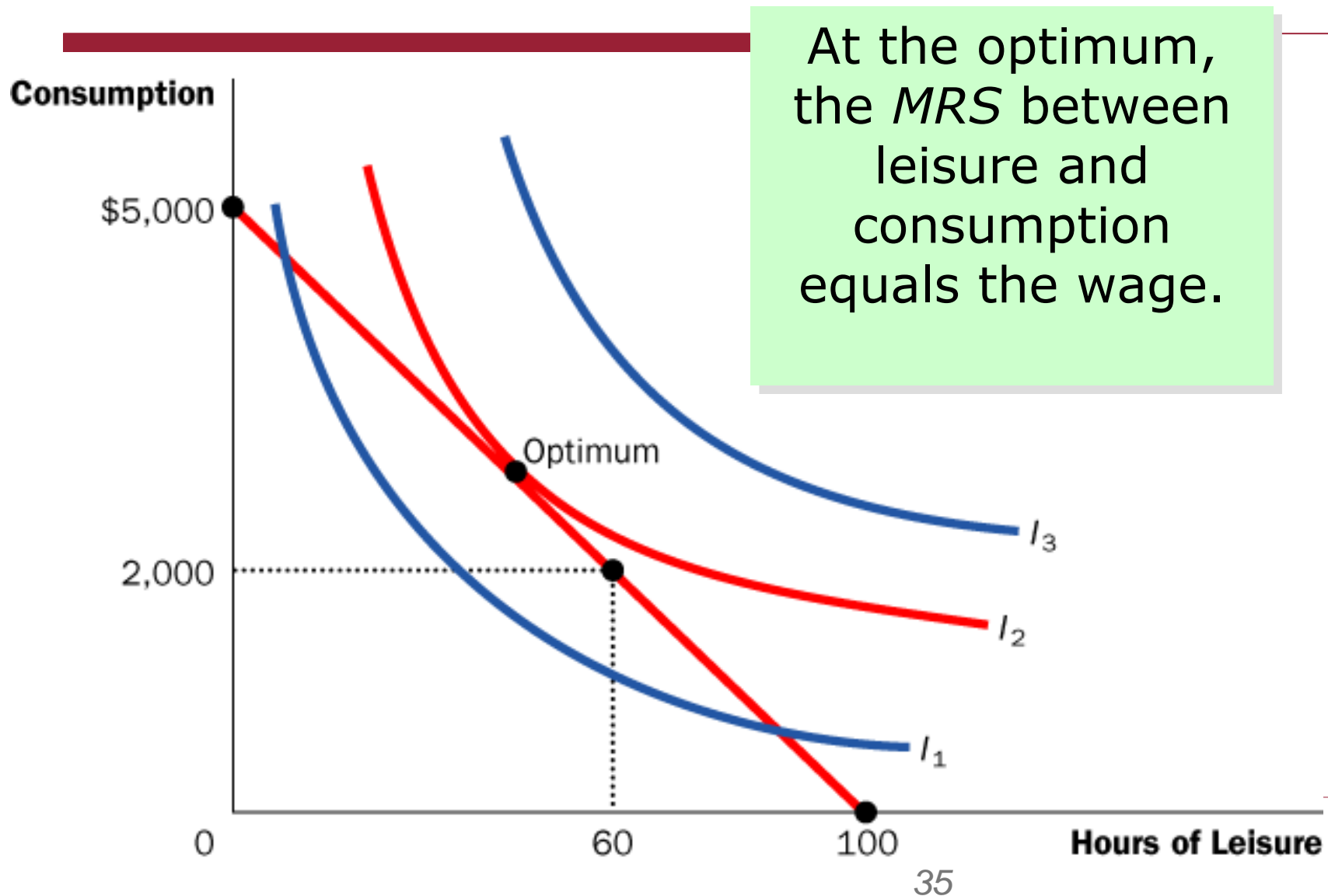
- Shows a person's tradeoff between consumption and leisure.
- Depends on how much time she has to divide between leisure and working.
- The relative price of an hour of leisure is the amount of consumption she could buy with an hour's wages.

### *Indifference curve*

- Shows "bundles" of consumption and leisure that give her the same level of satisfaction.



# Application 2: Wages and Labor Supply



# Application 2: Wages and Labor Supply

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An increase in the wage has two effects on the optimal quantity of labor supplied.

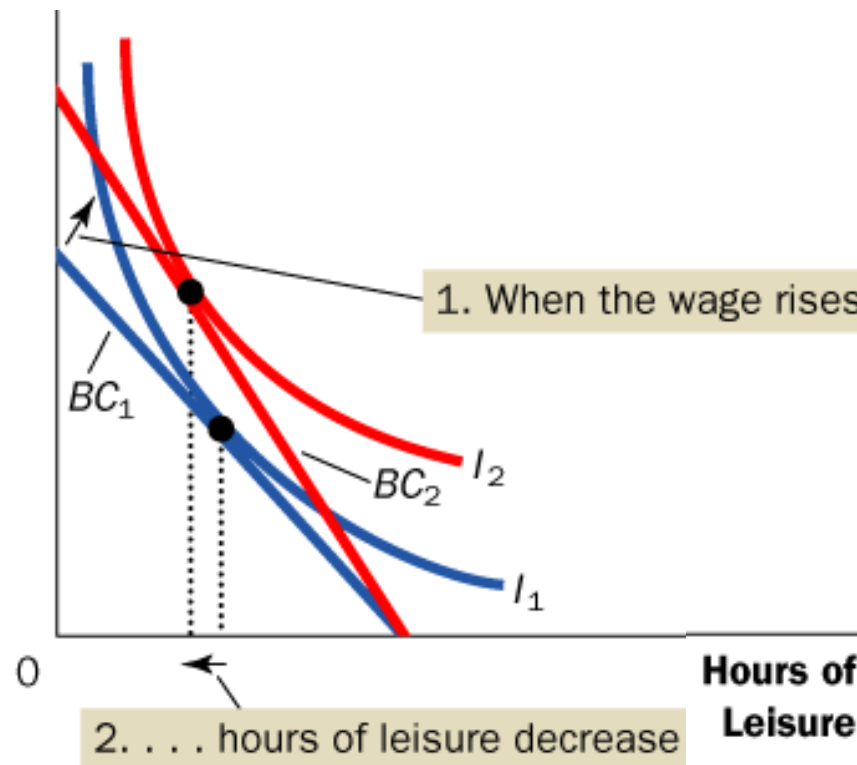
- *Substitution effect (SE)*: A higher wage makes leisure more expensive relative to consumption. The person chooses less leisure, *i.e.*, increases quantity of labor supplied.
- *Income effect (IE)*: With a higher wage, she can afford more of both “goods.” She chooses more leisure, *i.e.*, reduces quantity of labor supplied.

# Application 2: Wages and Labor Supply

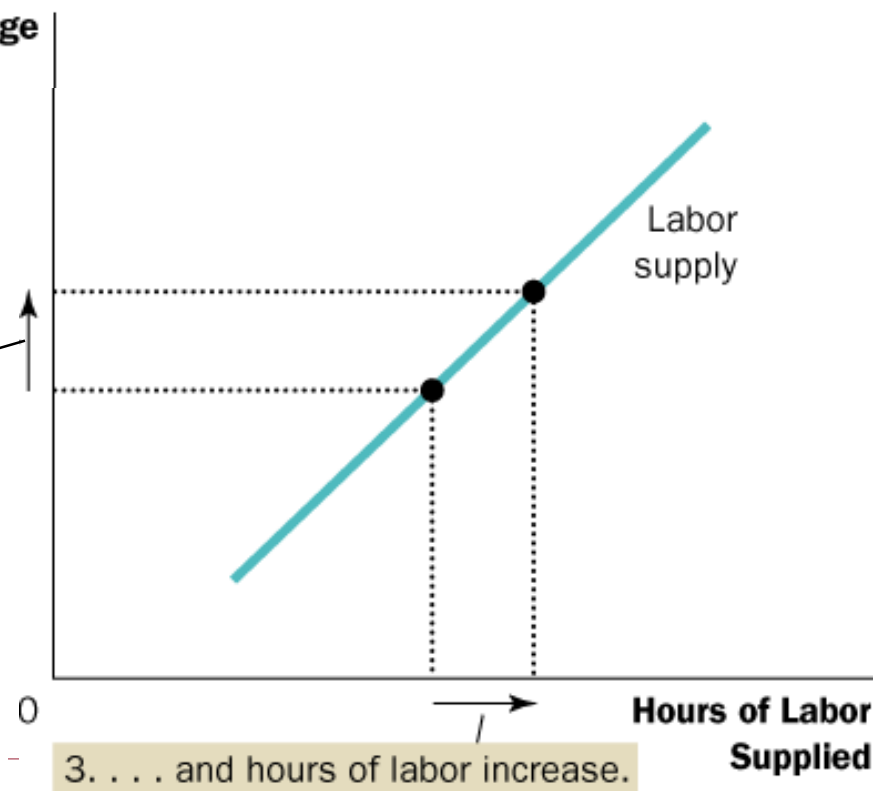
*For this person,  
 $SE > IE$*

*So her labor supply  
increases with the wage*

Consumption



Wage

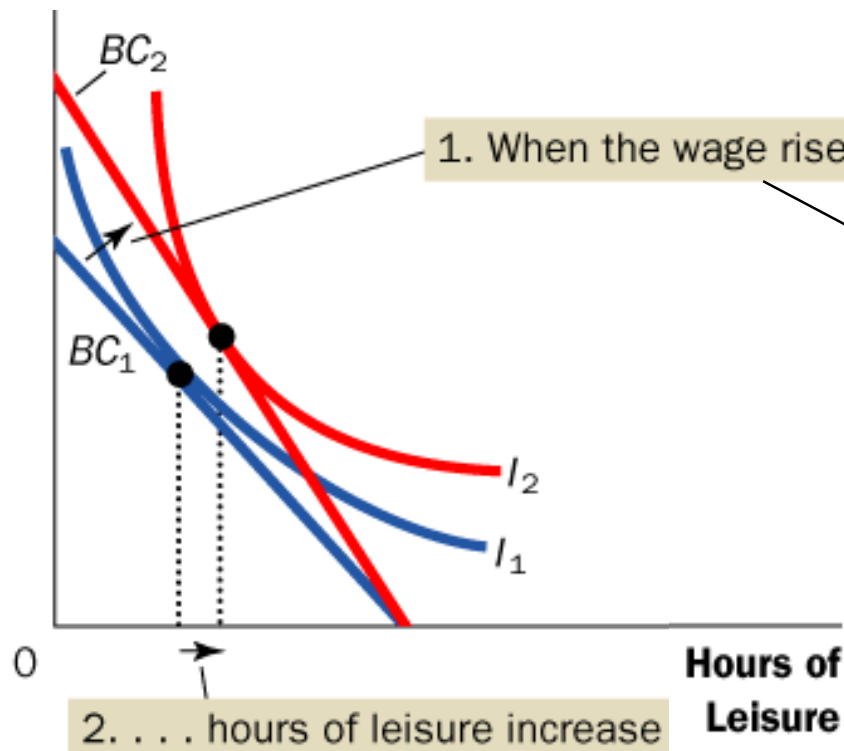


# Application 2: Wages and Labor Supply

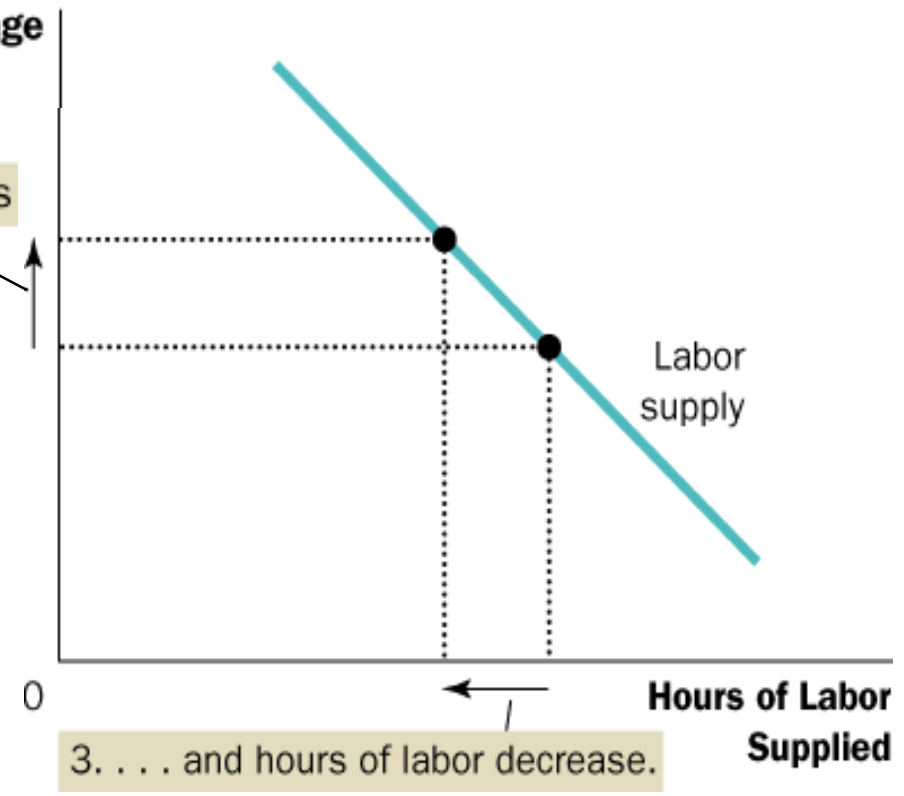
For this person,  
 $SE < IE$

So his labor supply falls  
when the wage rises

Consumption



Wage



# Could This Happen in the Real World???

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Cases where the income effect on labor supply is very strong:

- Over last 100 years, technological progress has increased labor demand and real wages.

The average workweek fell from 6 to 5 days.

- When a person wins the lottery or receives an inheritance, his wage is unchanged – hence no substitution effect.

But such persons are more likely to work fewer hours, indicating a strong income effect.

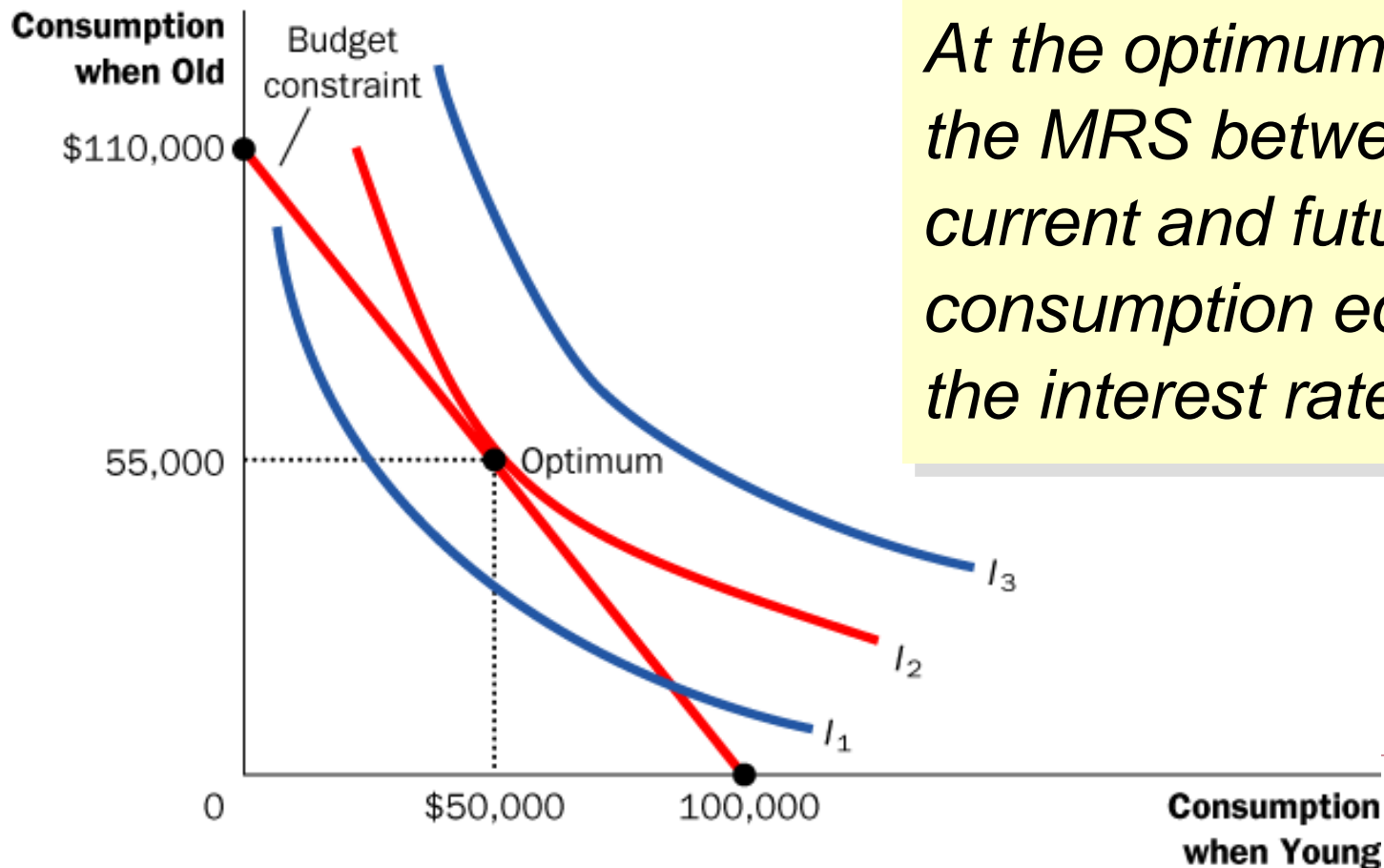
# Application 3: Interest Rates and Saving

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- A person lives for two periods.
  - Period 1: young, works, earns \$100,000  
consumption = \$100,000 minus amount saved
  - Period 2: old, retired  
consumption = saving from Period 1  
plus interest earned on saving
- The **interest rate determines the relative price of consumption when young in terms of consumption when old.**

# Application 3: Interest Rates and Saving

*Budget constraint shown is for 10% interest rate.*



*At the optimum, the MRS between current and future consumption equals the interest rate.*

# Effects of a change in the interest rate

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- Suppose the interest rate rises.
- Describe the income and substitution effects on current and future consumption, and on saving.



# Answers

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The interest rate rises.

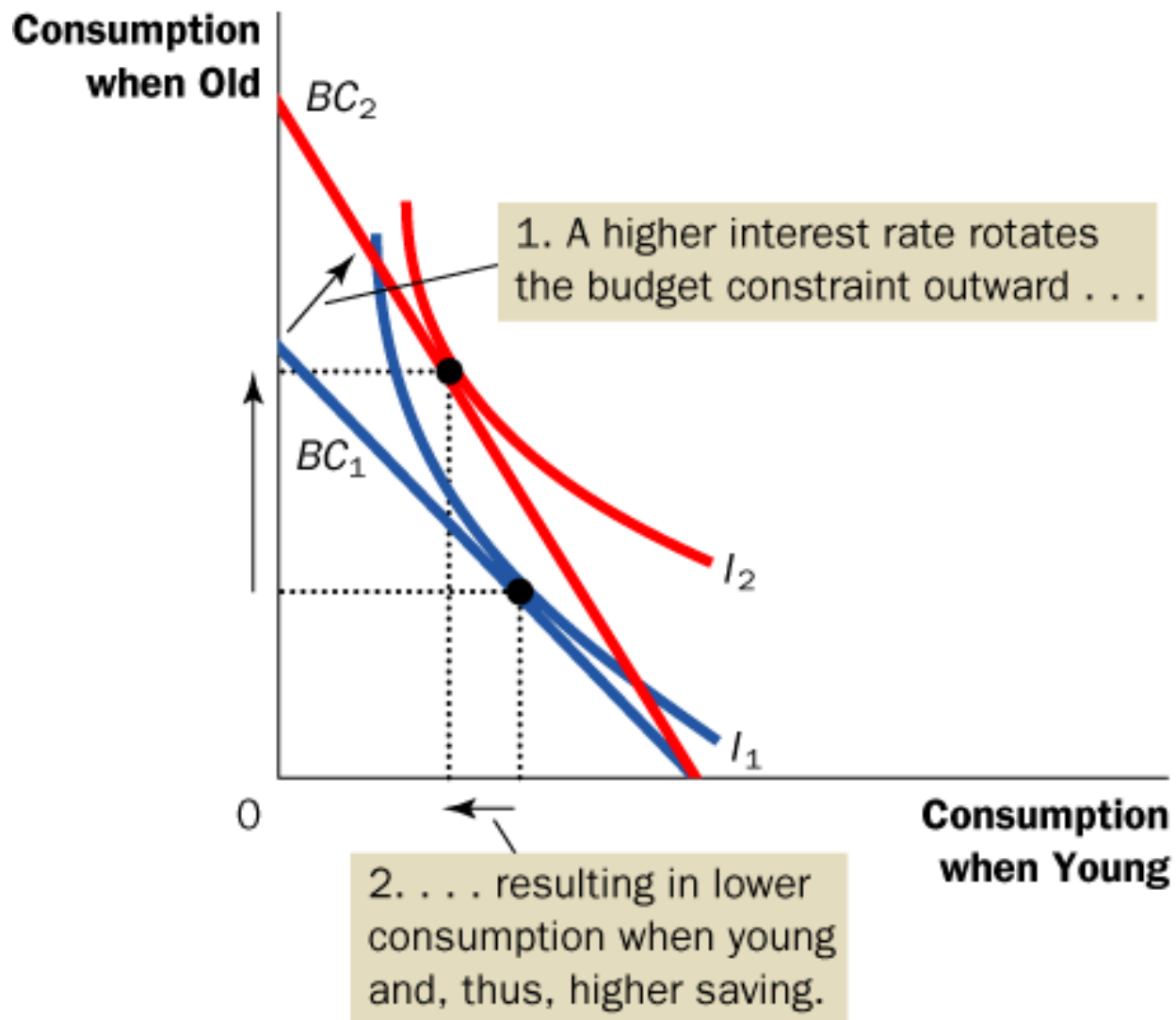
## *Substitution effect*

- Current consumption becomes more expensive relative to future consumption.
- Current consumption falls, saving rises, future consumption rises.

## *Income effect*

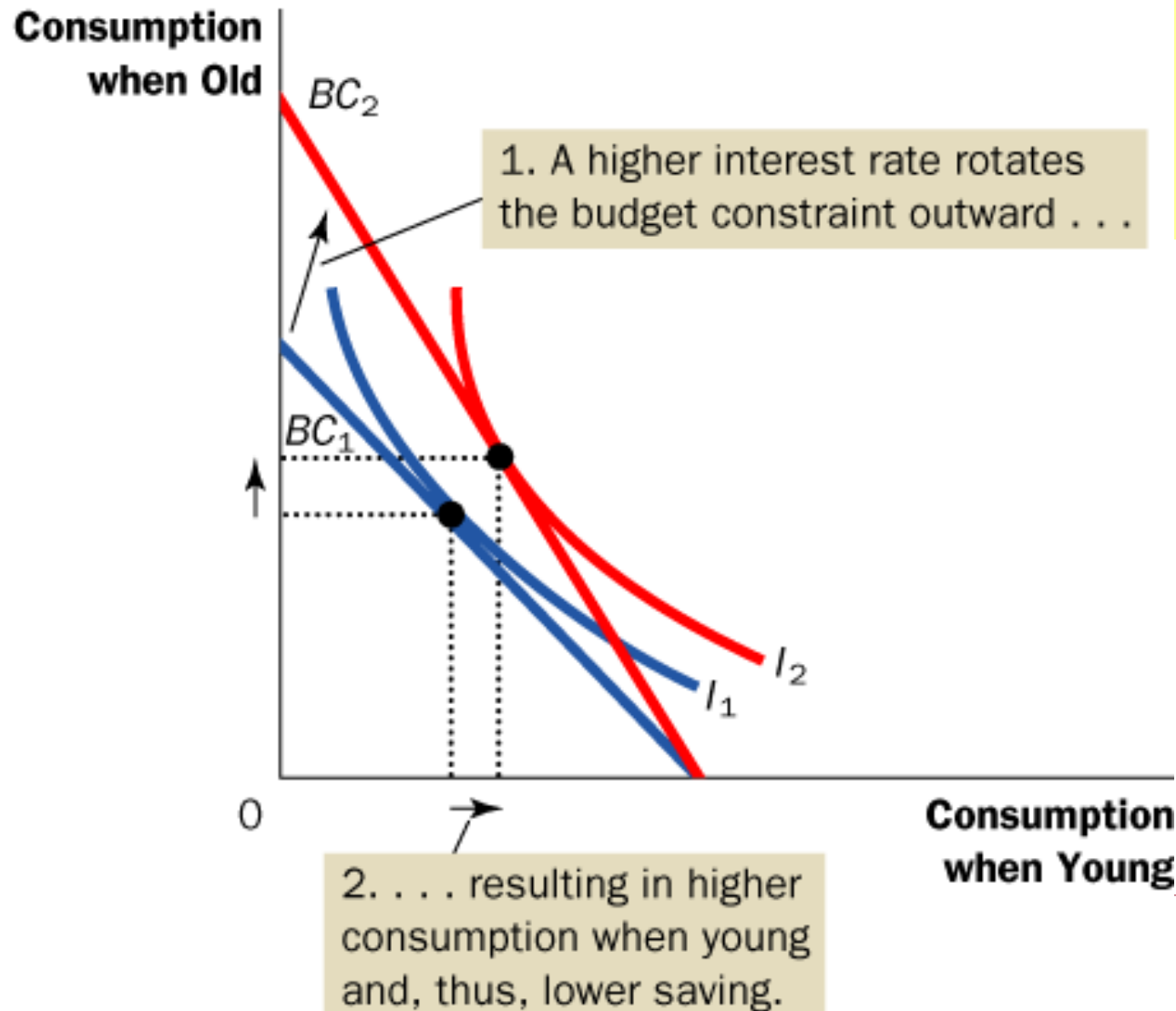
- Can afford more consumption in both the present and the future. Saving falls.

# Application 3: Interest Rates and Saving



*In this case,  
 $SE > IE$  and  
saving rises*

# Application 3: Interest Rates and Saving



# CONCLUSION:

## ***Do People Really Think This Way?***

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- People do not make spending decisions by writing down their budget constraints and indifference curves.
  - Yet, they try to make the choices that maximize their satisfaction given their limited resources.
  - The theory in this lecture is only intended as a metaphor for how consumers make decisions.
  - It explains consumer behavior fairly well in many situations and provides the basis for more advanced economic analysis.
  - New theory of consumer's choice → behavioral economics
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# LECTURE SUMMARY

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- A consumer's budget constraint shows the possible combinations of different goods she can buy given her income and the prices of the goods. The slope of the budget constraint equals the relative price of the goods.
- An increase in income shifts the budget constraint outward. A change in the price of one of the goods pivots the budget constraint.
- A consumer's indifference curves represent her preferences. An indifference curve shows all the bundles that give the consumer a certain level of happiness. The consumer prefers points on higher indifference curves to points on lower ones.
- The slope of an indifference curve at any point is the marginal rate of substitution – the rate at which the consumer is willing to trade one good for the other.

# LECTURE SUMMARY

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- The consumer optimizes by choosing the point on her budget constraint that lies on the highest indifference curve. At this point, the marginal rate of substitution equals the relative price of the two goods.
- When the price of a good falls, the impact on the consumer's choices can be broken down into two effects, an income effect and a substitution effect.
- The income effect is the change in consumption that arises because a lower price makes the consumer better off. It is represented by a movement from a lower indifference curve to a higher one.
- The substitution effect is the change that arises because a price change encourages greater consumption of the good that has become relatively cheaper. It is represented by a movement along an indifference curve.

# LECTURE SUMMARY

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- The theory of consumer choice can be applied in many situations. It can explain why demand curves can potentially slope upward, why higher wages could either increase or decrease labor supply, and why higher interest rates could either increase or decrease saving.