

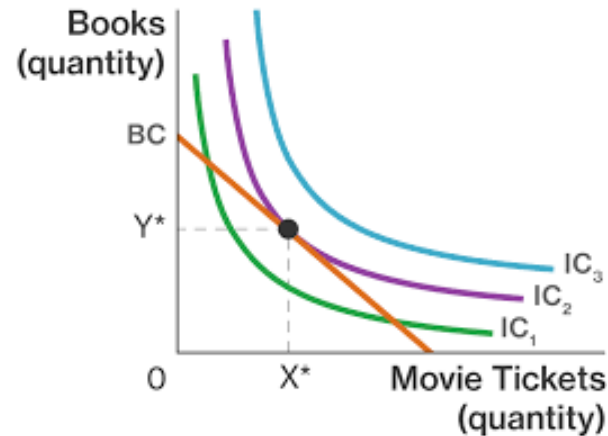
ECONOMICS Lecture 8

Utility Maximization Model

Biwei Chen

Topics

- Indifference Curve
- Budget Constraint
- Consumer Choice



This lecture provides a theoretical framework on how consumers allocate income among different combinations of goods and services to maximize their utility. Applying the theory of consumer choice, we can analyze the policy question whether low-income households are better off receiving good stamp or a comparable amount of cash.

Wicksteed on Consumption Decision

We have seen that the skillful marketer has a portion of her scale of preferences definitely and even minutely present in her consciousness as she enters the market. She knows with considerable nicety the terms on which this or that alternative purchase is preferable, and the immensely complex system of combinations which can be commanded by the money she has to spend is fairly well under her ken. She may therefore come out of the marketplace having done something like the best that was possible with her money. But in order for this result to represent the most effective administration of her resources in general for all the purposes of her life, other opportunities than those of the market in which she actually stood must also have been present in her mind with adequate preciseness; for her total expenditure in the market-place is not rigidly fixed in advance.

Philip Wicksteed (1910) The Common Sense of Political Economy

In this lecture, we will learn

- How do economists model consumer's preferences?
- How does the budget constraint represent the combination of goods a consumer can afford?
- How does a consumer allocate income on different goods?
- How does a consumer make optimal consumption decision?

Consumption is the sole end and purpose of all production.

—Adam Smith

Utility and Preferences

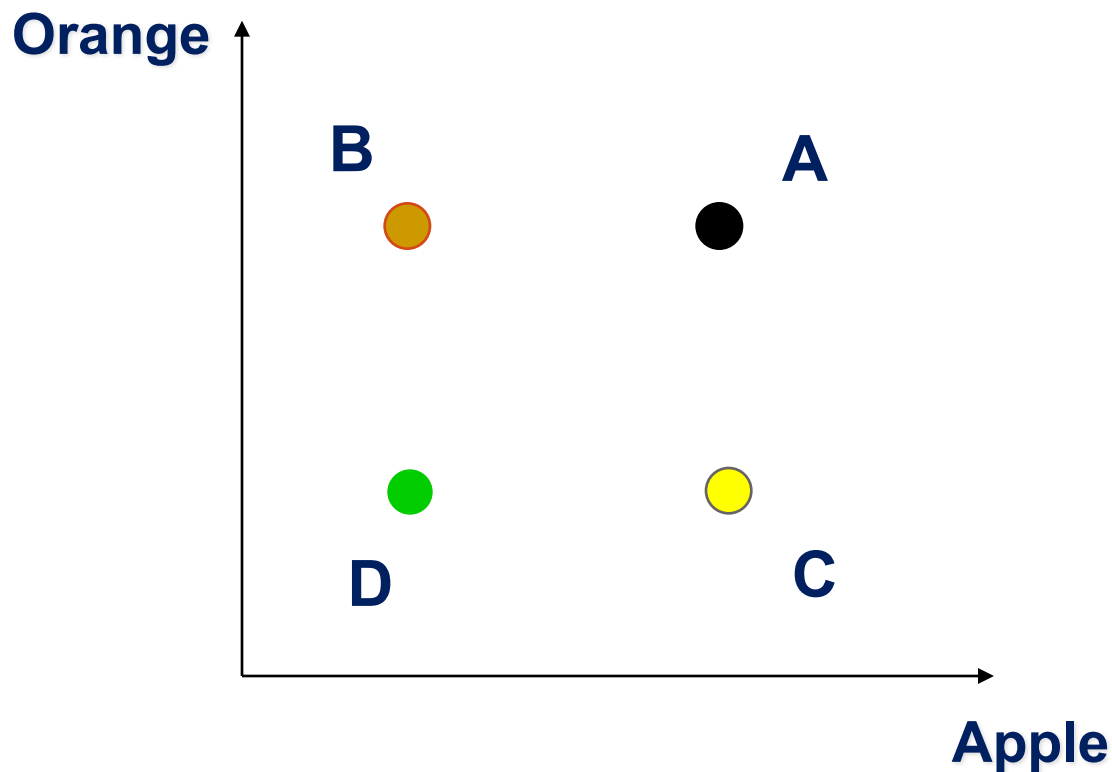
- **Utility**: Numerical value or rank representing the satisfaction that a consumer gets from consumption.
- **Utility function**: Formula that assigns a level of utility to individual market baskets. For example, $U=2x$ or $U=2xy$.
- **Cardinal utility function**: Utility function describing by how much one market basket is preferred to another.
- **Ordinal utility function**: Utility function that generates a ranking of market baskets in order of most to least preferred.

Consumer Preferences

- Recall from last class how classical economists view individuals as utility seekers.
- A representative consumer, Harry, is rational and self-interested. His goal is trying to maximize his utility.
- Economists invented lots of concepts and tools to analyze this utility maximization process.
- Utility function describes the relationship between the consumption quantity and level of satisfaction.
- $U=f(X)$ denotes a utility function of a single type of consumption good. $U=f(X,Y)$ represents a utility function of two goods.

Consumer Preferences

We assume that consumer's choice behavior follows the laws of preference: Completeness; Transitivity; Insatiateness.



$A \succ B$

$A \succ C$

$A \succ D$

$B \succ D$

$C \succ D$

$B ? C$

Preferences: What Harry Wants

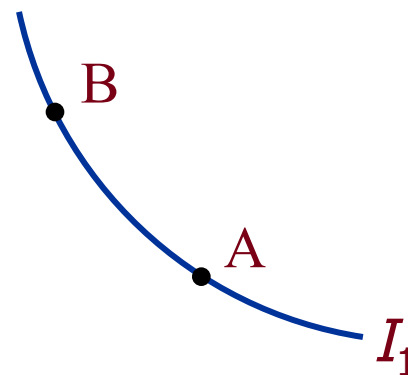
Indifference Curve:

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

A, B, and all other bundles on I_1 make Harry equally happy: he is *indifferent* between them.

Mangos

One of Harry's
indifference curves



Fish

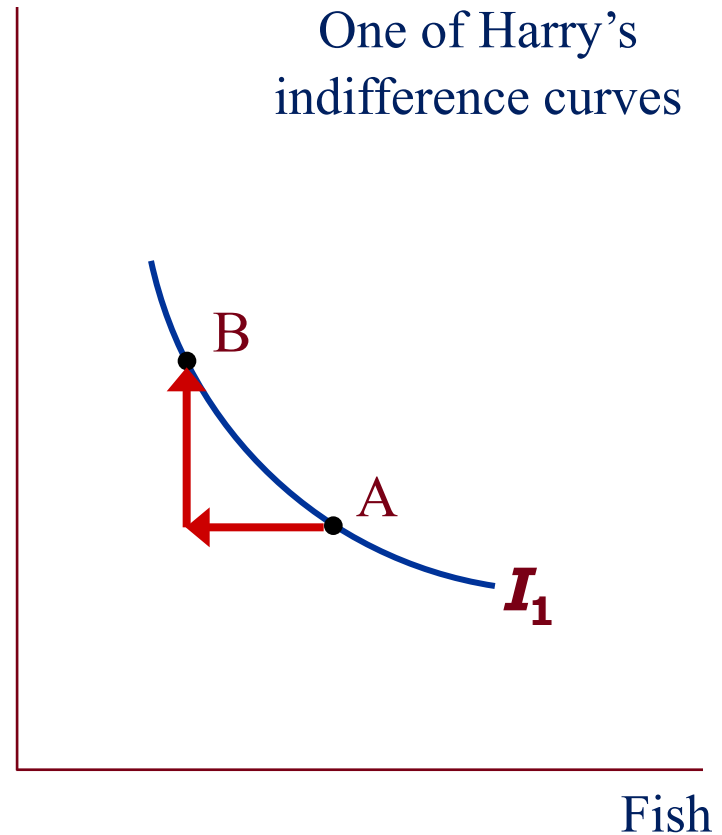
Properties of Indifference Curves I

1. Indifference curves are downward-sloping.

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

Mangos

One of Harry's indifference curves



Properties of Indifference Curves II

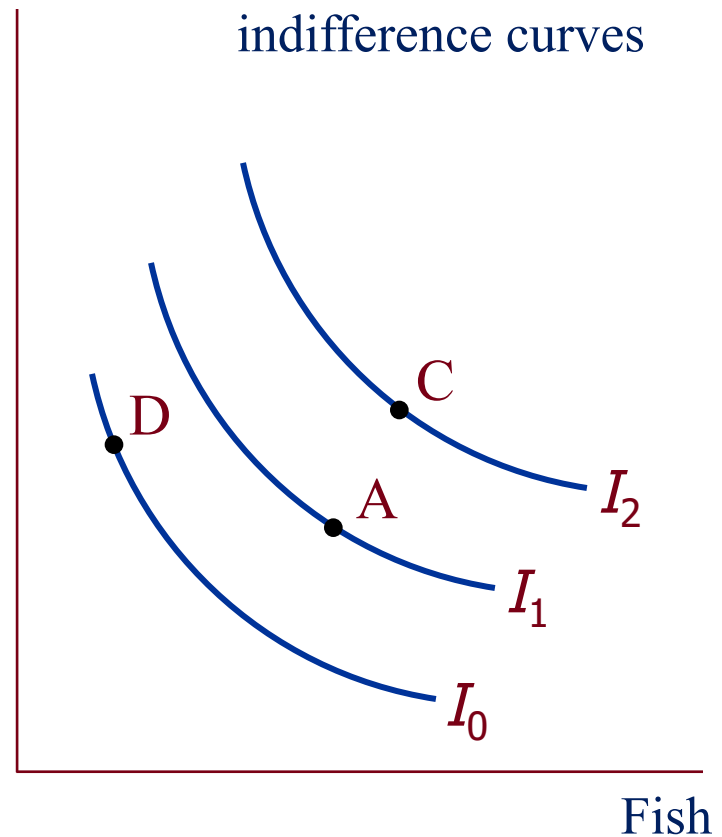
2. Higher indifference curves are preferred to lower ones.

Harry 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).

Mangos

A few of Harry's indifference curves



Properties of Indifference Curves III

3. Indifference curves cannot cross.

Suppose they did.

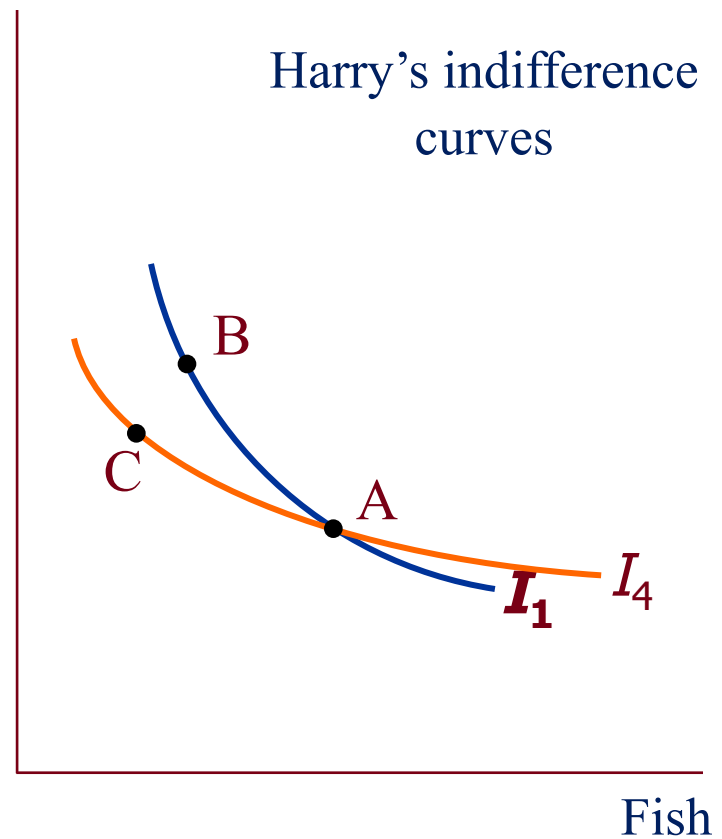
Harry should prefer B to C, since B has more of both goods.

Yet, Harry 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).

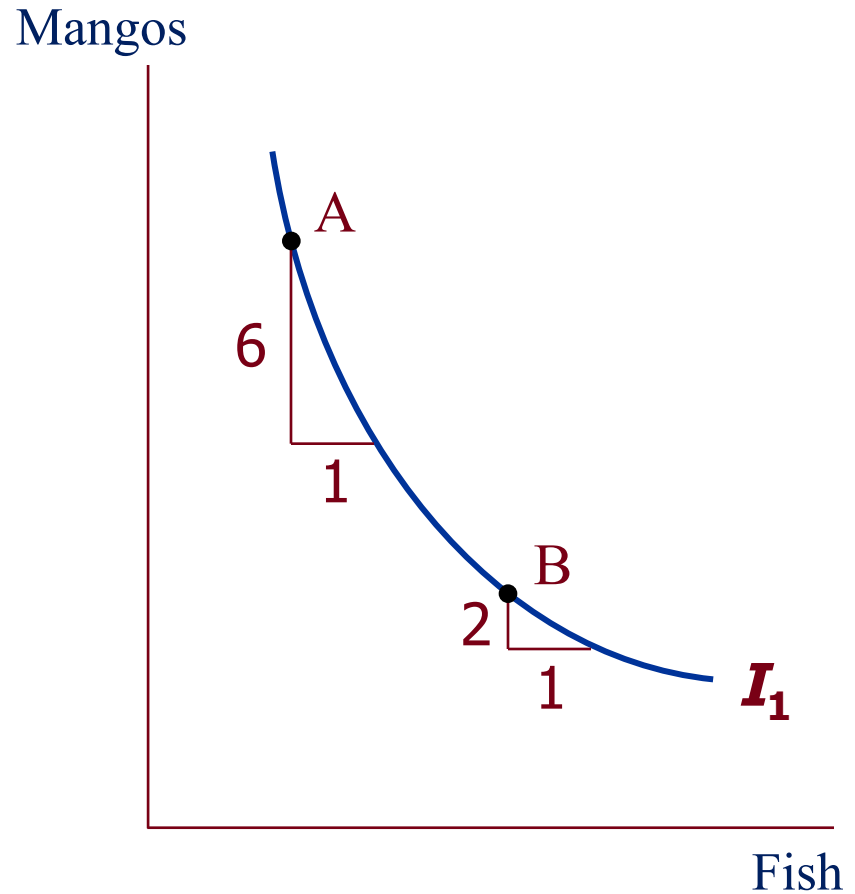
Mangos



Properties of Indifference Curves IV

4. Indifference curves are bowed inward.

Harry is willing to give up more mangos for a fish if he has few fish than if he has many.



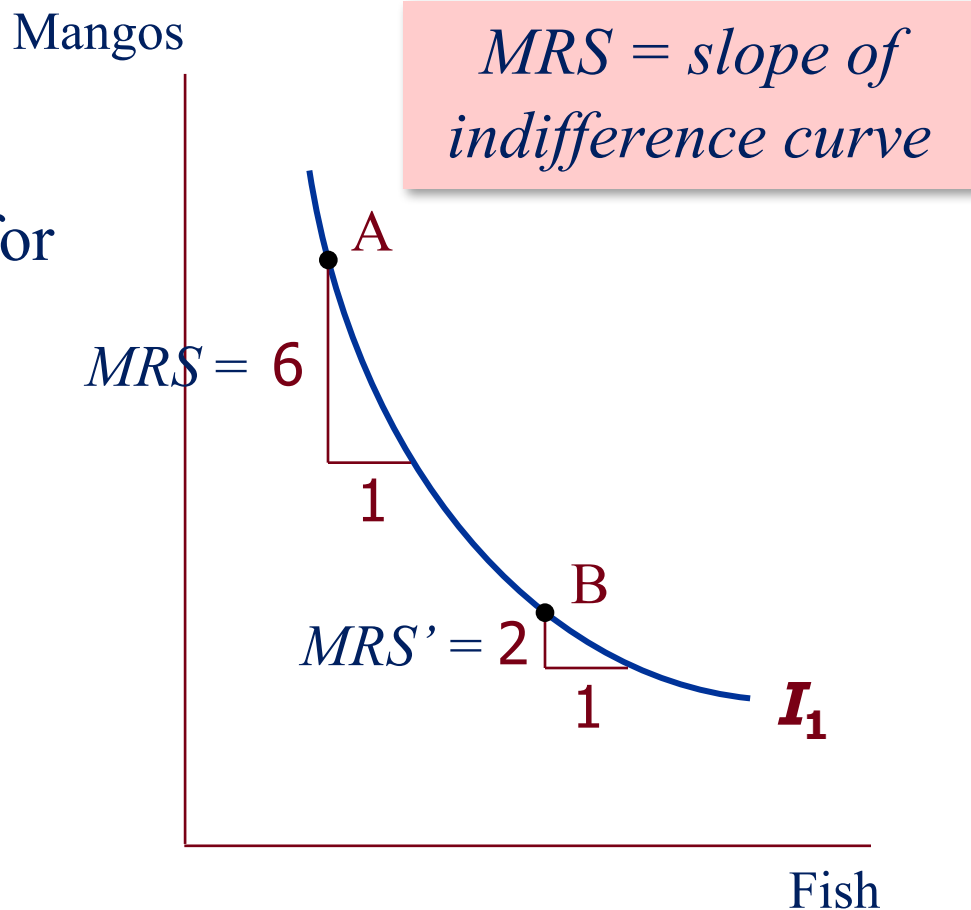
The Marginal Rate of Substitution

Marginal Rate of Substitution (MRS):

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

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

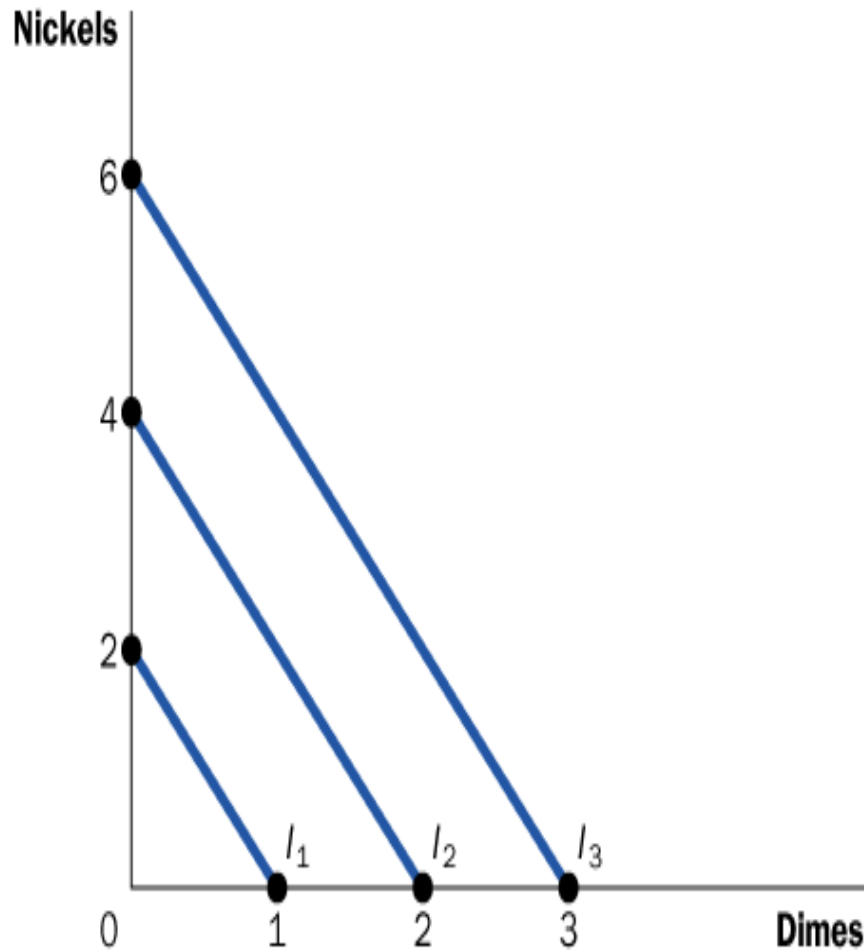
MRS falls as you move down along an indifference curve.



Perfect Substitutes & Complements

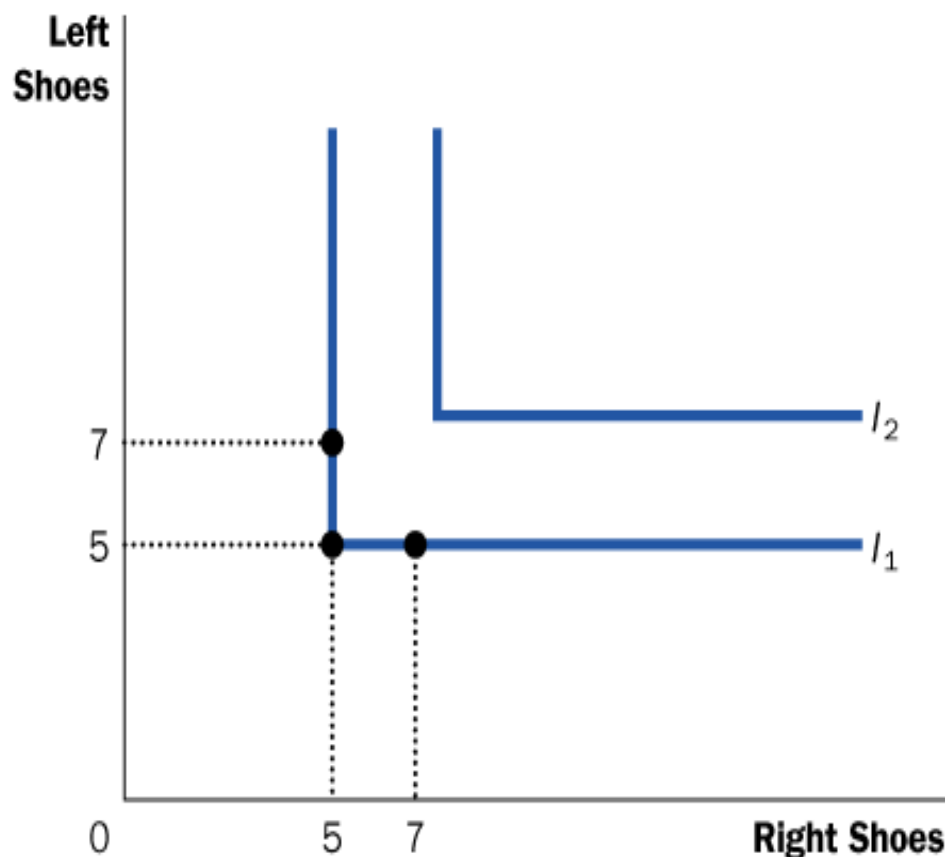
- **Perfect substitutes** Two goods for which the marginal rate of substitution (MRS) of one for the other is a constant. Examples: Orange juice and apple juice; Pepsi and Coca.
- **Perfect complements** Two goods for which the MRS is zero or infinite; the indifference curves are shaped as right angles. Examples: iPod and digital music; left shoes and right shoes.

Extreme Case: Perfect Substitutes



- Perfect substitutes: two goods with straight-line indifference curves, constant MRS
- Example: Nickels and dimes. Consumer is always willing to trade two nickels for one dime.
- Other example?

Extreme Case: Perfect Complements

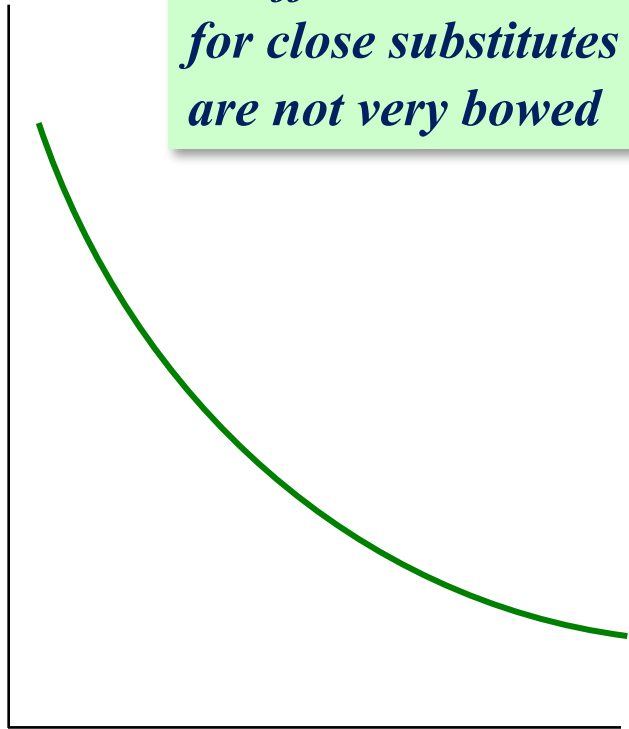


- Perfect complements: two goods with right-angle indifference curves
- Example: Left shoes, right shoes {7 left shoes, 5 right shoes} is just as good as {5 left shoes, 5 right shoes}
- Where is the other pair?

Less Extreme Cases: Close Substitutes and Close Complements

Pepsi

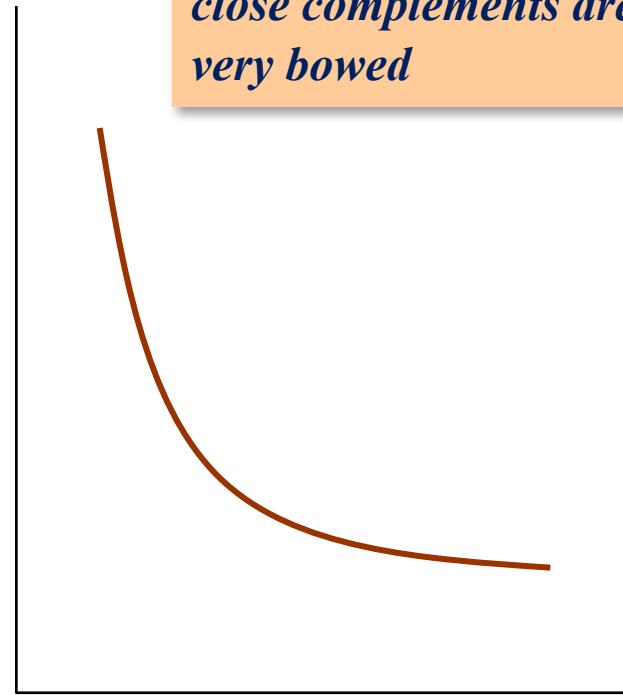
*Indifference curves
for close substitutes
are not very bowed*



Coke

Hot dog
buns

*Indifference curves for
close complements are
very bowed*



Hot dogs

Consumer Preferences and Income

- Let's switch our attention to an important economic factor that determines his consumption preference: his income.
- Because all the goods and services Harry prefers must derive from his income.
- For normal goods, larger income implies more consumption.
- Income determines Harry's budget constraint: his attainable consumption bundles.

Consumer Budget Constraint

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

ACTIVE LEARNING 1 Budget Constraint

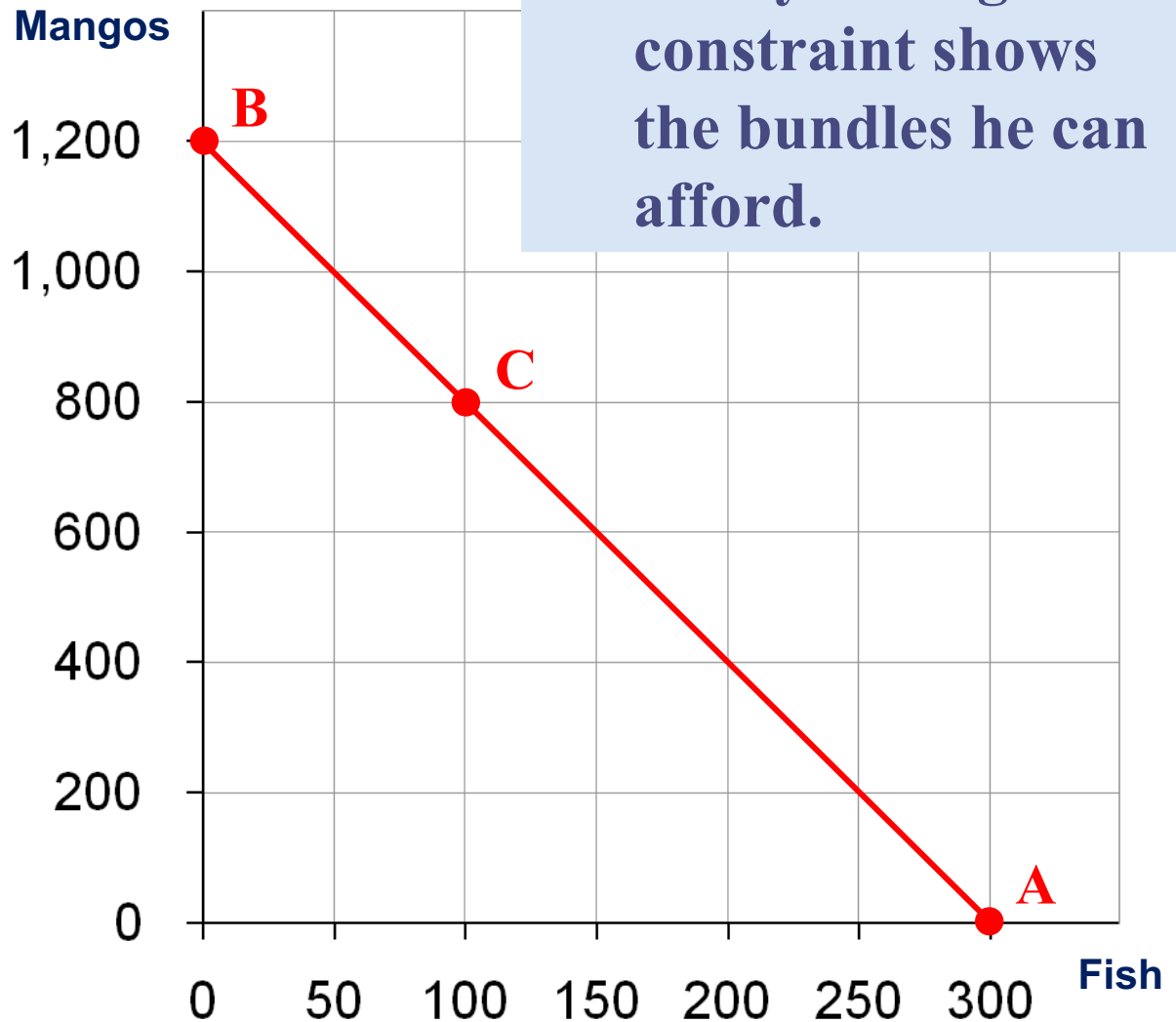
- Harry's income: \$1200
- Prices: $P_F = \$4$ per fish, $P_M = \$1$ per mango
 - a. If Harry spends all his income on fish,
how many fish does he buy?
 - b. If Harry spends all his income on mangos,
how many mangos does he buy?
 - c. If Harry buys 100 fish, how many mangos can he buy?
 - d. Plot each of the bundles from parts a – c on a graph.

ACTIVE LEARNING 1 Answers

A. $\$1200/\4
 $= 300 \text{ fish}$

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

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



ACTIVE LEARNING 2 Budget Constraint

- Does the budget constraint look familiar to you?
- Can we use a linear equation to represent it?
- Harry's income: \$1200
- Prices: $P_{\text{fish}} = \$4$ per fish, $P_{\text{mango}} = \$1$ per mango
- What is the slope of the equation?

The Slope of the Budget Constraint

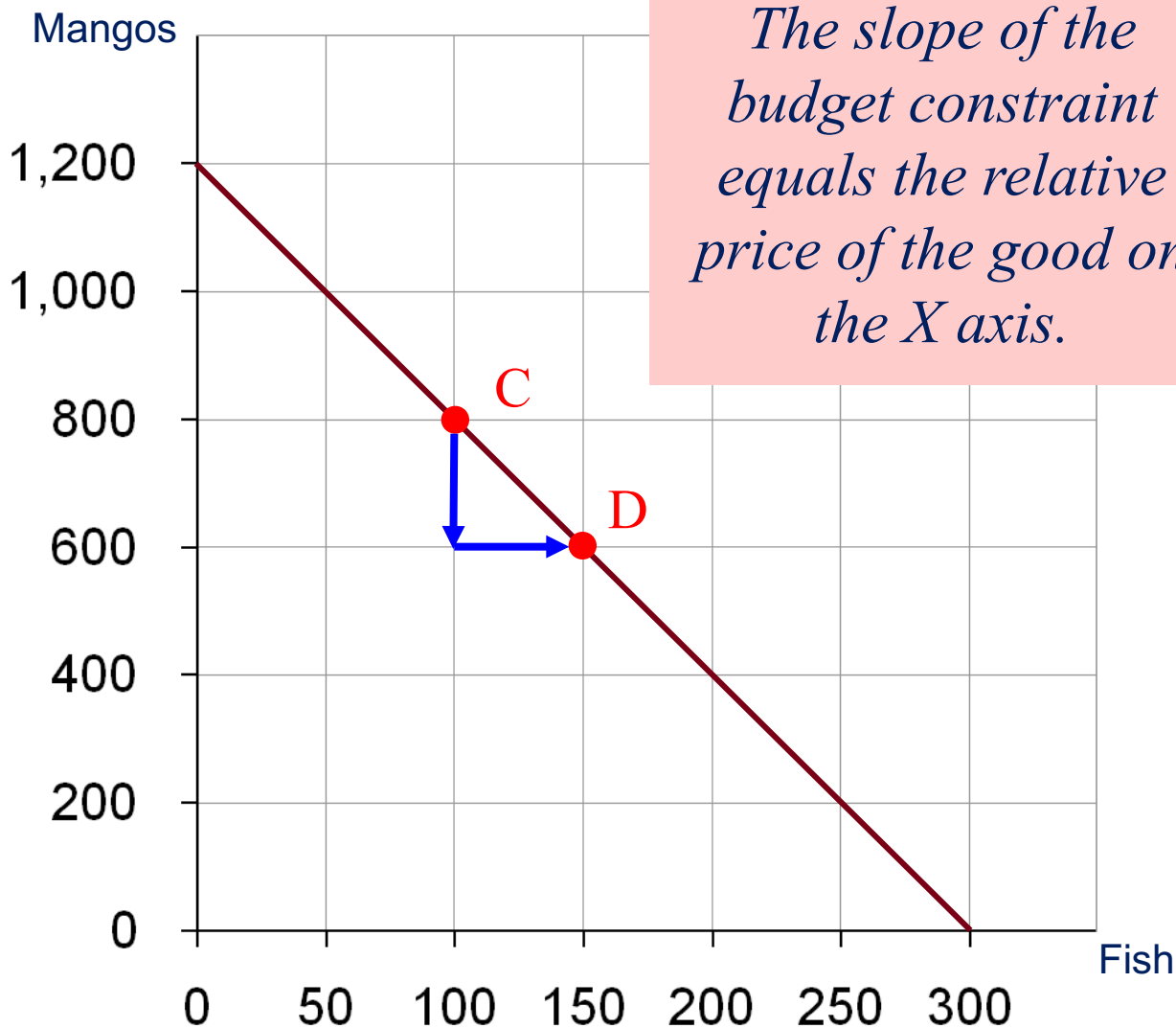
From C to D,

“rise” =
–200 mangos

“run” =
+50 fish

Slope = – 4

Harry must
give up
4 mangos
to get one fish.



The slope of the budget constraint equals the relative price of the good on the X axis.

ACTIVE LEARNING 3 Budget Constraint

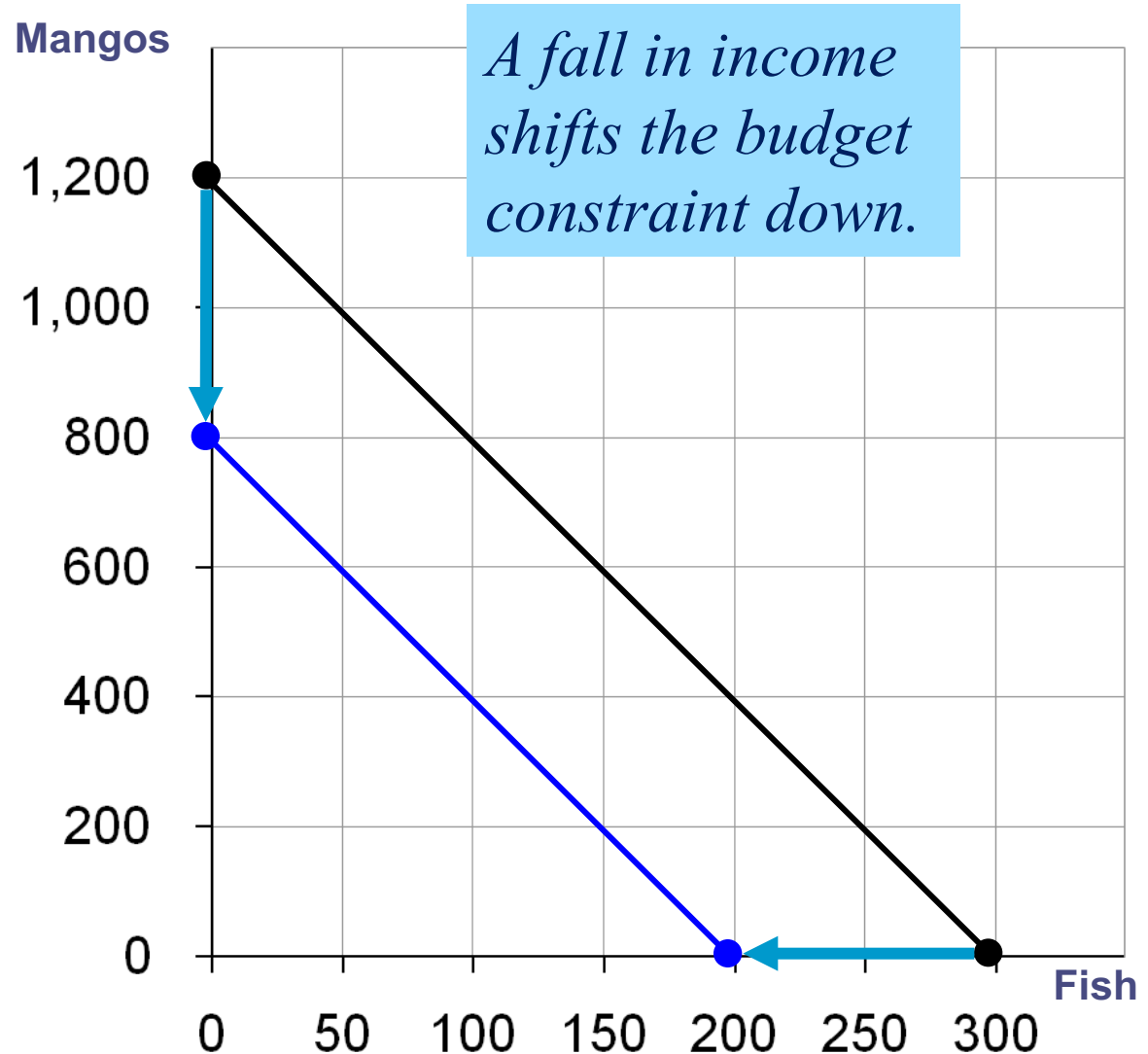
- Getting closer to reality. People's income increases over time, also, the prices of goods change from time to time.
- Can we model these changes using budget constraint?
- What would happen to Harry's budget constraint if:
 - a. His income falls to \$800
 - b. The price of mangos rises to $P_m = \$2$ per mango

ACTIVE LEARNING 3 Answers

Now,
Harry
can buy
 $\$800/\4
 $= 200$ fish

or
 $\$800/\1
 $= 800$ mangos

or any
combination in
between.



ACTIVE LEARNING 3 Answers

Harry
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.



Consumer's Optimal Choice

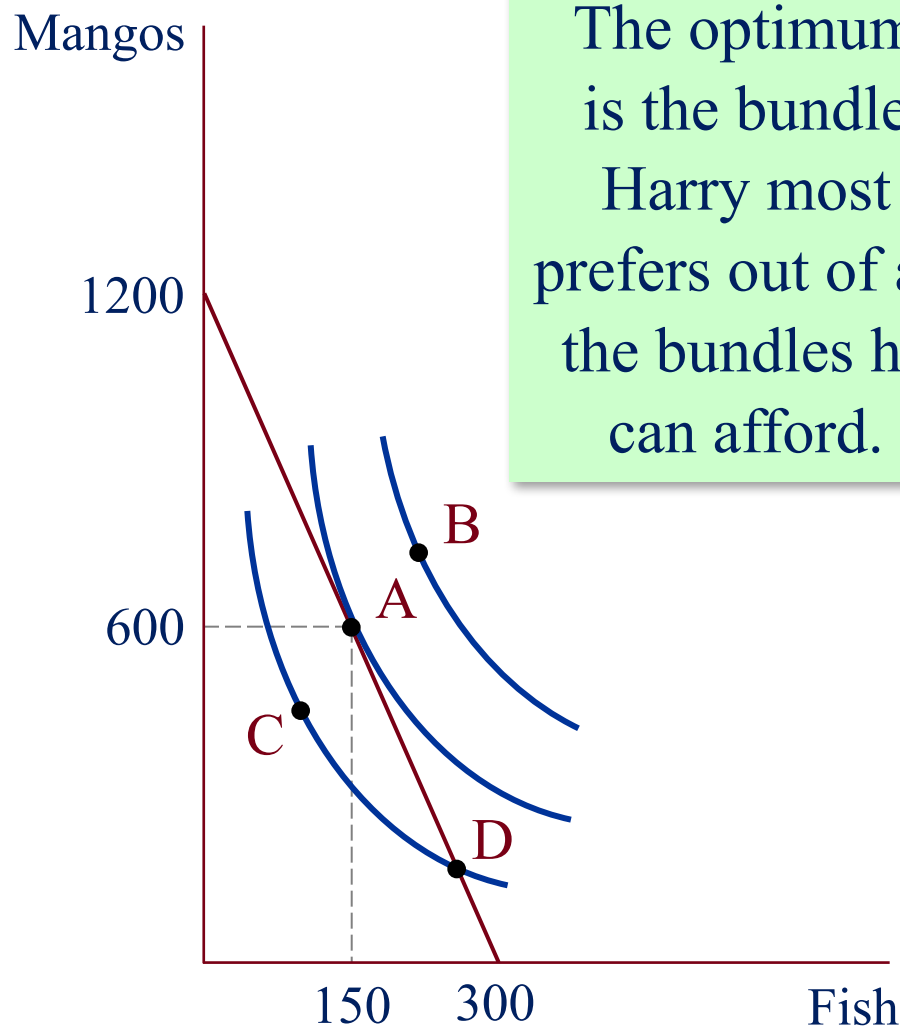
- Using the tools, we can explain how Harry makes decision.
- First, we know the pattern of Harry's preferences.
- Second, we learn the Harry's income budget constraint.
- Finally, what would he do as a rational individual?
- Summarize all these processes in one graph.
- Think about two more questions: 1) what would be the new consumption equilibrium/optimality if Harry's income doubles? 2) what would be the new equilibrium if the price of fish declines by half?

Optimization: What Harry Chooses

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

Harry prefers B to A, but
he cannot afford B.

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



The optimum
is the bundle
Harry most
prefers out of all
the bundles he
can afford.

Application: U.S. Food Stamp Programs

- The U.S. Food Stamp Plan started in 1939. It was renamed the Food Stamp Program in 1964 and the Supplemental Nutrition Assistance Program (SNAP) in 2008. SNAP is one of the nation's largest social welfare programs, with nearly 47 million people (one in seven U.S. residents) receiving food stamps at a cost of \$74 billion in 2014. The average benefits were \$125 per person per month or \$4.11 per day. The share of food-at-home spending funded by SNAP is between 10% and 16% overall and 50% for low-income households (Beatty and Tuttle, 2015).
- In 2013, the U.S. Department of Agriculture reported that over 60% of SNAP participants were children, age 60 or older, or a disabled nonelderly adult. By the time they reach 20 years of age, half of all Americans and 90% of African-American children have received food stamps at least briefly.

Application: U.S. Food Stamp Programs

- Since the food stamp programs started, economists, nutritionists, and policymakers have debated “cashing out” food stamps by providing cash instead of coupons (or the modern equivalent, which is a debit card) that can be spent only on food. Legally, recipients may not sell food stamps (though a black market for them exists). Because of technological advances in electronic fund transfers, switching from food stamps to a cash program would lower administrative costs and reduce losses due to fraud and theft.
- Would a switch to a comparable cash subsidy increase the well-being of food stamp recipients? Would the recipients spend less on food and more on other goods?

References

- [1] N. Mankiw, Principles of Microeconomics, 8th edition. South-Western
- [2] Pindyck & Rubinfeld (2018) Microeconomics, 9th edition. Prentice Hall
- [3] Jeffrey M. Perloff (2019) CH5.3 Microeconomics: Theory and Application

201712 What is universal basic income? | CNBC 4:34

https://www.youtube.com/watch?v=W2Xv_9vSDE8

201801 Is universal basic income working? | CNBC 4:58

<https://www.youtube.com/watch?v=mkF-Lsy-SlM>

201902 Can free-cash handouts help society? | The Economist 5:35

<https://www.youtube.com/watch?v=hz4NW0TKP0g>