Lecture 4:
Consumer Choice

September 19, 2017

Overview

Course Administration

Ripped from the Headlines

Consumer Preferences and Utility

Indifference Curves

Income and the Budget Constraint

Making a Choice with Utility and the Budget Constraint

Course Administration

1. Return PS 2, PS 4 posted
2. Please use scheduler to book office hours
3. Please come see me, and realize that office hours at the deadline book up
4. Any questions or outstanding issues?

Examples of Floor and Ceilings from PS 2

- cap on therapy in Medicare: restricts supply, and patient faces market prices after cap
- Argentina limited the price of basic food items to control inflation $\rightarrow$ increase in demand for bread $\rightarrow$ bread shortage
- US limited prices on gasoline in the 1970s $\rightarrow$ shortages
- Many examples of taxes (x% more for some goods), which are related, but not quite the same. Wait till Lecture 6.

How What You're Learning is Policy-Relevant

Ripped from Headlines presentation(s)

As a reminder, next week

Afternoon

Finder	Presenter
Ian Tang	Stephen Haas
Chris Rogers	Ilhman Dehry
Emily Labandera	Danielle Schultz

Evening

Finder	Presenter
Elisa Walker	Erika Ross
Vanessa Lopez	Justin Pollard
Hannah Seligman	Ben Darland

Why Do We Study the Consumer's Problem?

- Build up to the demand curve from first principles
- Understand consumer choices
- Clearly illuminate areas where policy can act
- Illustrate welfare consequences of policy choices
- Understand intuition of constrained maximization

Utility

Assumptions about Consumer Preferences

1. Completeness and Rankability
   - You can compare all your consumption choices
   - For two bundles A and B, you always either
     - prefer A to B
     - prefer B to A
     - are indifferent between A and B
2. More is better – at least no worse – than less
3. Transitivity
   - If A is preferred to B, and B to C, then $A > C$
4. The more you have of a particular good, the less of something else you are willing to give up to get more of that good

What is Utility?

Overall satisfaction or happiness

What is Utility?

Overall satisfaction or happiness

- Measured in utils!
- This framework allows us to describe what consumption or habits make you happier than other consumptions or habits
- It's not a tool for comparing across people

Some Example Utility Functions

Most general $U = U(X, Y)$

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They can take many forms, such as

- $U = U(X, Y) = XY$
- $U = U(X, Y) = X + Y$
- $U = U(X, Y) = X^{0.7} Y^{0.3}$

Marginal Utility

Marginal utility $\equiv$ "additional utility consumer receives from an additional unit of a good or service"

$$MU_X = \frac{\Delta U(X,Y)}{\Delta X}\left(= \frac{\partial U}{\partial X}\right)$$

$$MU_Y = \frac{\Delta U(X,Y)}{\Delta Y}\left(= \frac{\partial U}{\partial Y}\right)$$

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What is generally true about marginal utility of X as consumption of X increases?

Utility and Comparisons

- Ordinal: we can rank bundles from best to worst
- Not cardinal: we cannot say how much one bundle is preferred to another in fixed units
- We cannot make interpersonal comparisons

No other assumptions on utility apart from the four preference assumptions.

Indifference Curves

Describing Your Utility

- A consumer is indifferent between two bundles (X_1, Y_1) and (X_2, Y_2) when $U(X_1, Y_1) = U(X_2, Y_2)$
- An indifference curve is a line where utility is constant: a combination of all consumption bundles that give the same utility

Working Up to an Indifference Curve

- Give me two items

Working Up to an Indifference Curve

- Give me two items
- Each axis is a **quantity** of those items
- Give me some points where you are equally happy

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Why Can We Draw Indifference Curves?

- Because of the assumptions we made at the beginning about preferences: completeness and rankability
- All bundles have a utility level and we can rank them

Indifference Curves Level and Slope

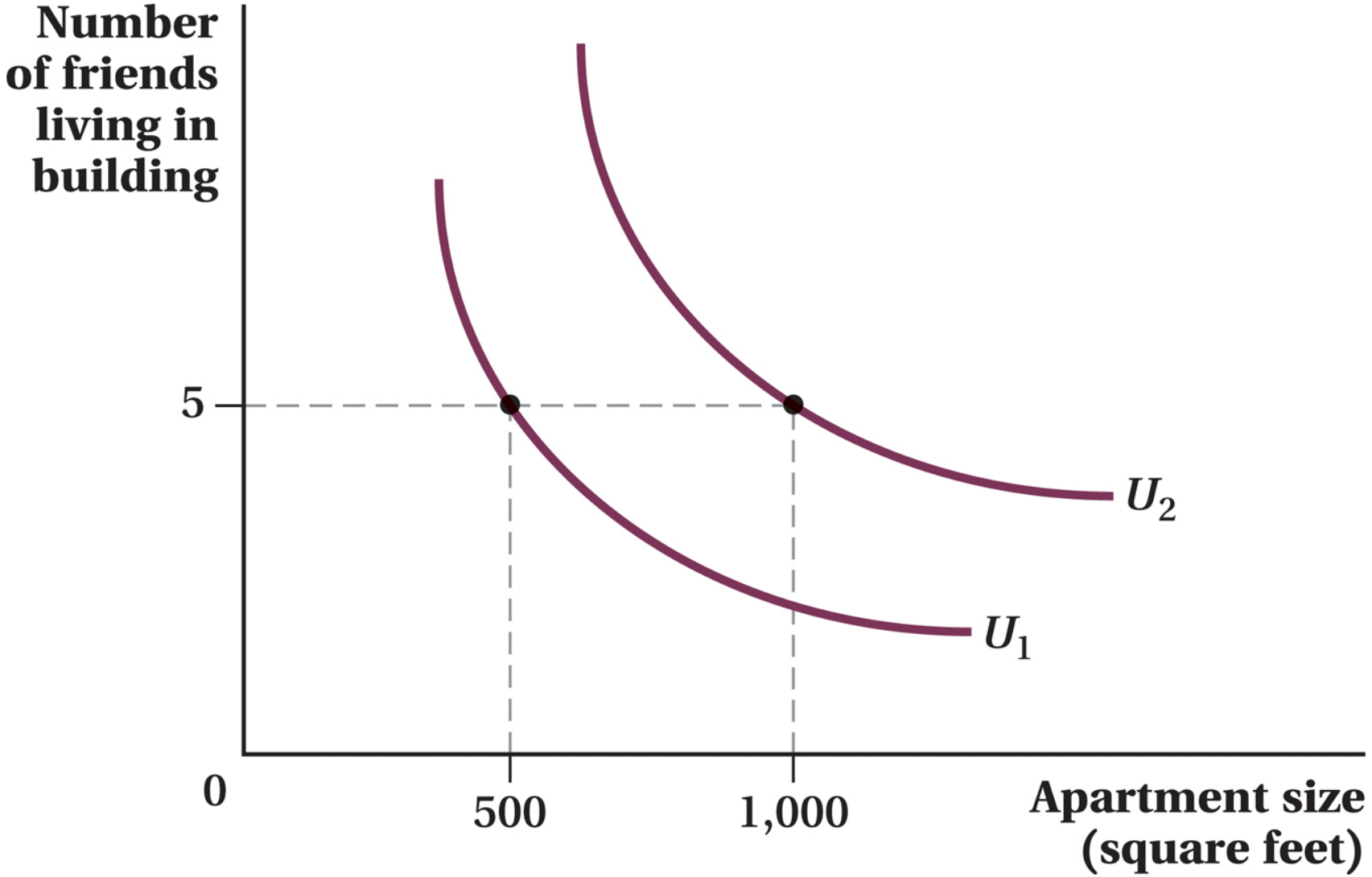
What does "more is better" tell us?

Indifference Curves Level and Slope

What does "more is better" tell us?

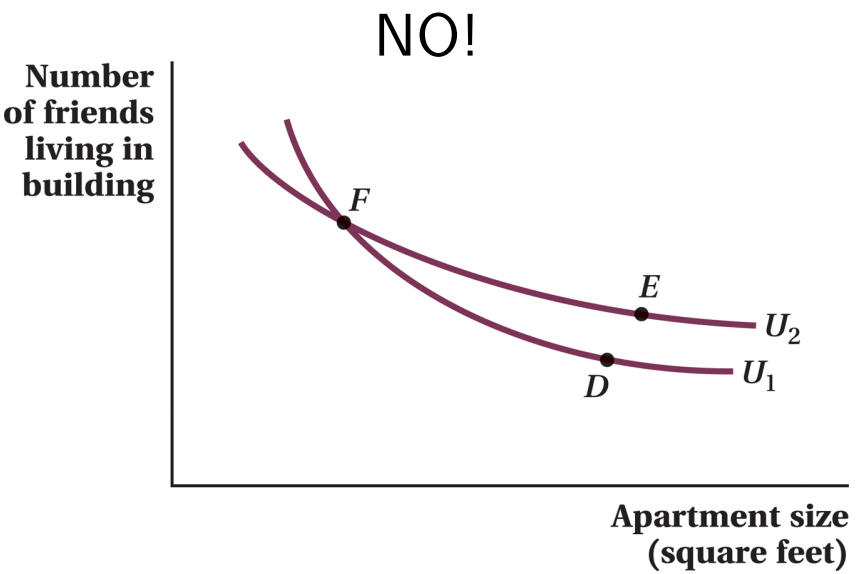
- That higher indifference curves give more utility
- Curve must have a negative slope
  - Suppose that you increase your consumption of X
  - "More is better" $\rightarrow$ you are happier
  - To be equally happy as before, you should give up some Y

More Utility on Curves Farther From Origin



Indifference Curve Shape

- Curves never cross
  - it would violate transitivity
- Curves are U-like (convex) with respect to the origin
  - Comes from assumption about diminishing marginal utility
  - Your willingness to trade off differs along the curve

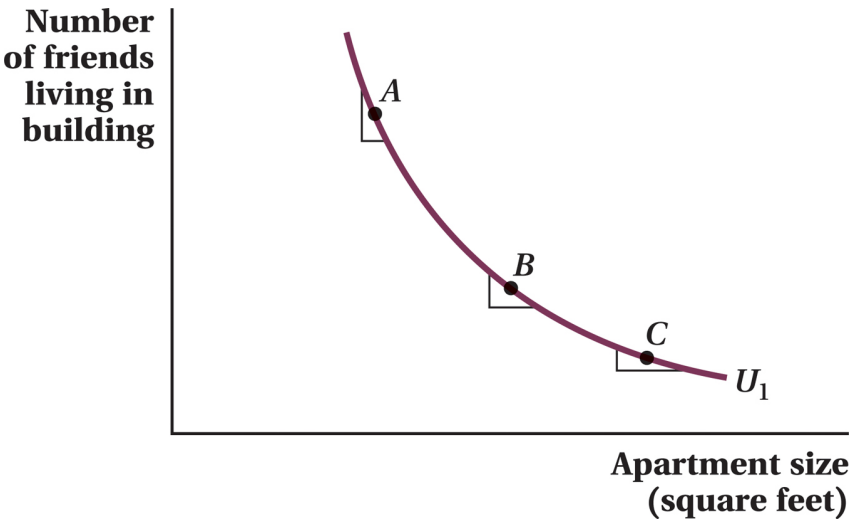


Steepness of the Indifference Curve

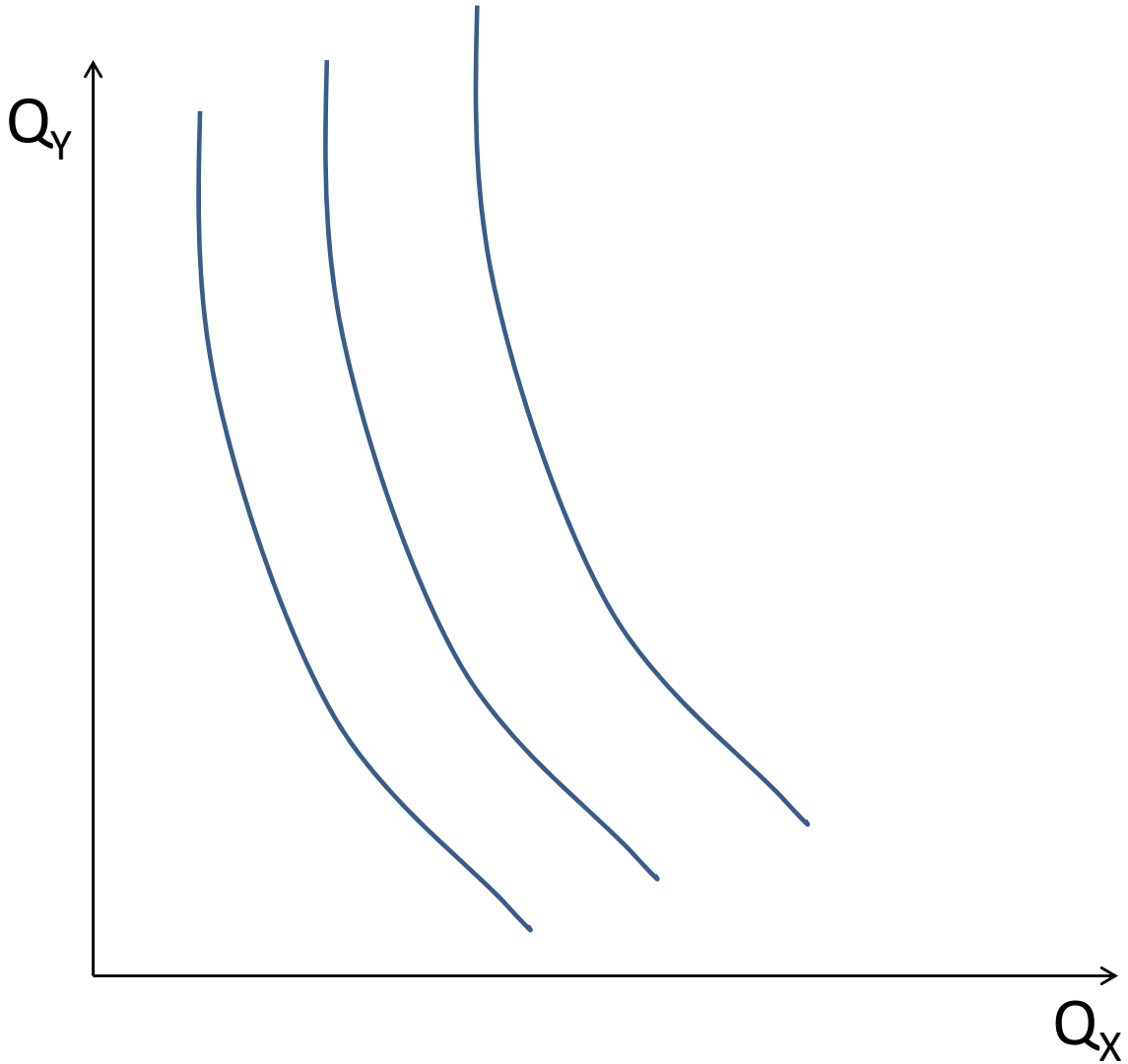
- We know that you are equally happy anywhere along the indifference curve
- So what changes as you move along the curve?

Steepness of the Indifference Curve

- We know that you are equally happy anywhere along the indifference curve
- So what changes as you move along the curve?
  - you are trading off X and Y
  - the rate at which you trade them off tells us how much you value them



When the curve is steep, what are you willing to give up more of?



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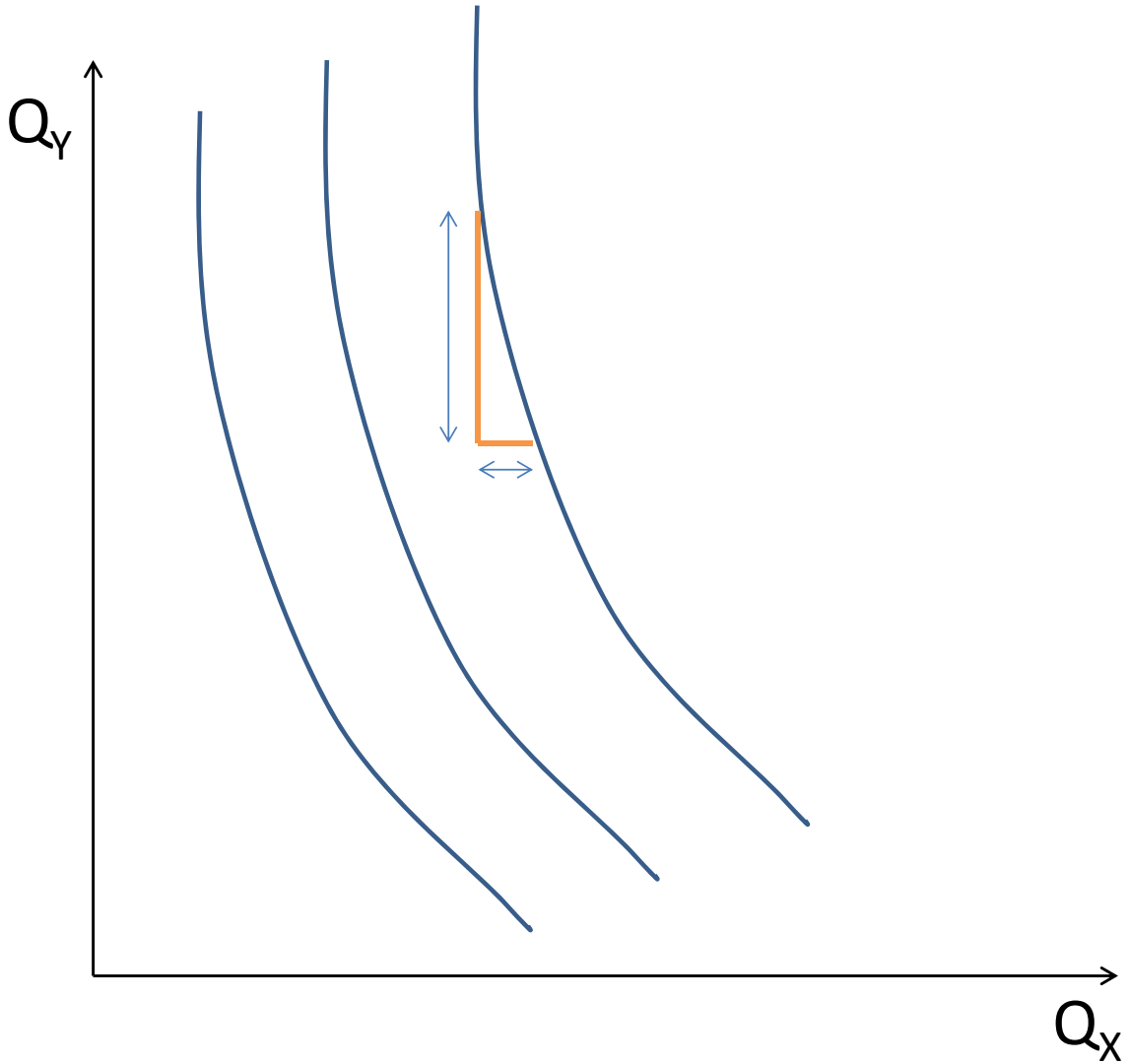

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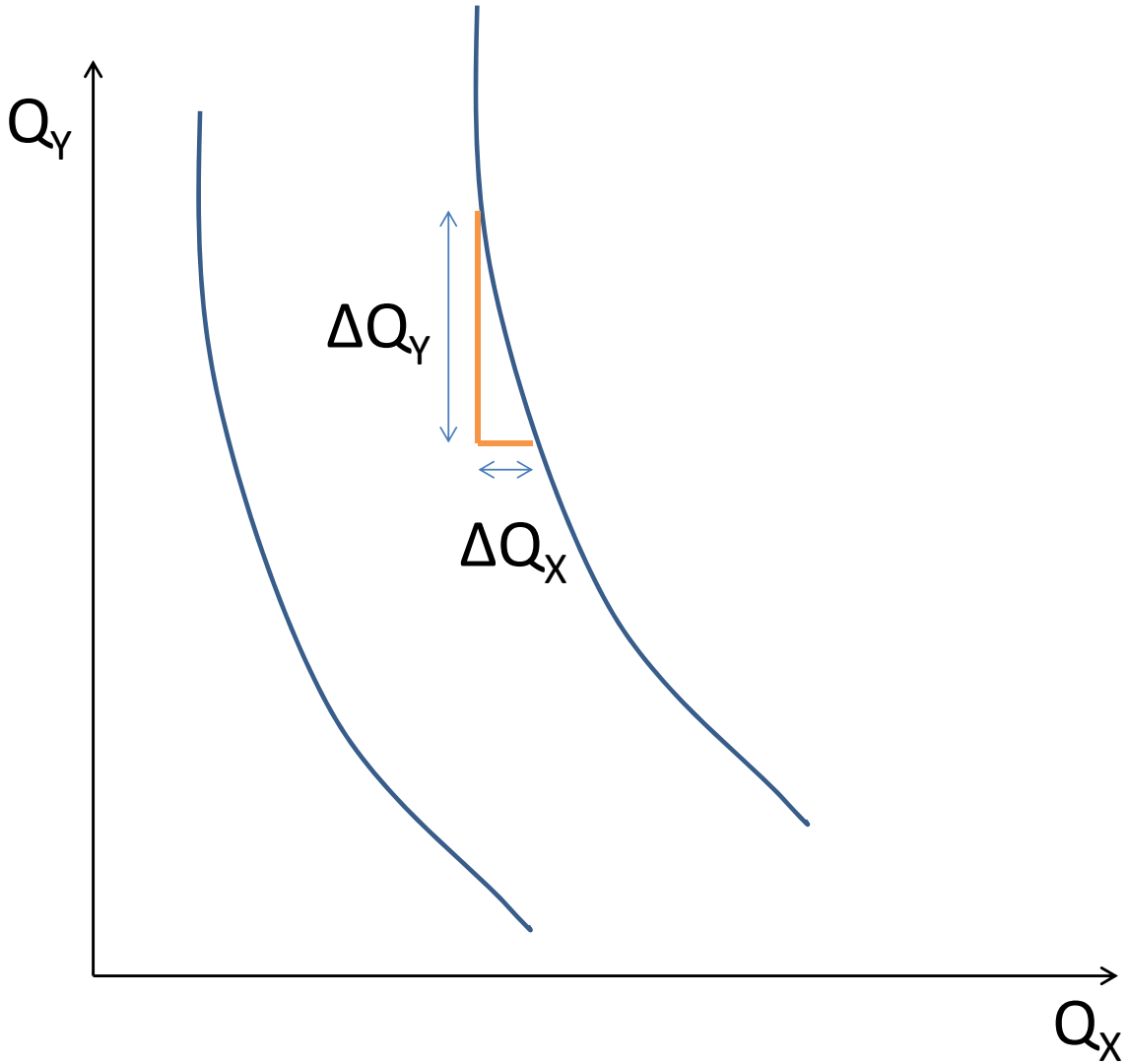

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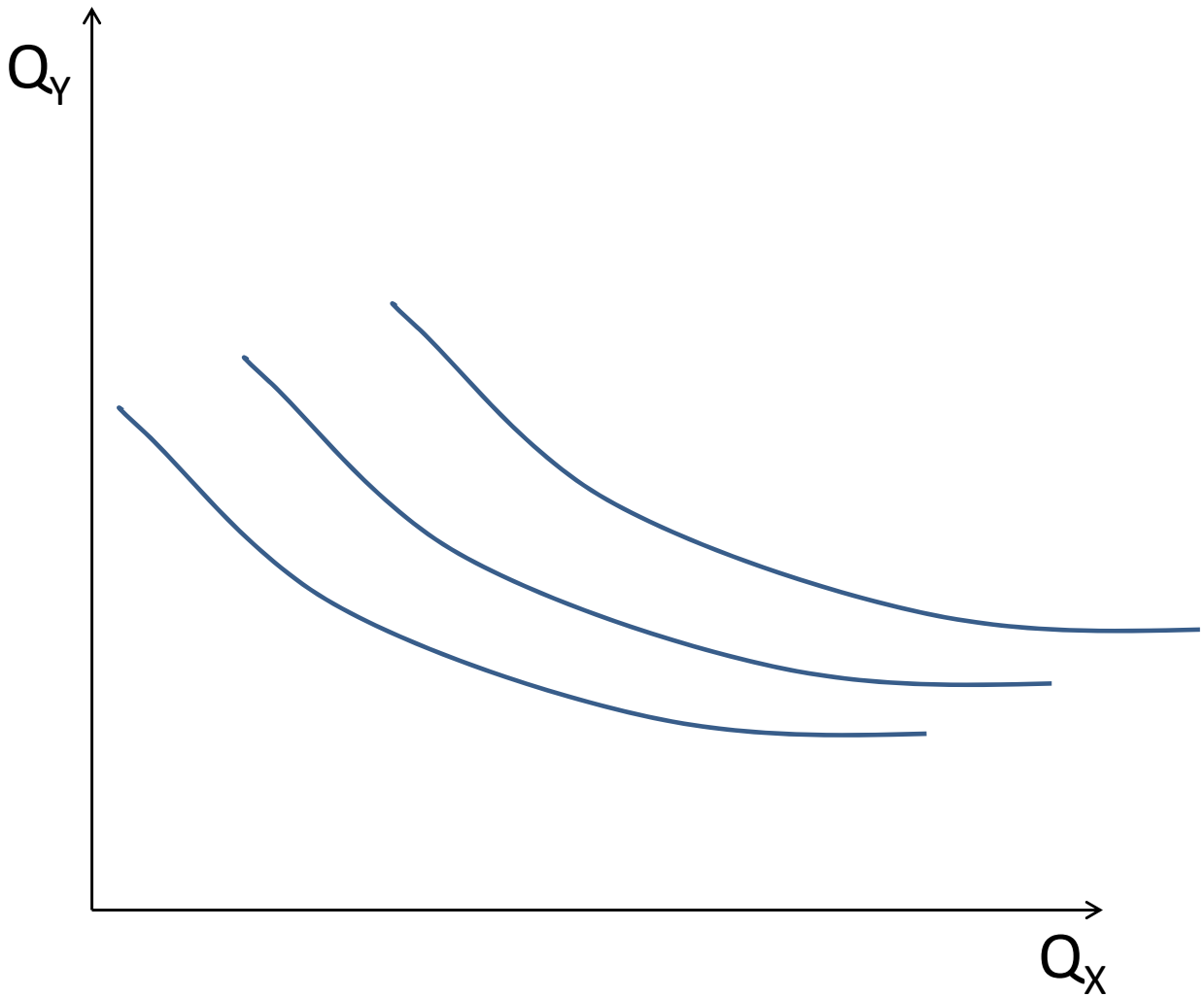

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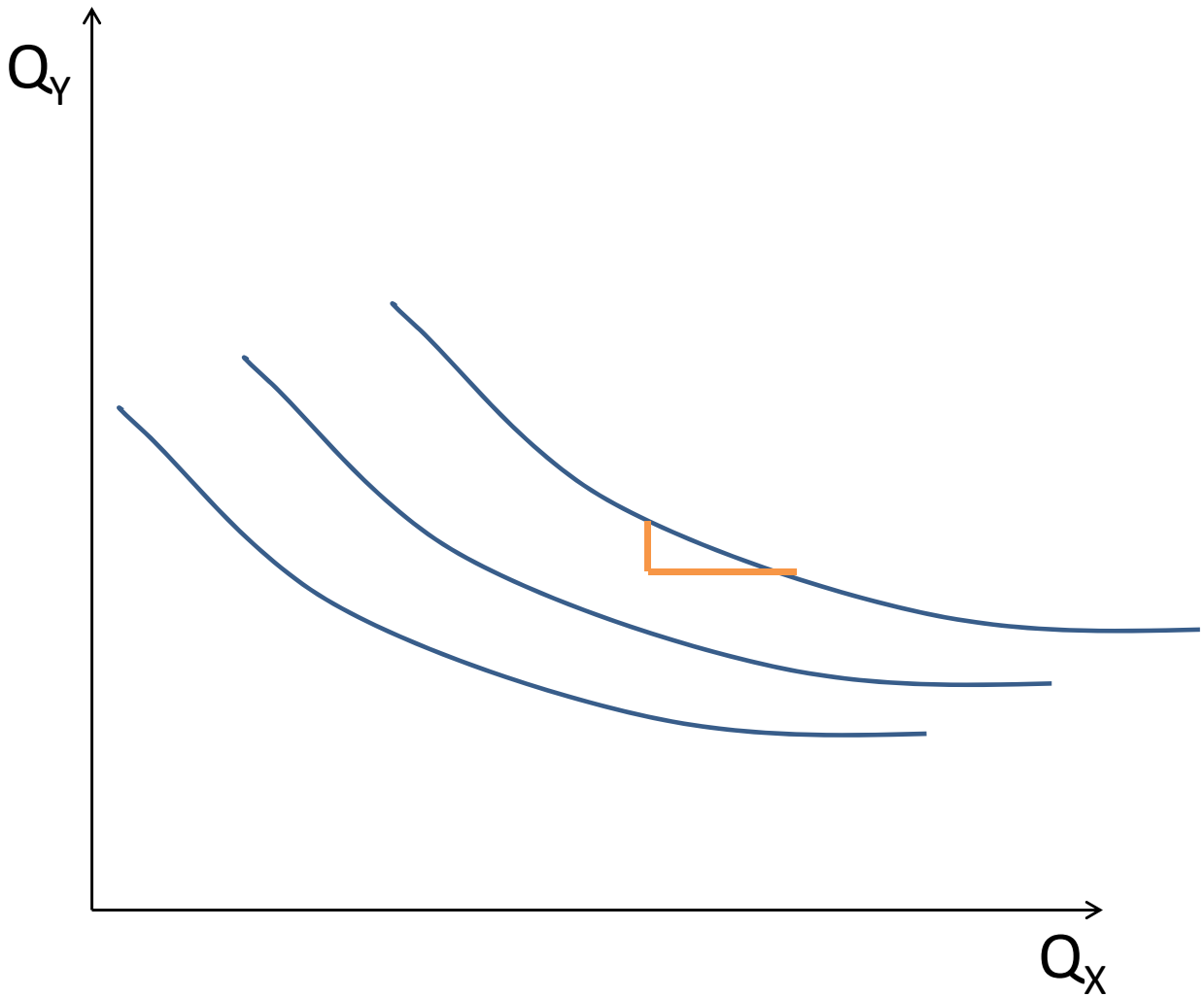

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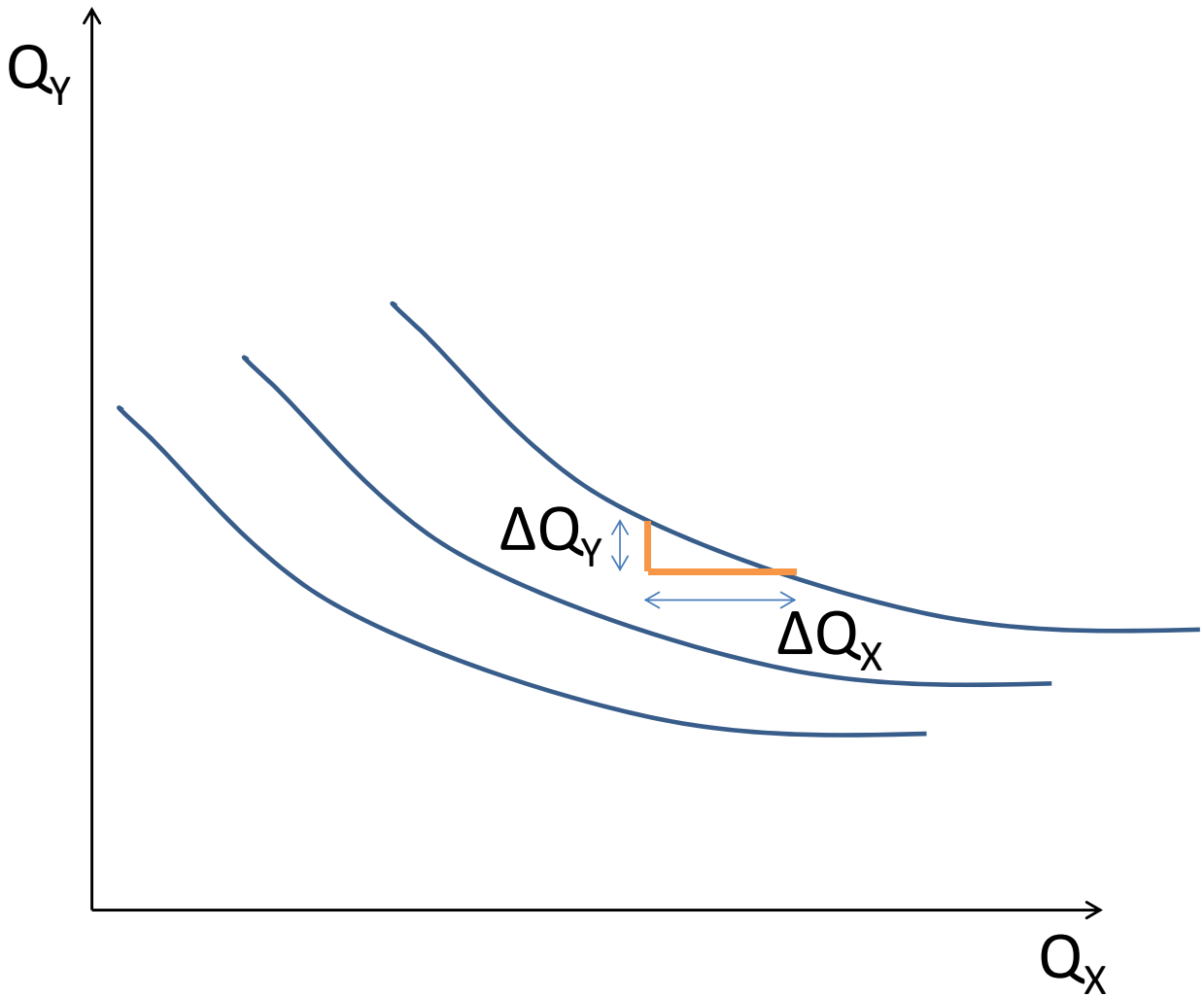

Quantifying the Trade-off in the Indifference Curve

- How much of X are you willing to give up for Y?
- **Marginal Rate of Substitution** is the trade-off
- Define

$$MRS_{XY} = \frac{MU_X}{MU_Y}$$

$$MRS_{XY} = (-1) * \text{slope of indifference curve}$$

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- Is it the same everywhere on the curve?

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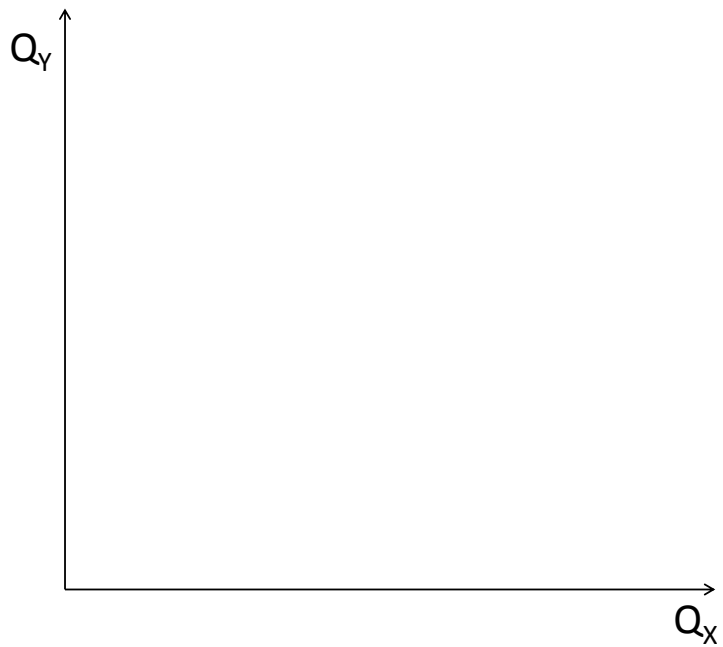
- A rate of change along the indifference curve
- Is it the same everywhere on the curve? Not necessarily.
- If you want a derivation, see the textbook!

Curves for Perfect Complements

Work with your neighbor!

- Suppose we have two goods that are perfect complements
- X and Y being perfect complements means each is useless without the other
- What do the indifference curves look like?
- We write this utility as $U = \min\{aX, bY\}$



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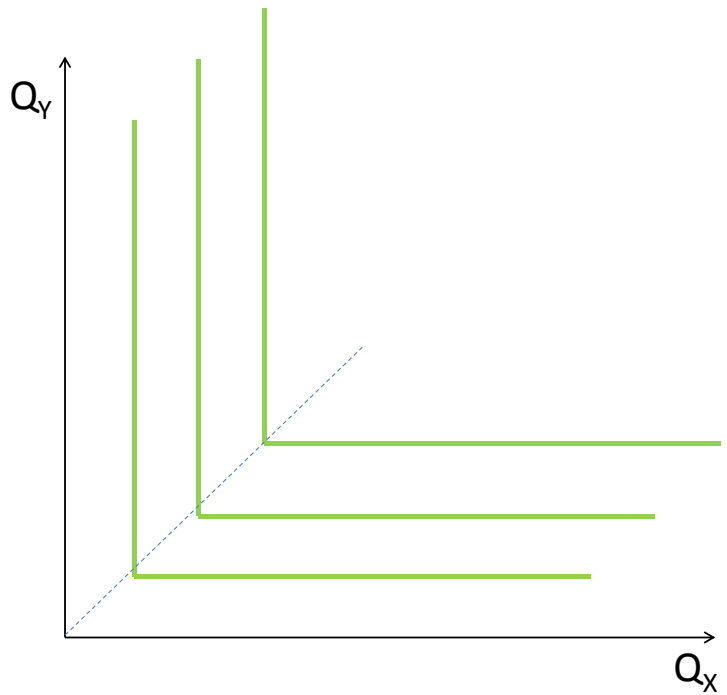

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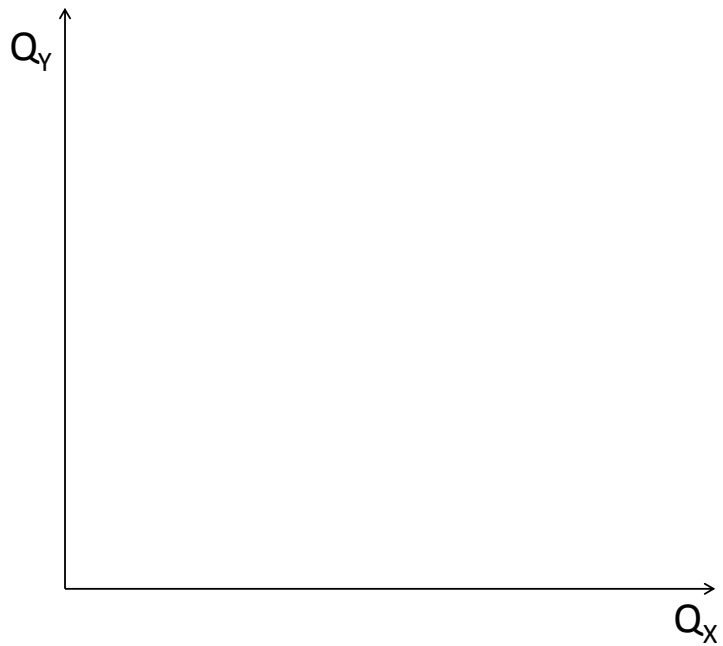
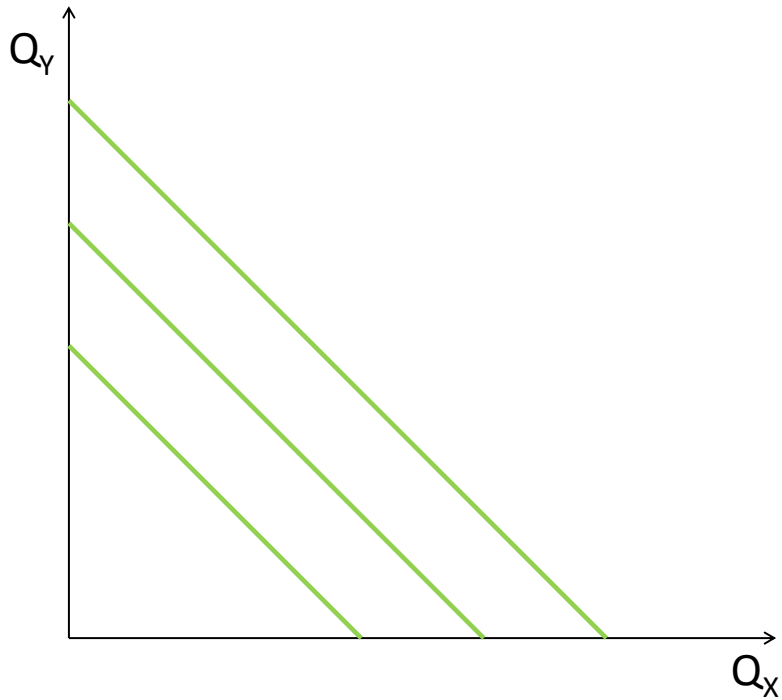


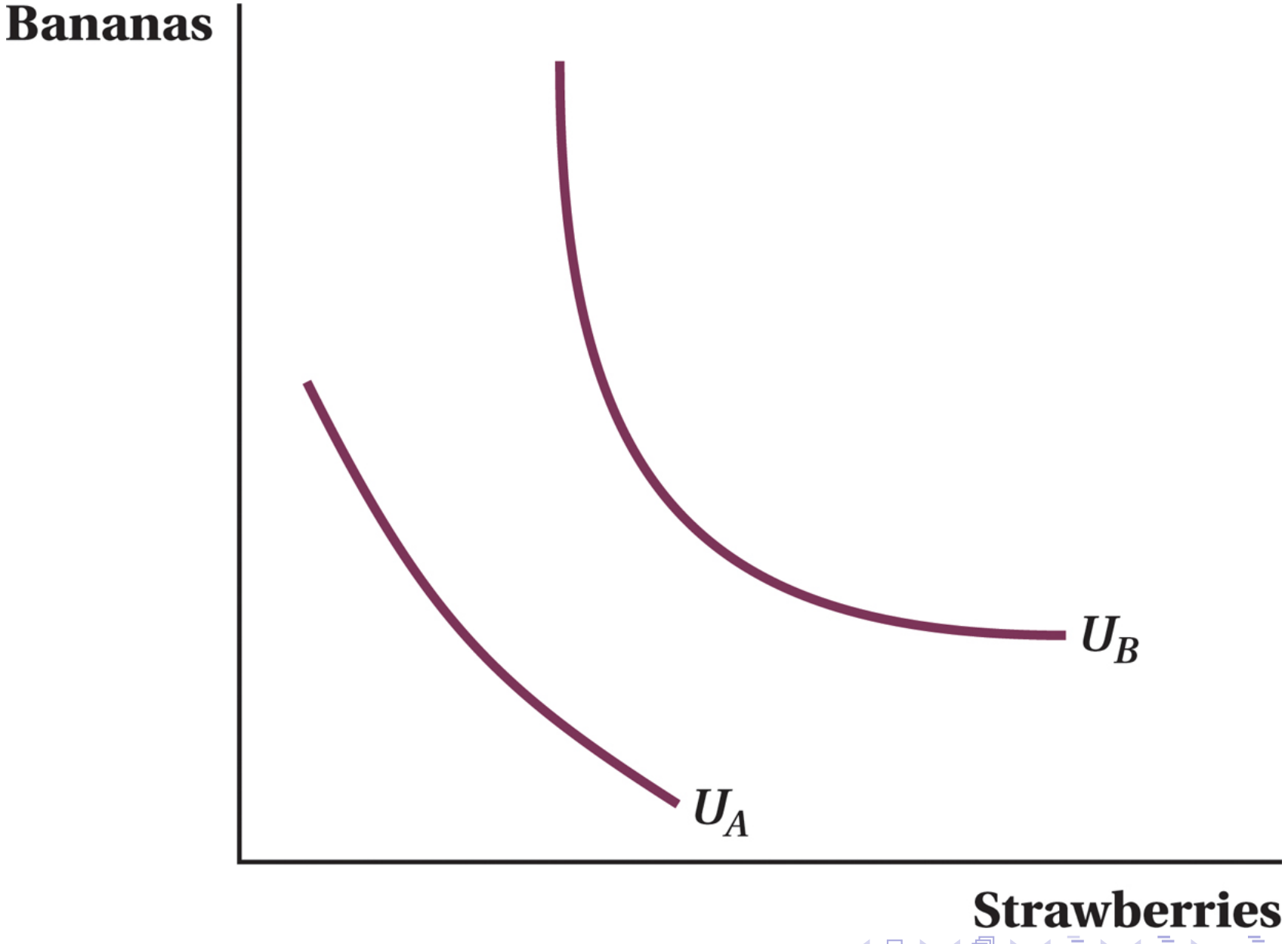
Curves for Substitutes

Work with your neighbor!

- Suppose we have two goods that are perfect substitutes
- What do the indifference curves look like?
- Write as $U = aX + bY$



Curves May Change Shape as Consumption Increases



Budget Constraint

Budget Constraint Assumptions

1. Each good has a fixed price and infinite supply
2. Each consumer has a fixed amount of income to spend
3. The consumer cannot save or borrow

Defining the Budget Constraint

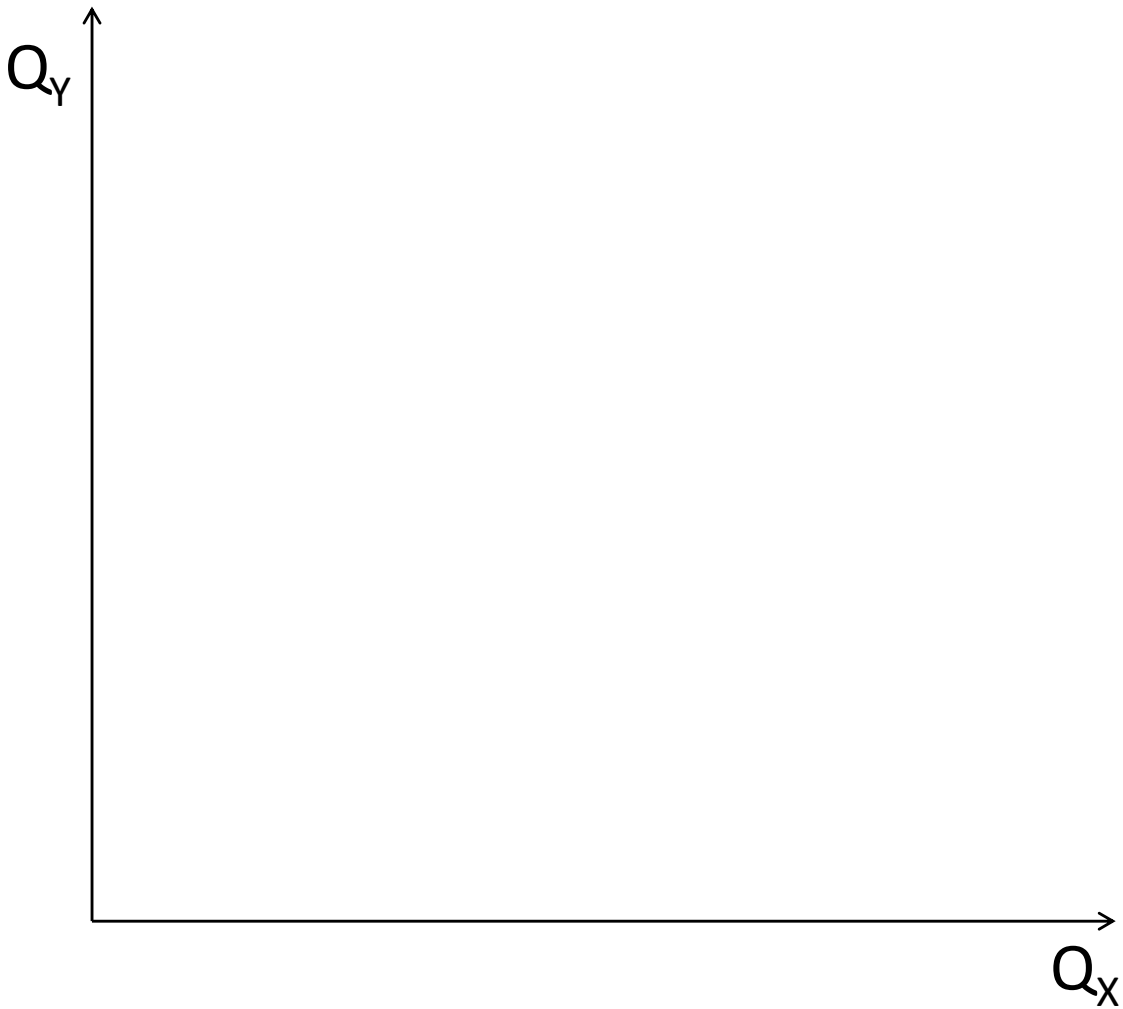
Budget constraint:

$$I = P_X Q_X + P_Y Q_Y$$

- **feasible bundle** $\equiv$ combinations of X and Y that the consumer can purchase with his income
- **infeasible bundle** $\equiv$ all the combinations the consumer is just too poor to get

Drawing the Budget Constraint

What if you spend all your money on X or Y?



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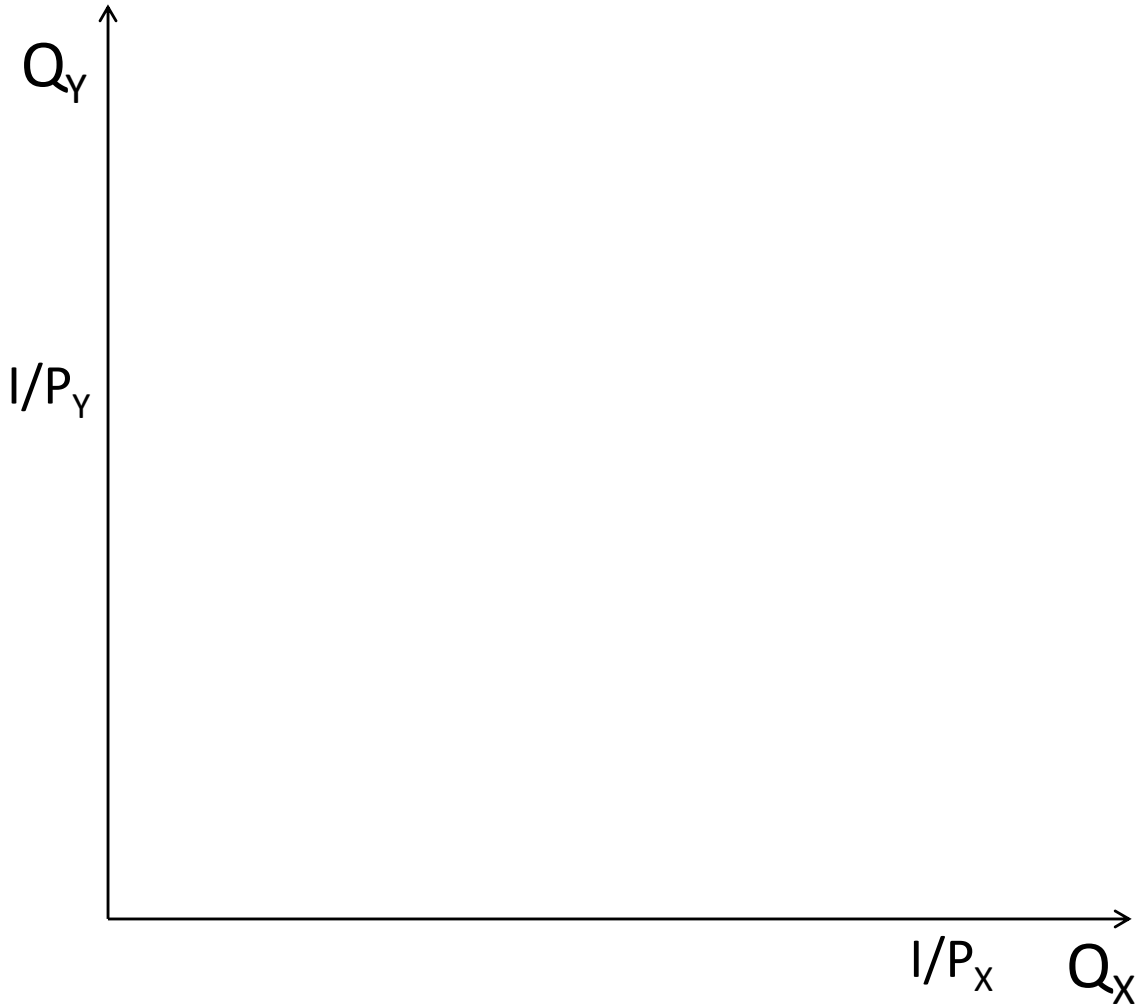

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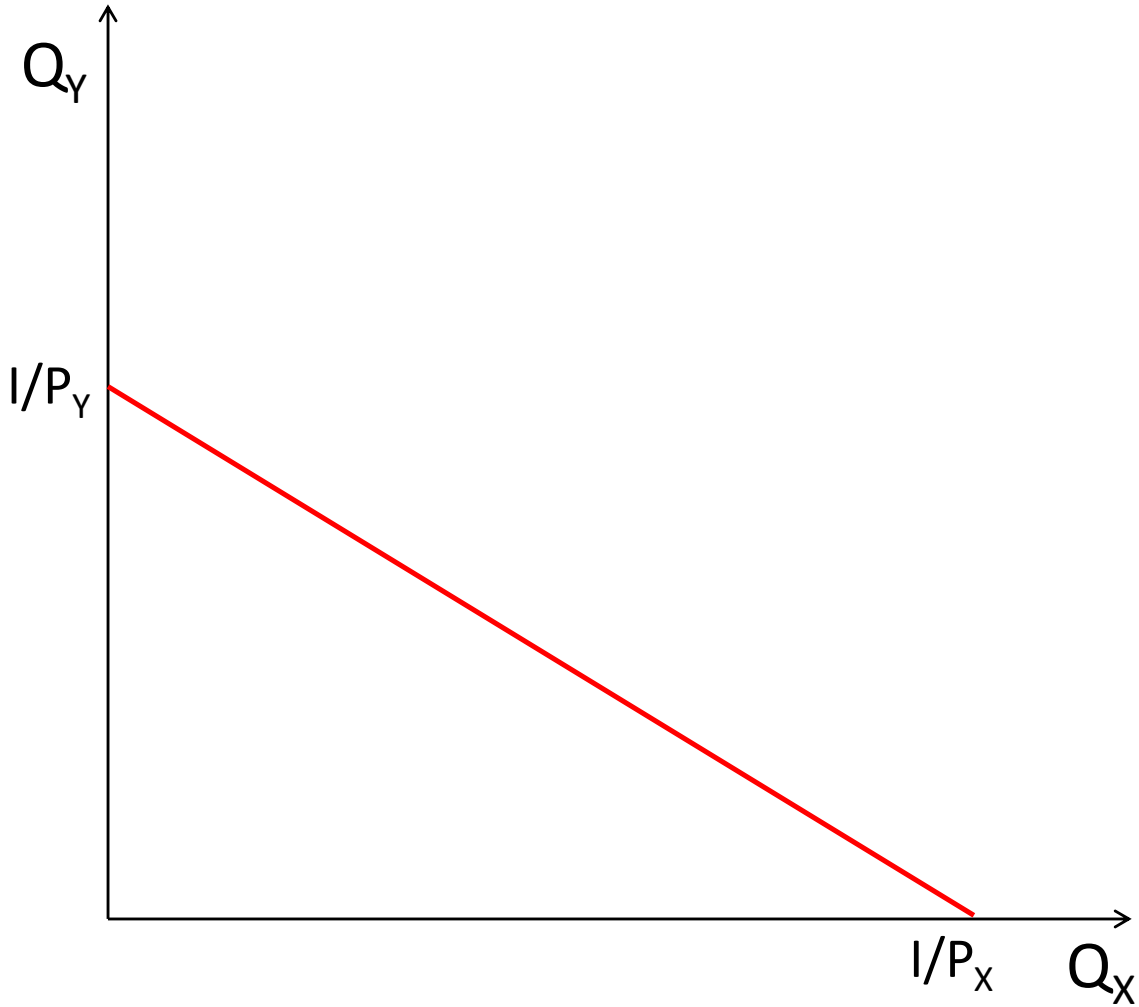

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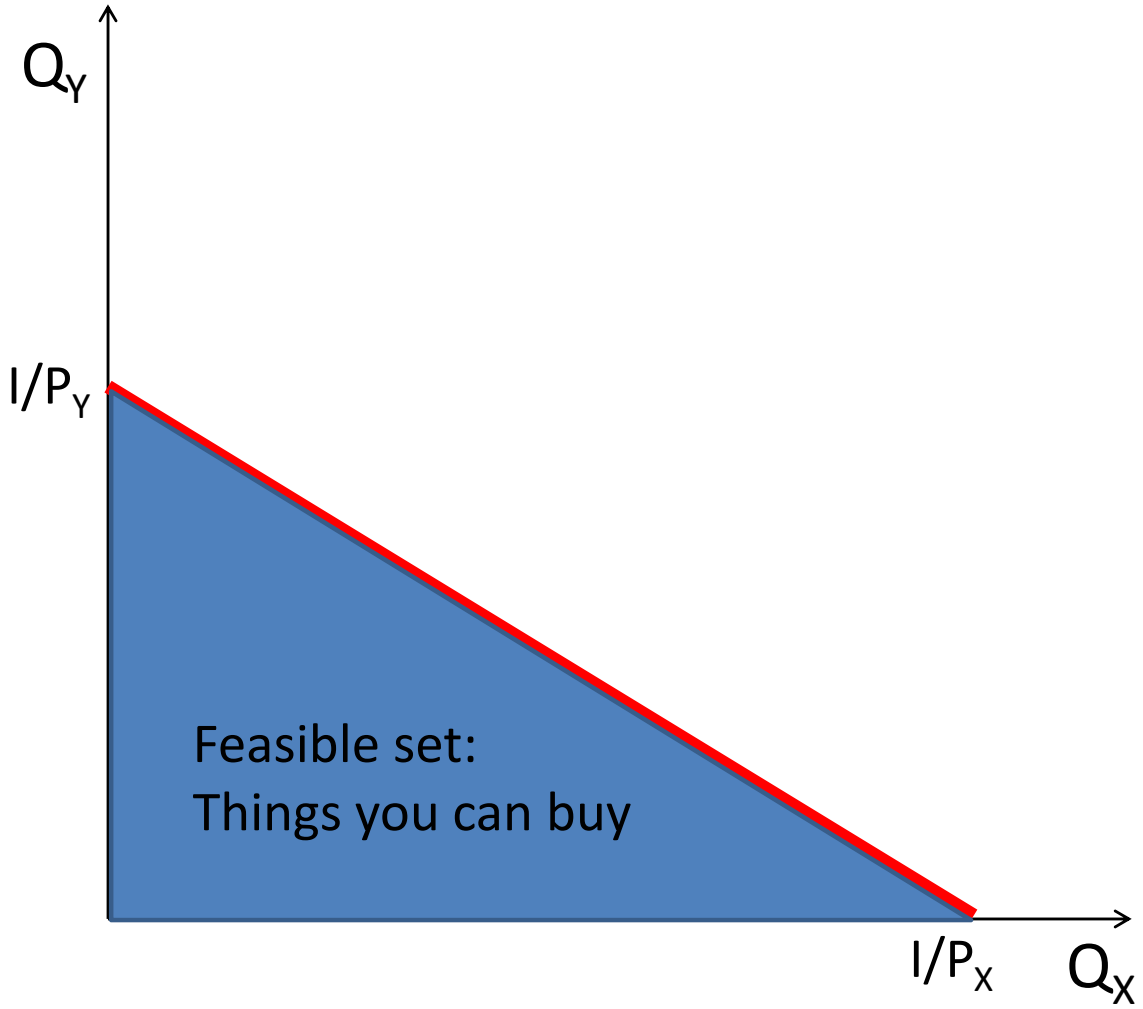

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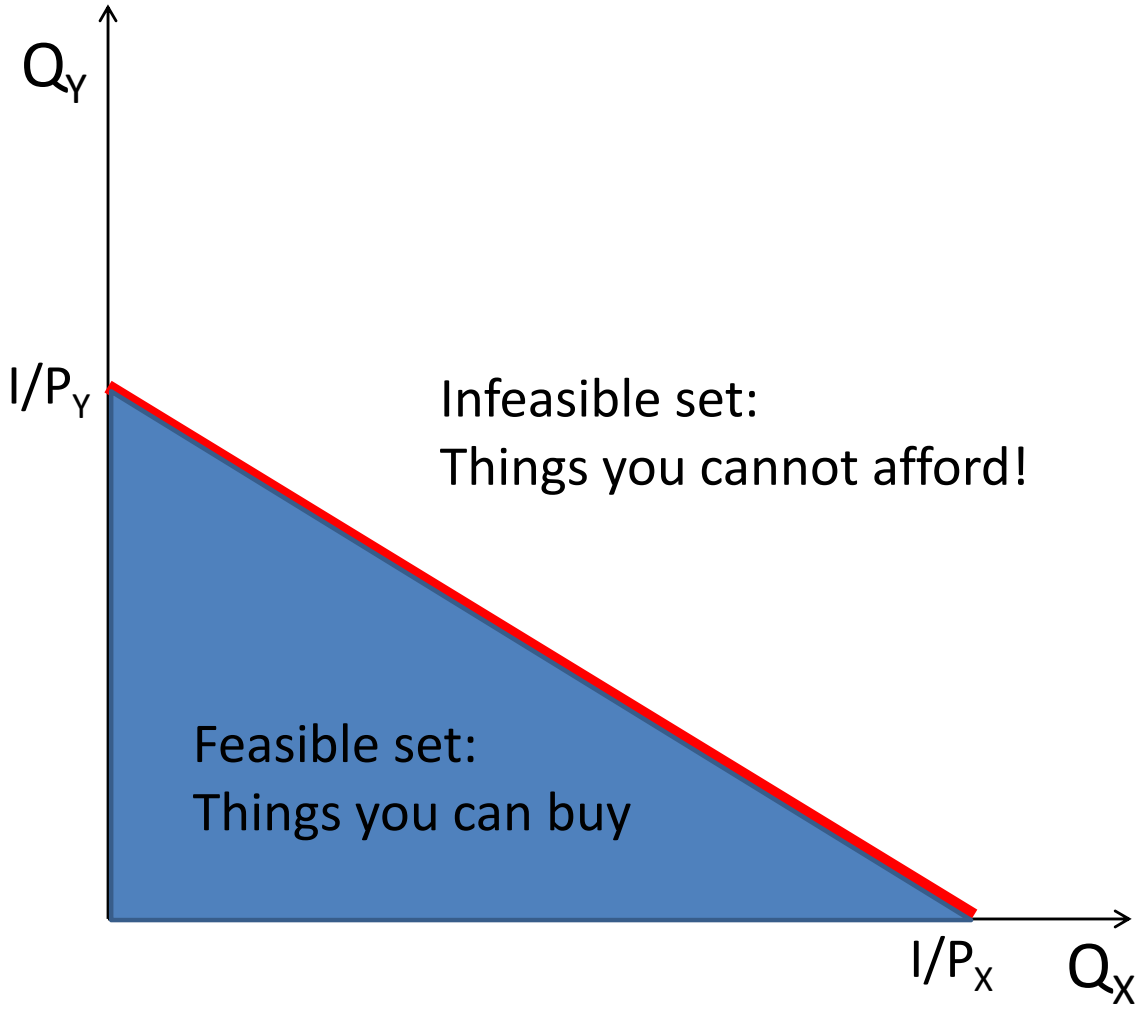

Slope of the Budget Constraint

Algebra of the slope

$$I = P_X Q_X + P_Y Q_Y$$

Slope of the Budget Constraint

Algebra of the slope

$$\begin{aligned} I &= P_X Q_X + P_Y Q_Y \\ P_Y Q_Y &= I - P_X Q_X \\ Q_Y &= \frac{I}{P_Y} - \frac{P_X Q_X}{P_Y} \end{aligned}$$

Slope of the Budget Constraint

Algebra of the slope

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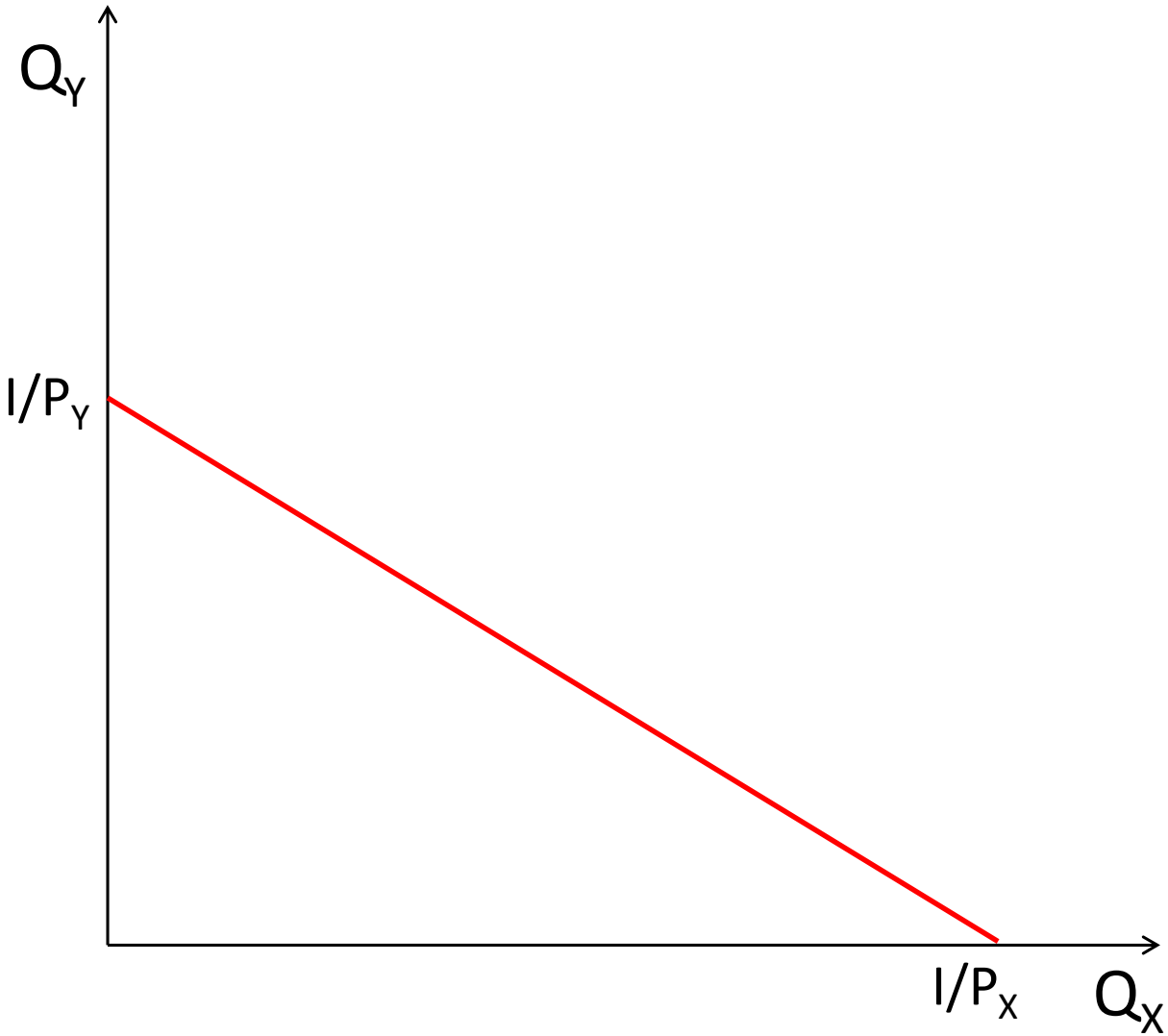
So an additional unit of Q_X requires you to give up $\frac{P_X}{P_Y}$ of Q_Y

What Affects the Position of the Budget Constraint?

What Affects the Position of the Budget Constraint?

- Prices
- Income

What Happens if the Price of Y Decreases?



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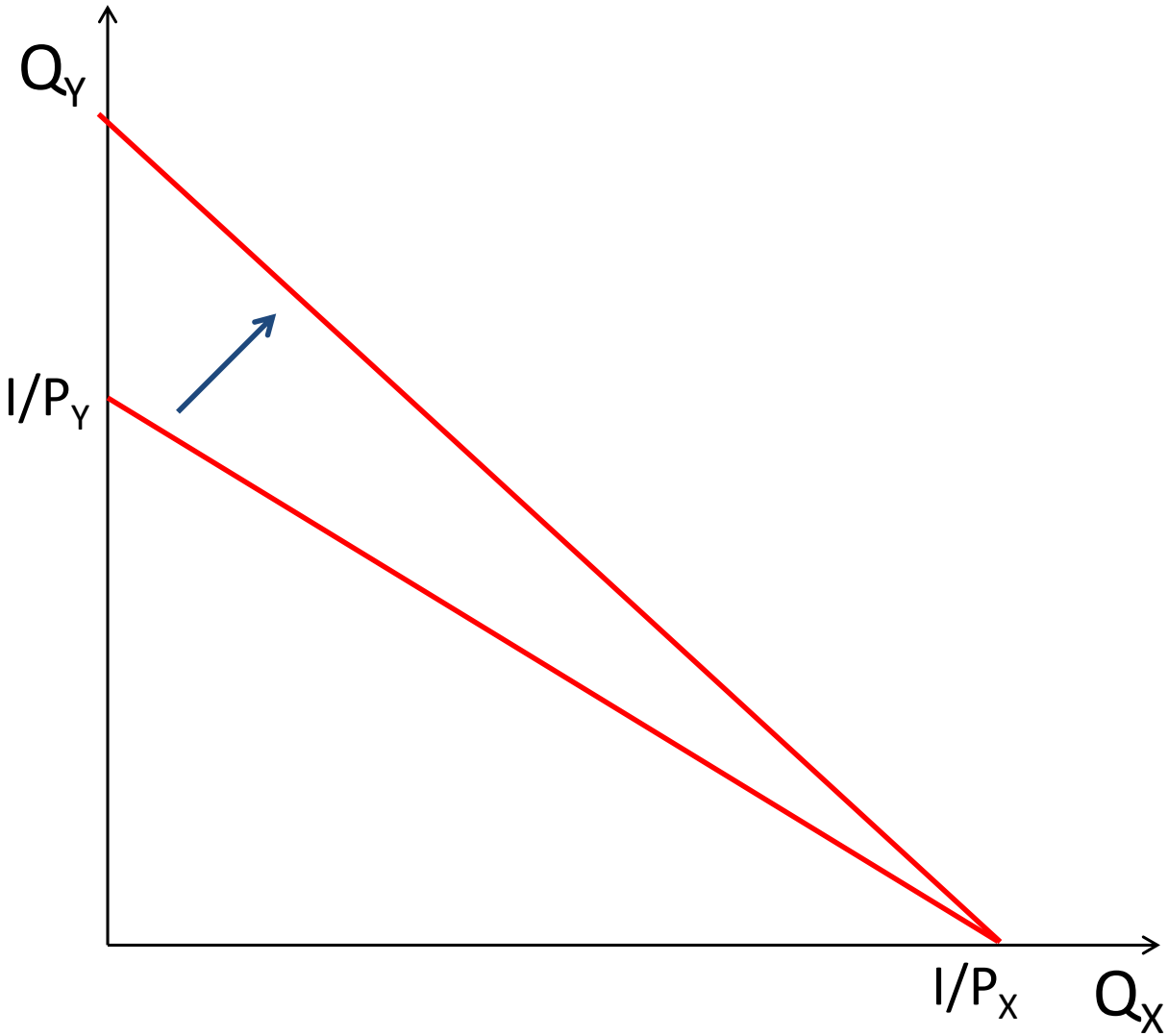
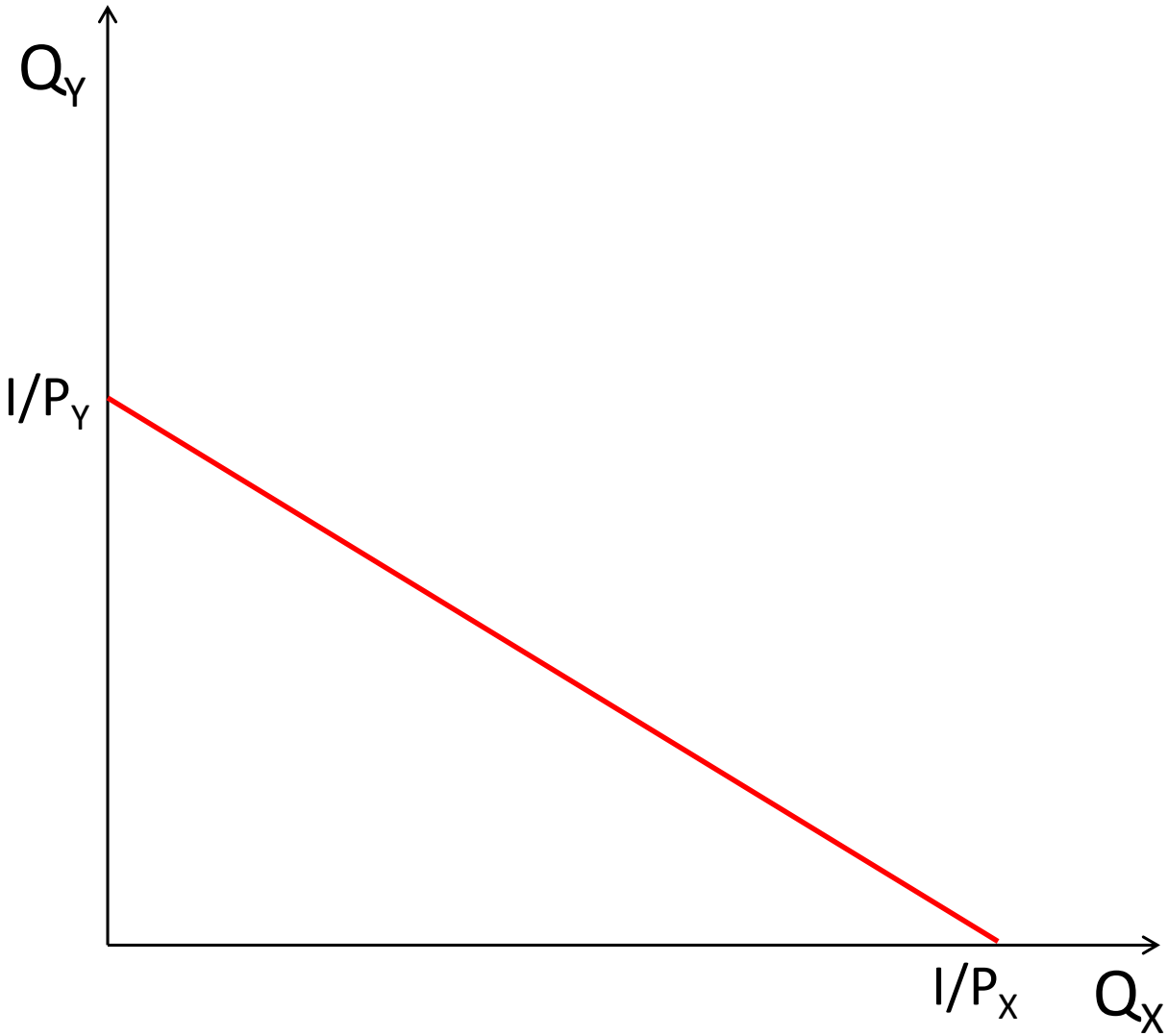


What Happens if the Price of X Increases?



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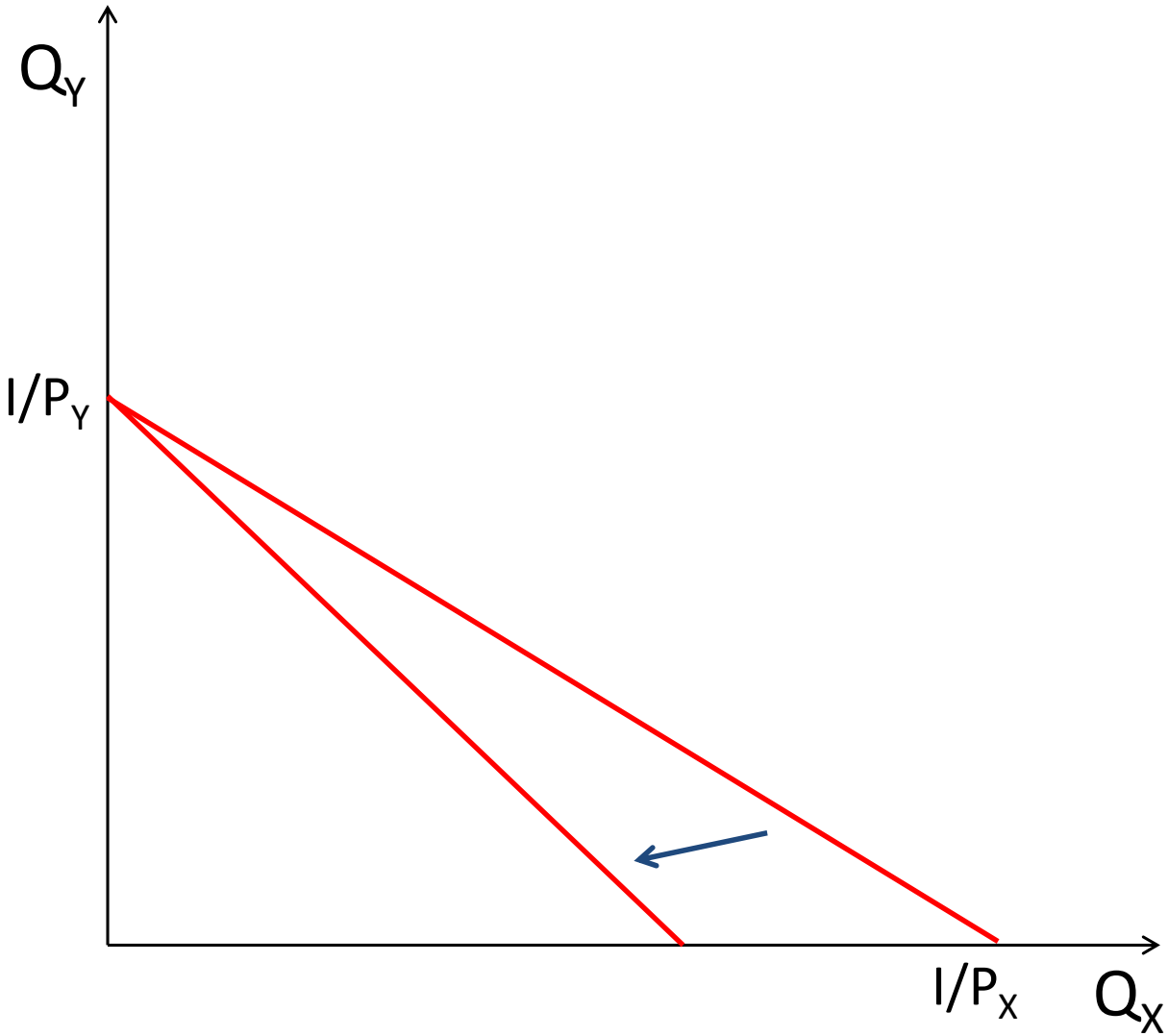
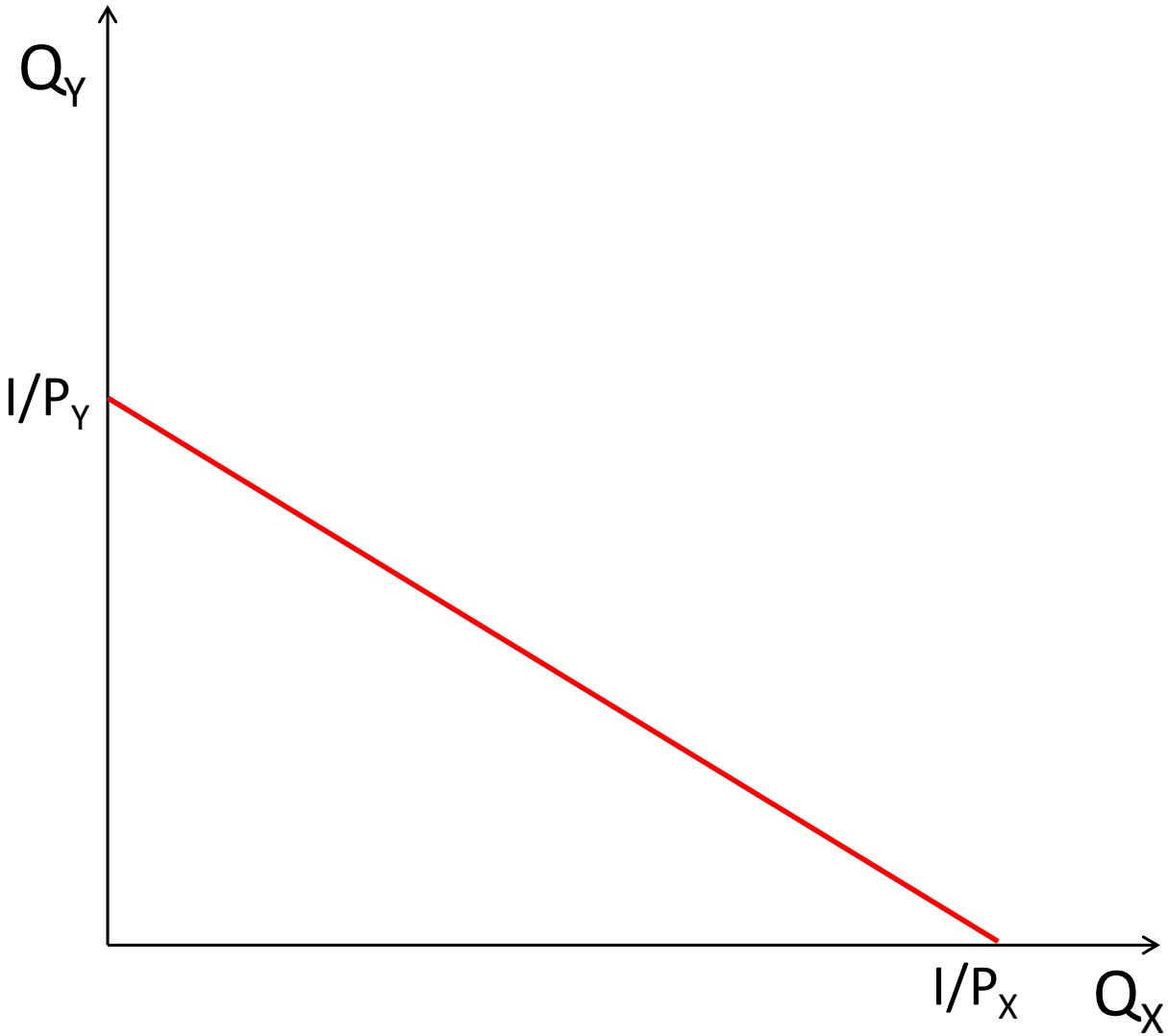


What Happens if Income Increases?



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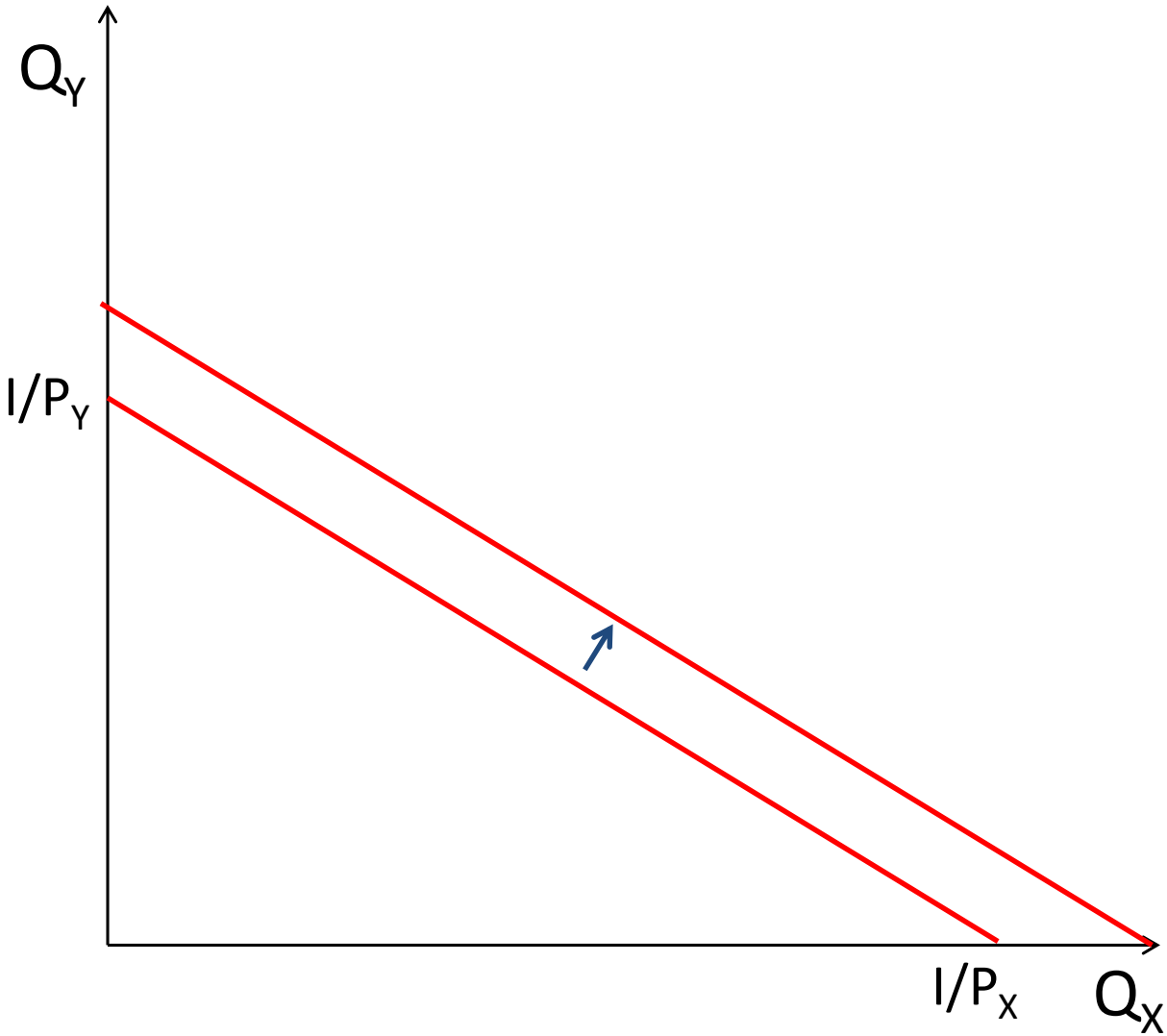

Budget Constraint Changes, In Sum

- Things that change the slope
  - Change in prices, P_X or P_Y
- Things that don't change the slope, but move the line in and out
  - Change in income

Optimizing

How to Be As Happy as Possible

- Maximize your utility given your budget constraint
- How do you do it?

How to Be As Happy as Possible

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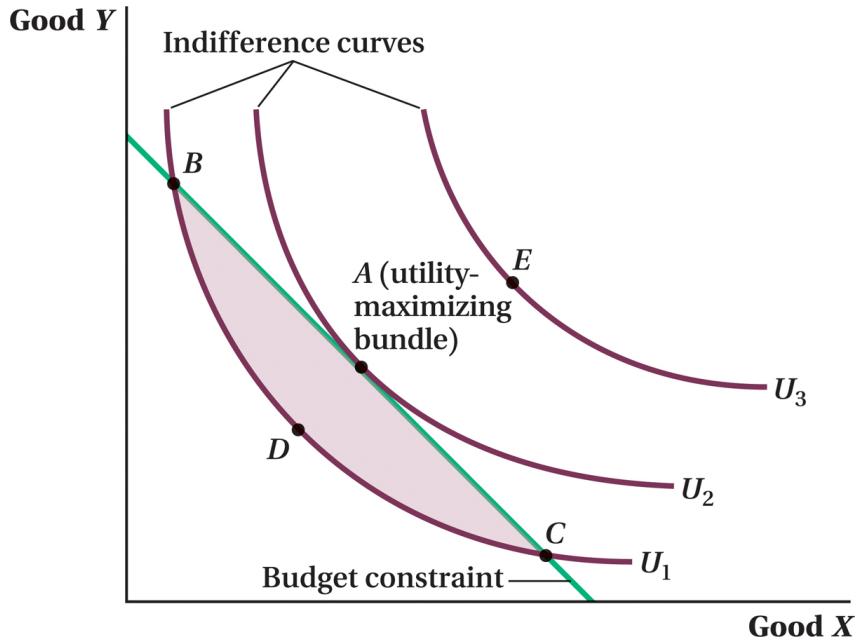

Algebra of Utility Maximization

- Utility is maximized, given the budget constraint, when the slope of the indifference curve is tangent to the budget constraint
- tangency $\rightarrow$ equality

$$-MRS_{XY} = -\frac{P_X}{P_Y}$$

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\end{aligned}
$$

When Are You Optimizing?

By definition

- if $MRS_{XY} = P_X/P_Y$ you are optimizing
- if $MRS_{XY} \neq P_X/P_Y$ you are **not** optimizing*

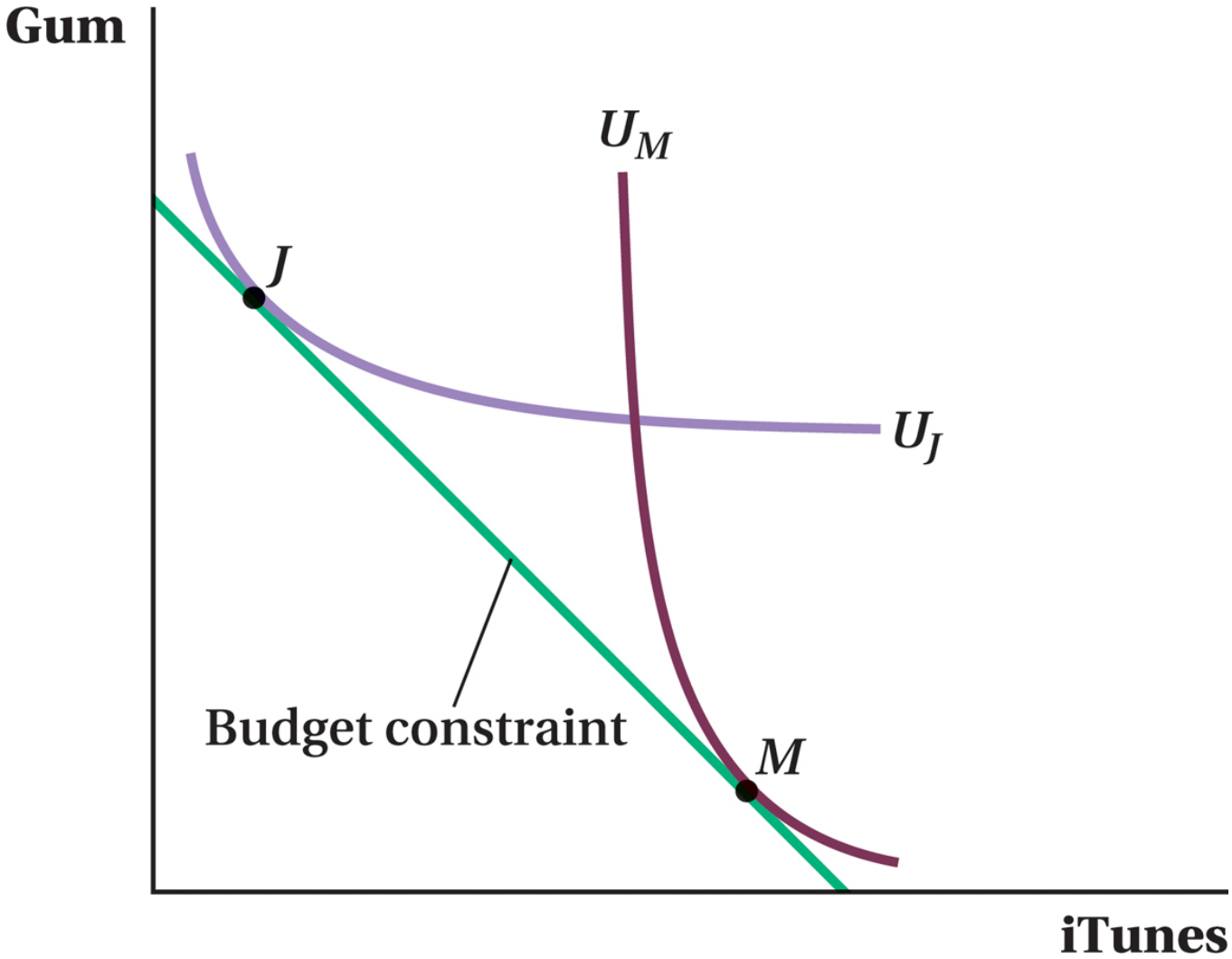
* unless you are at a corner solution, which we'll get to in a few slides

In-Class Problem

Sarah gets utility from soda (S) and hotdogs (H). Her utility function is $U = S^{0.5}H^{0.5}$, $MU_S = 0.5\frac{H^{0.5}}{S^{0.5}}$, and $MU_H = 0.5\frac{S^{0.5}}{H^{0.5}}$. Sarah's income is \$12, and the prices of soda and hotdogs are \$2 and \$3, respectively.

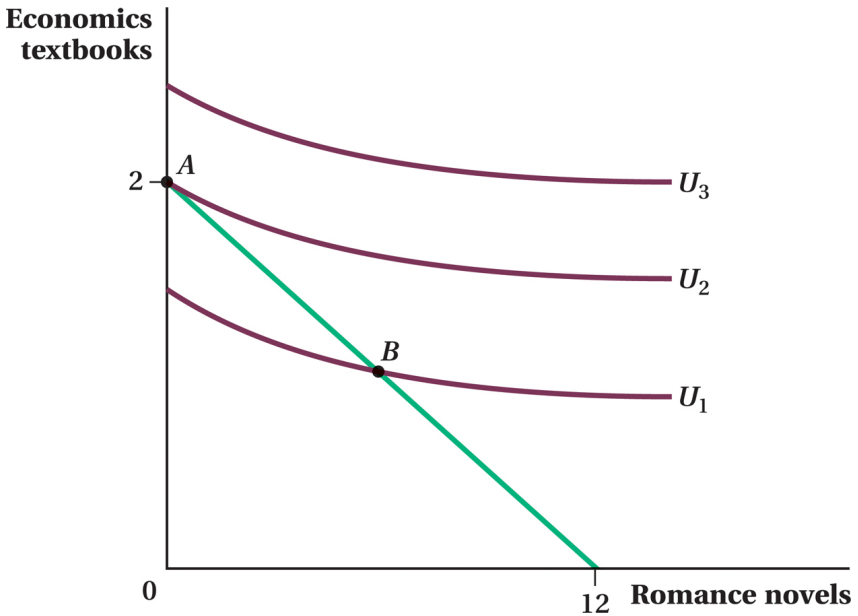
1. Draw Sarah's budget constraint
2. What amount of sodas and hotdogs makes Sarah happiest, given her budget constraint? (Recall that you have two equations and two unknowns.)

A Usual Maximization of Utility s.t. Budget Constraint



Must the indifference curve always be tangent?

A "Corner Solution"



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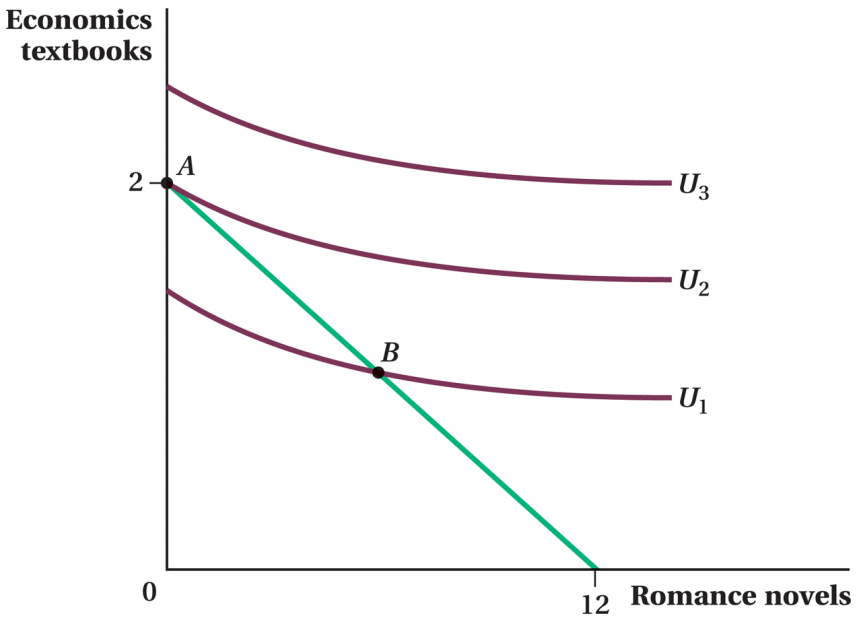
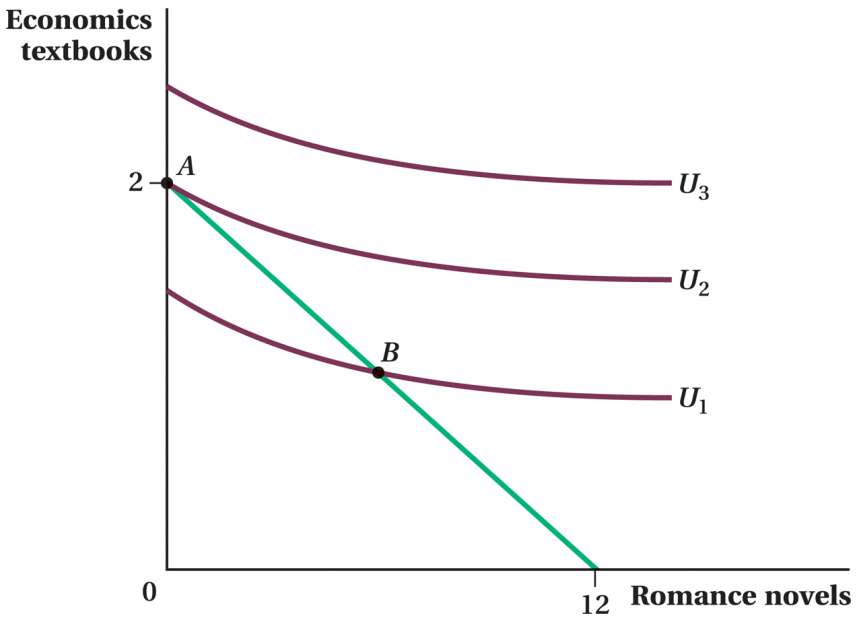


Three key things to note

- Consumer is still maximizing utility
- He is not consuming both goods
- Is the indifference curve is tangent to budget constraint?

A "Corner Solution"



Three key things to note

- Consumer is still maximizing utility
- He is not consuming both goods
- Is the indifference curve is tangent to budget constraint? No

What We Did This Class

1. Preferences and utility
2. Indifference curves
3. Budget constraint
4. Optimization

Next Class

- Turn in Problem Set 4
- Read Chapter 5
  - Omit income Engel curves from 5.1
  - Omit inferior goods and Giffen goods at the end of 5.3
- Two more classes before midterm