LECTURE 6

Consumers and Utility Maximization

I. INTRODUCTION TO CONSUMER OPTIMIZATION

Why Consumer Optimization Is Important

- It has implications for how we view the desirability of market outcomes.

- It can help us to understand the many choices that consumers make.

II. THE BUDGET CONSTRAINT
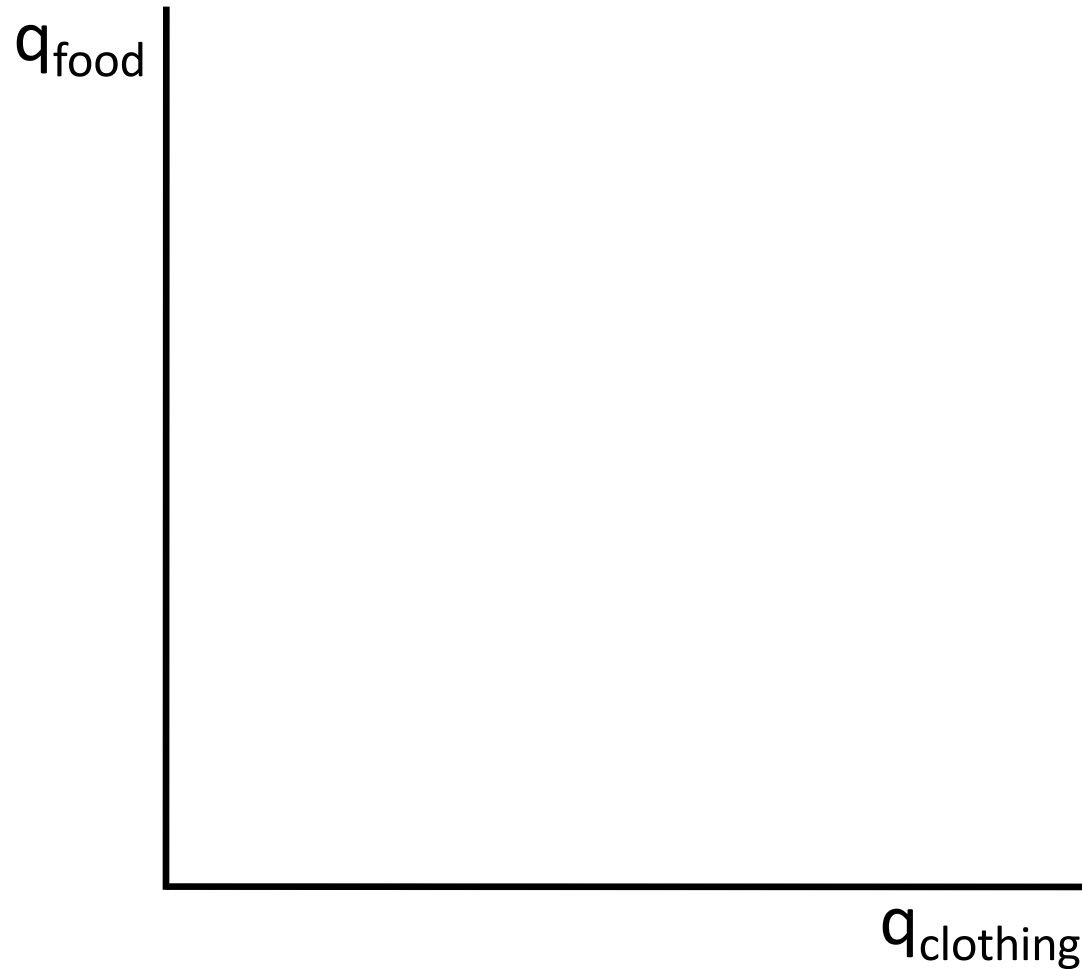
A Household's Budget Constraint

- **In words:** The total amount the household spends cannot exceed its income.

- **In symbols:**

$$P_a \cdot q_a + P_b \cdot q_b + P_c \cdot q_c + \dots + P_z \cdot q_z = Income,$$

where the *P*'s are the market prices of the various goods, and the *q*'s are the quantities that the individual household buys.
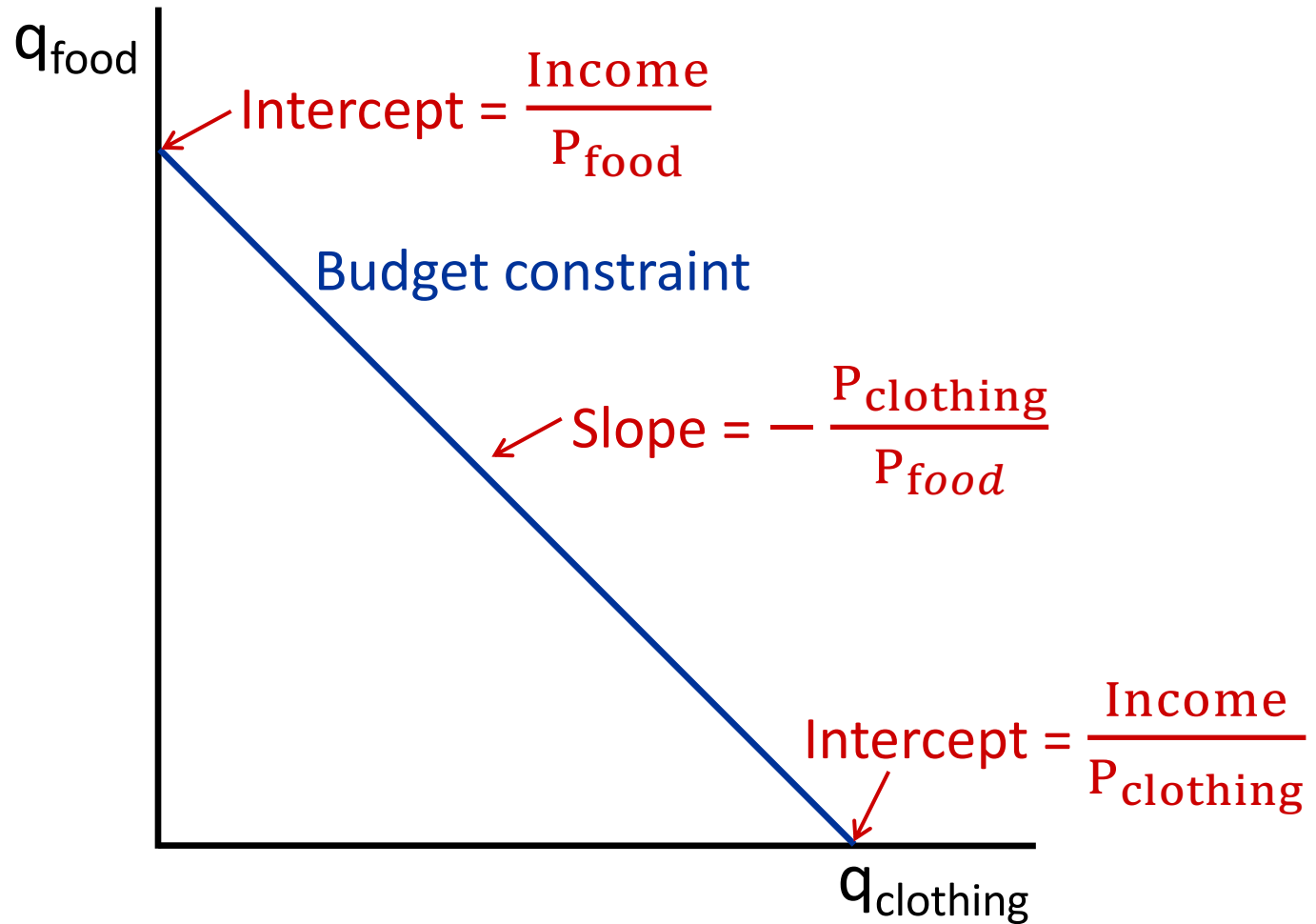
Budget Constraint for the Case of Two Goods
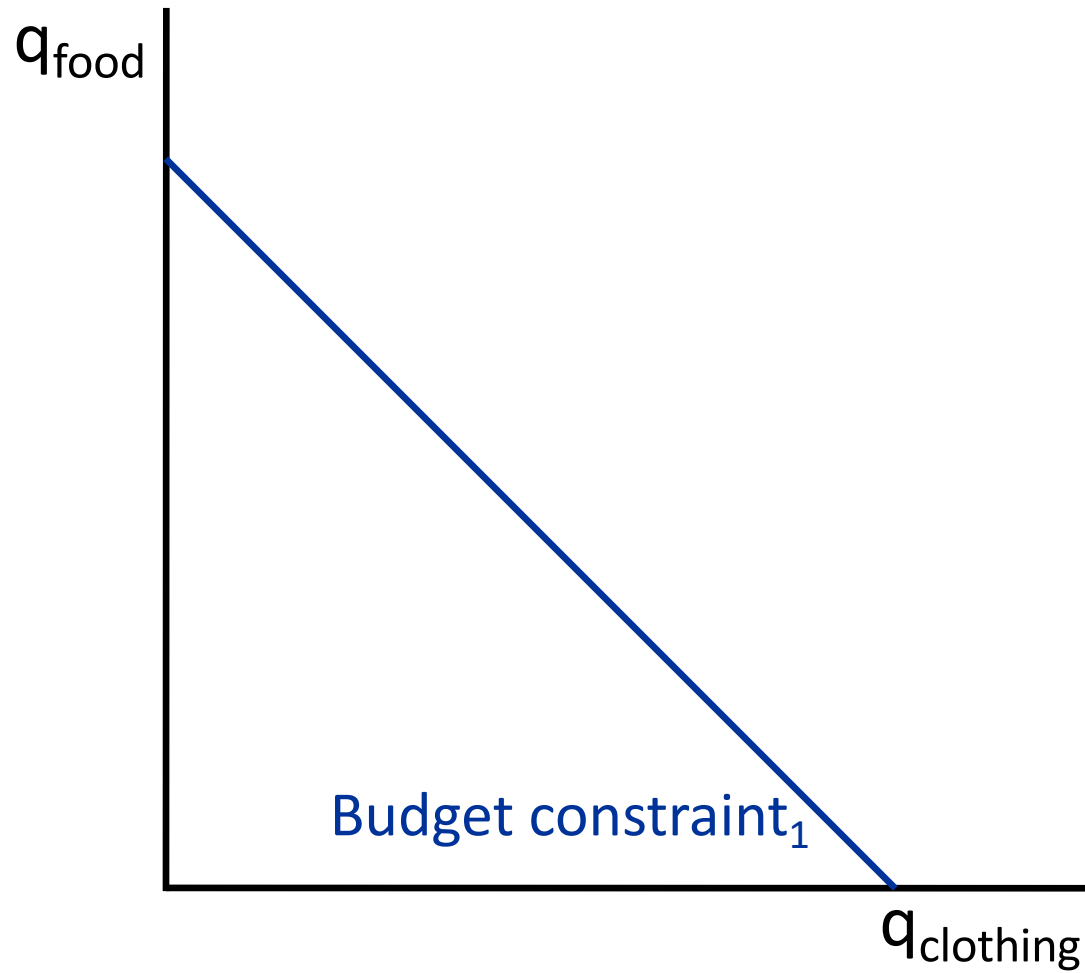$$P_{food} \cdot q_{food} + P_{clothing} \cdot q_{clothing} = Income$$

Budget Constraint for the Case of Two Goods

$$P_{food} \cdot q_{food} + P_{clothing} \cdot q_{clothing} = Income$$

q_{food}

$\text{Intercept} = \dfrac{Income}{P_{food}}$

Budget constraint

$\text{Slope} = -\dfrac{P_{clothing}}{P_{food}}$

$\text{Intercept} = \dfrac{Income}{P_{clothing}}$
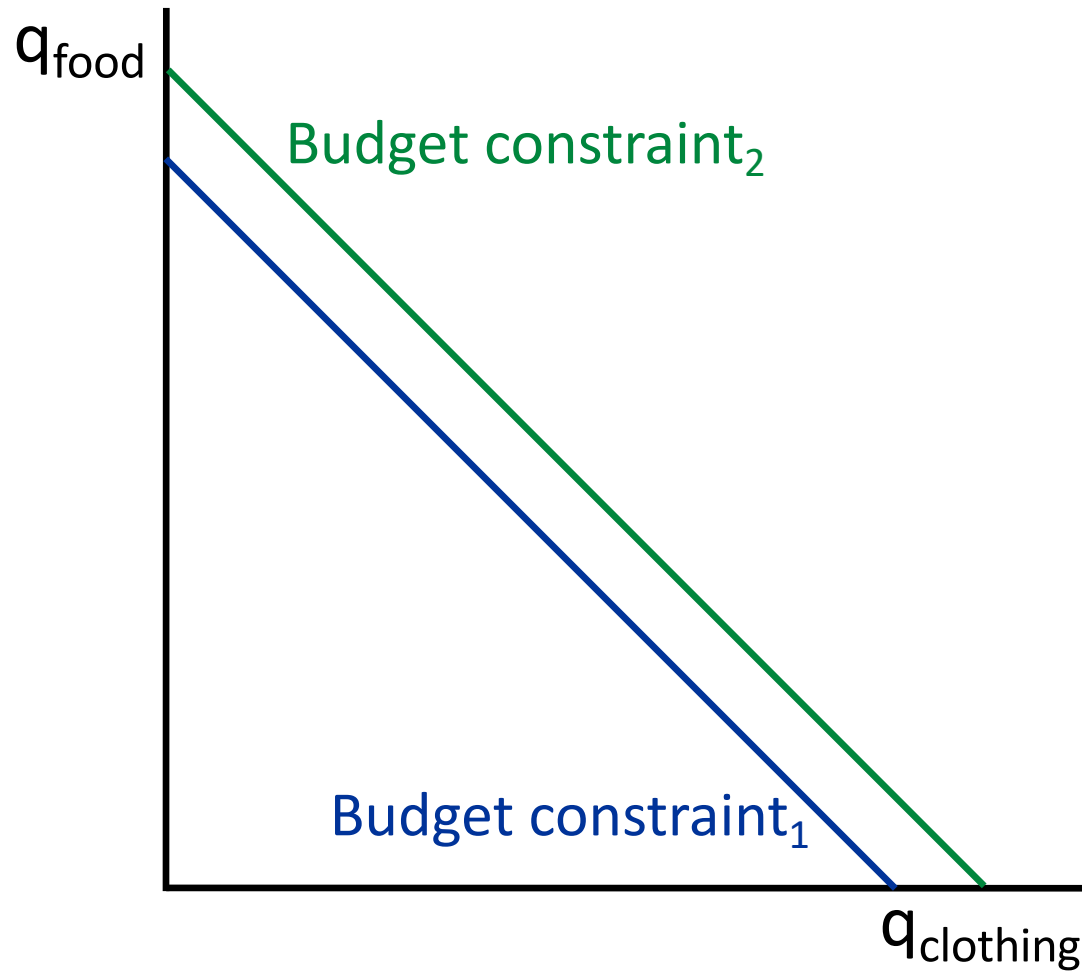
$q_{clothing}$

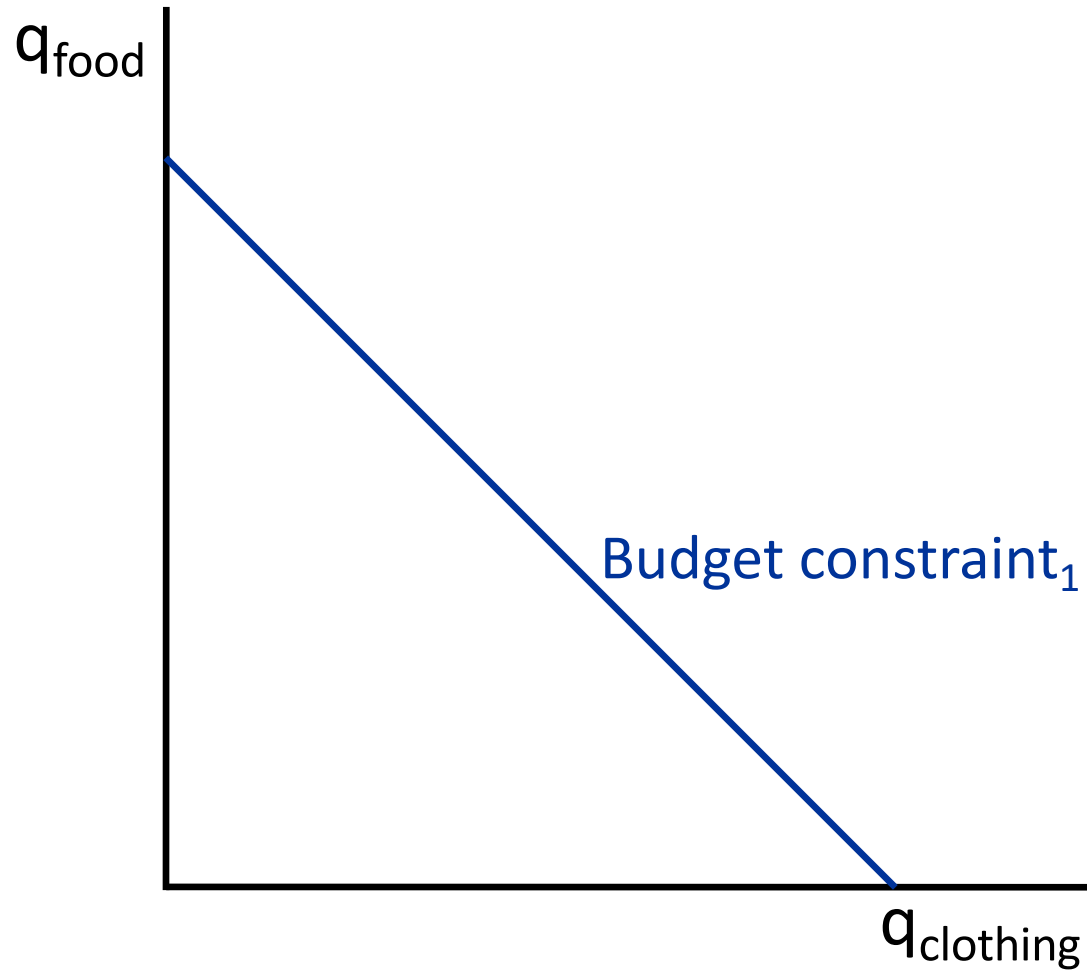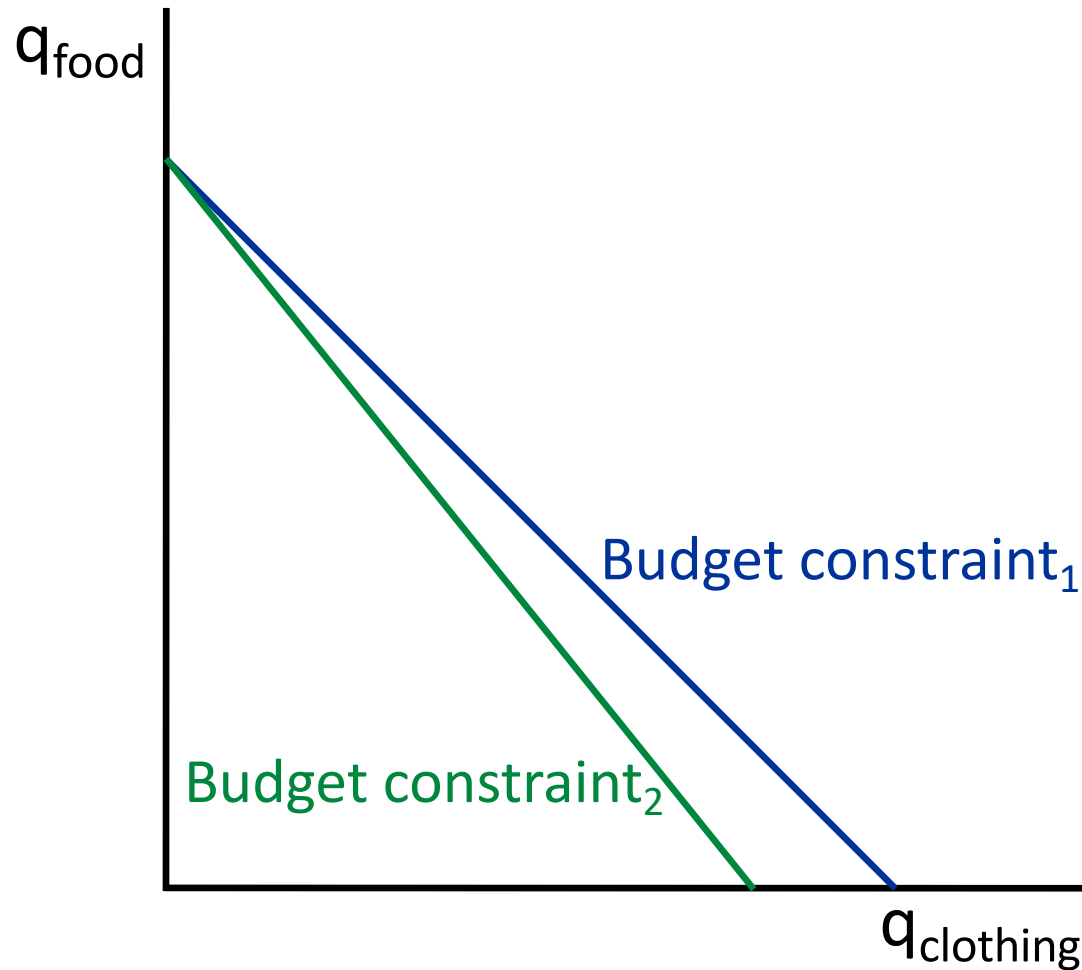# A Rise in the Household's Income

A Rise in the Household's Income

A Rise in the Price of Clothing

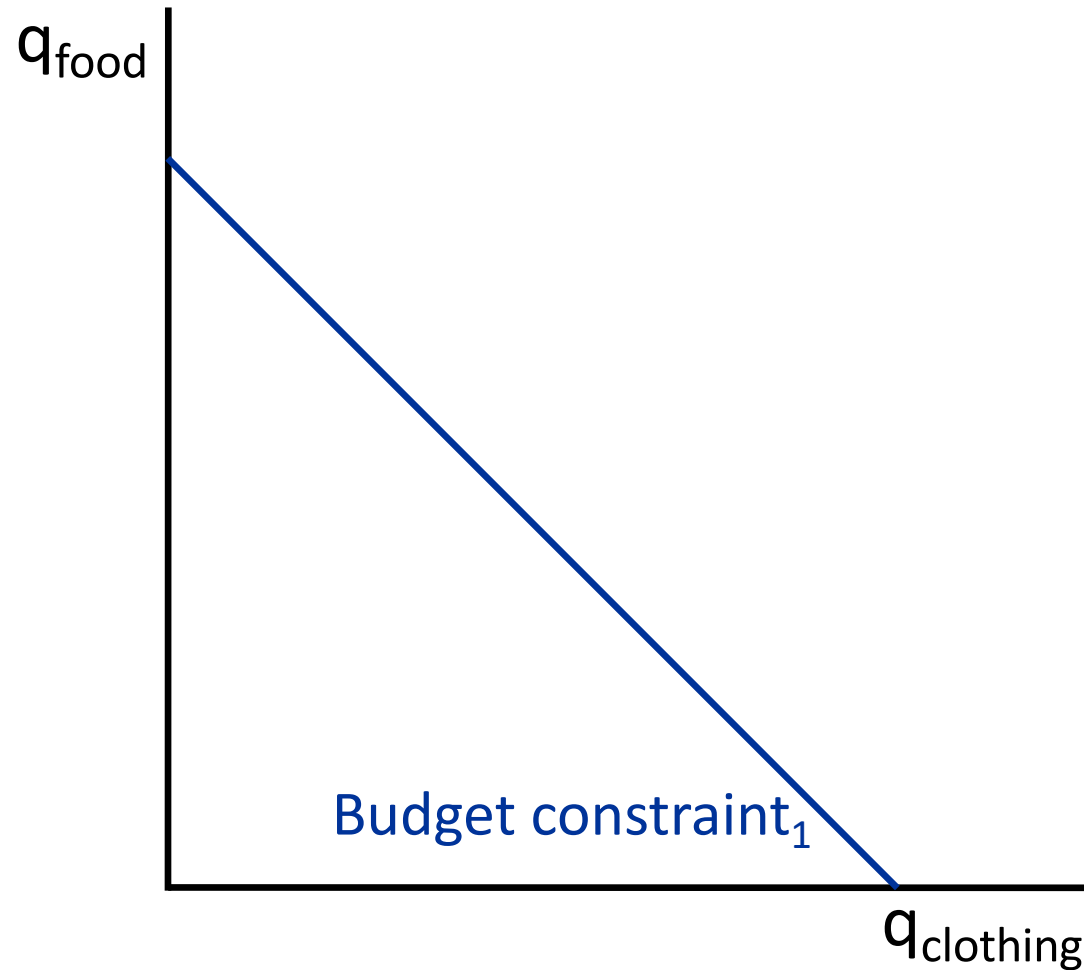# A Rise in the Price of Clothing

Recall that the slope of the budget constraint is $-P_{clothing}/P_{food}$.

What point does the consumer choose on the budget constraint?

III. UTILITY MAXIMIZATION

What do we think consumers maximize?

What do we think consumers maximize?

- Happiness, satisfaction, utility.

- Economists don't make judgments about *what* gives people happiness.

- Preferences of individuals are "sacred" for economists and are revealed by their choices
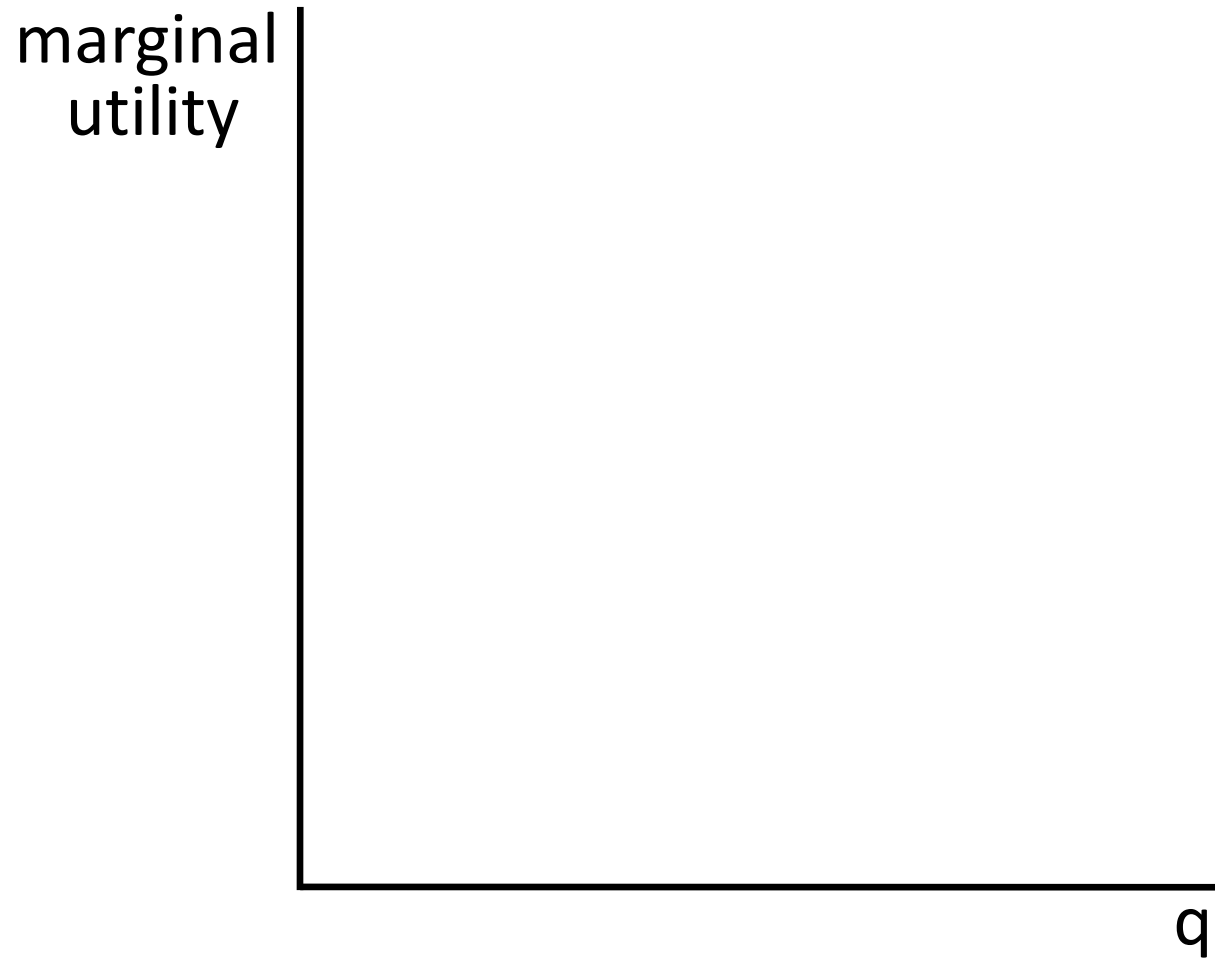
Utility

- Total utility: The total happiness one gets from consuming a given amount of a good.

- Marginal utility: The extra utility derived from consuming one more unit of a good.
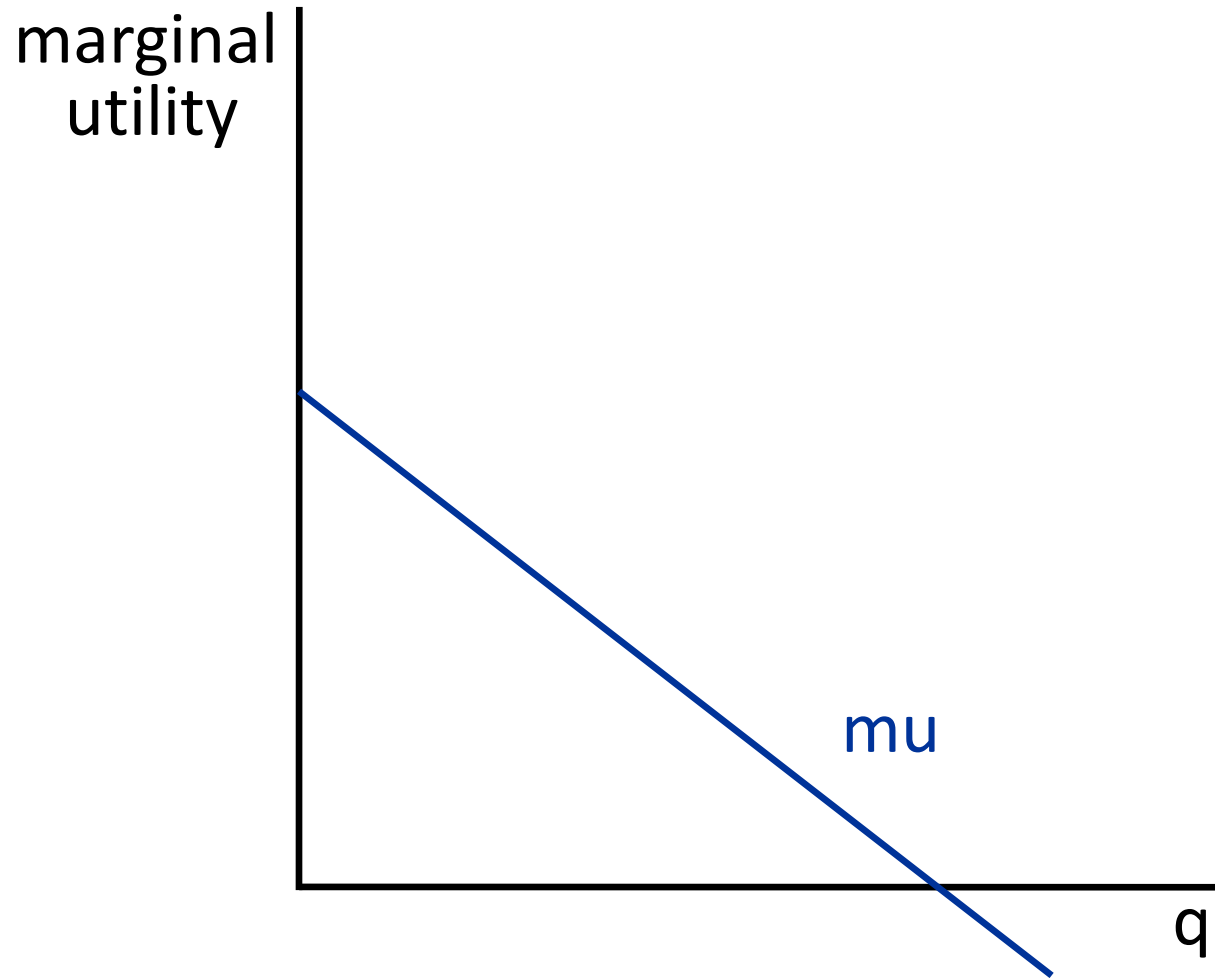
Diminishing Marginal Utility

- As a household consumes more of a given good, the marginal utility of the good declines.

- Canonical example is food:

  – when hungry, an extra unit of food gives you a lot of utility

  – when satiated, an extra unit of good gives you a lot less utility, eventually negative

Diminishing Marginal Utility

Diminishing Marginal Utility

Relationship between Total Utility and Marginal Utility

- Suppose

$$u = f(q)$$

  where q is the quantity of some good a household consumes, and u is the total utility the household gets from consuming the good.

- Then

$$mu = f'(q)$$

  where mu is marginal utility

  $f'(q)$ is derivative of function f at point q

Recall about derivatives

- Function f(x)

- Derivative f'(x) is the slope of function at x

$$f'(x)=(f(x+1)-f(x))/1$$

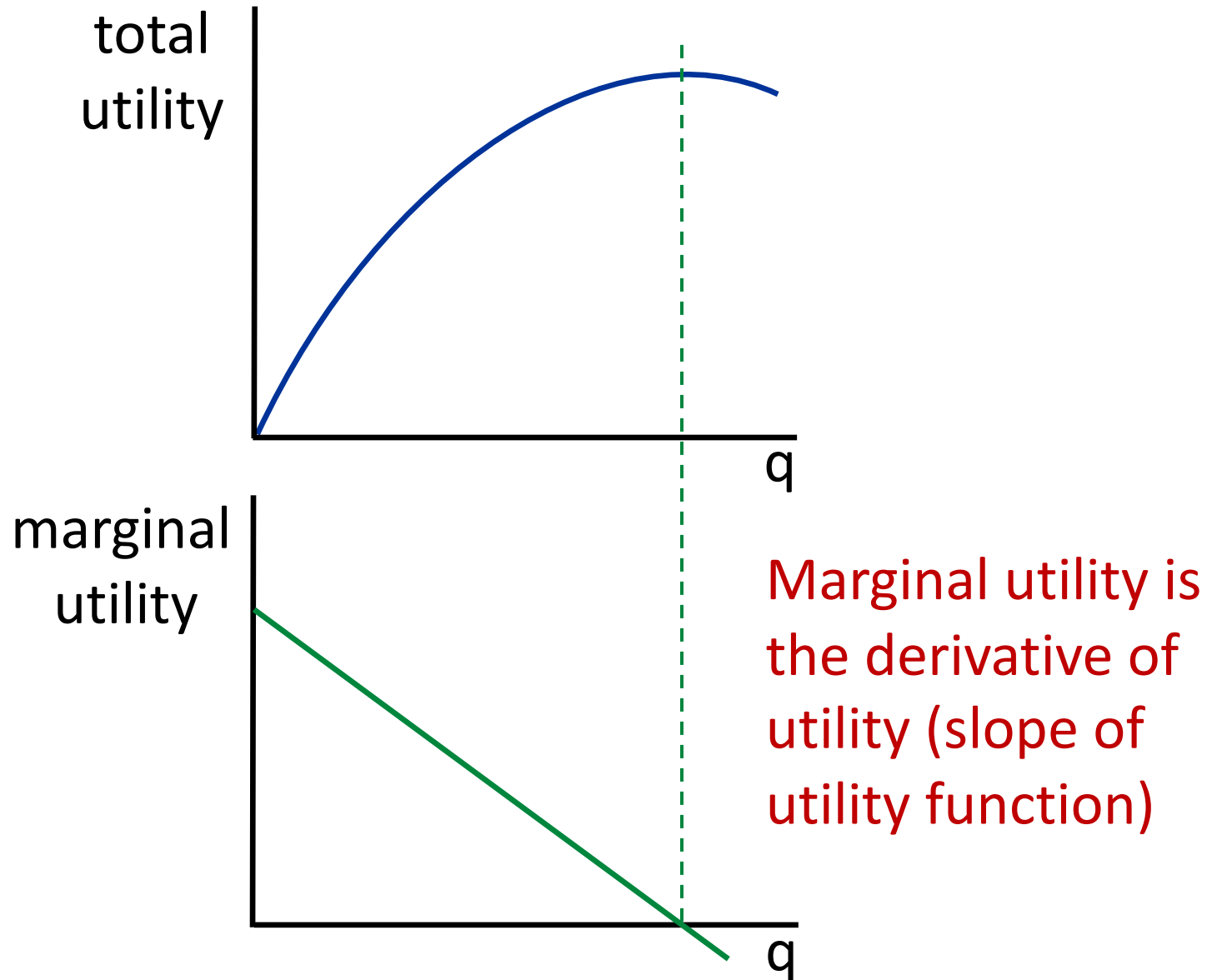assuming that 1 extra unit is small

- Formal mathematical definition is:

f'(x) = limit of (f(x+e)-f(x))/e when e goes to zero

- In economics: marginal always means derivative (adding one extra small unit) so that we can use calculus

Relationship between Total and Marginal Utility

total
utility

q

marginal
utility

Marginal utility is
the derivative of
utility (slope of
utility function)

q

Marginal Utility Likely Declines at Different Rates for Different Goods

Good a

mu_a

q_a

Good b

mu_b
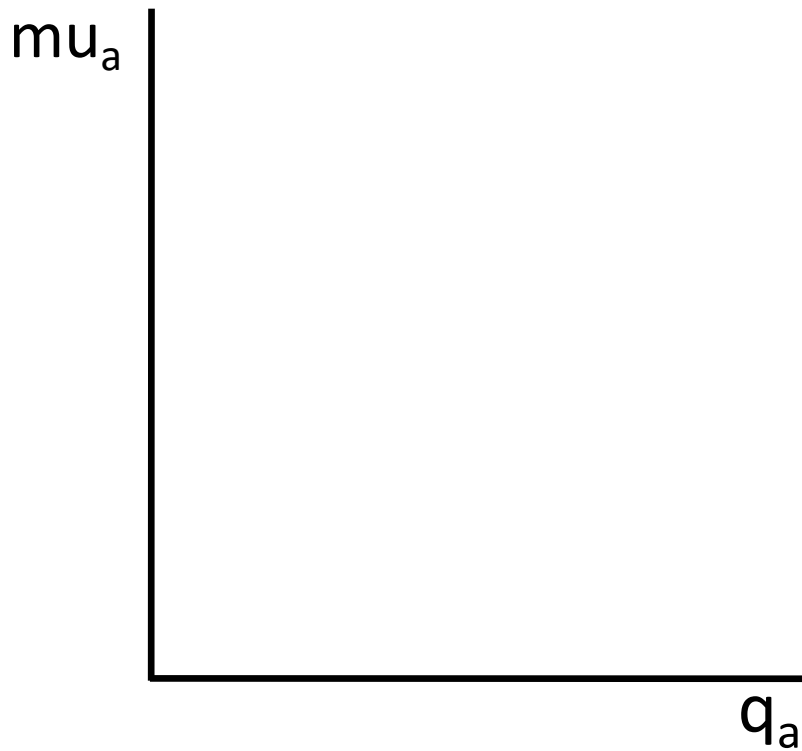
q_b
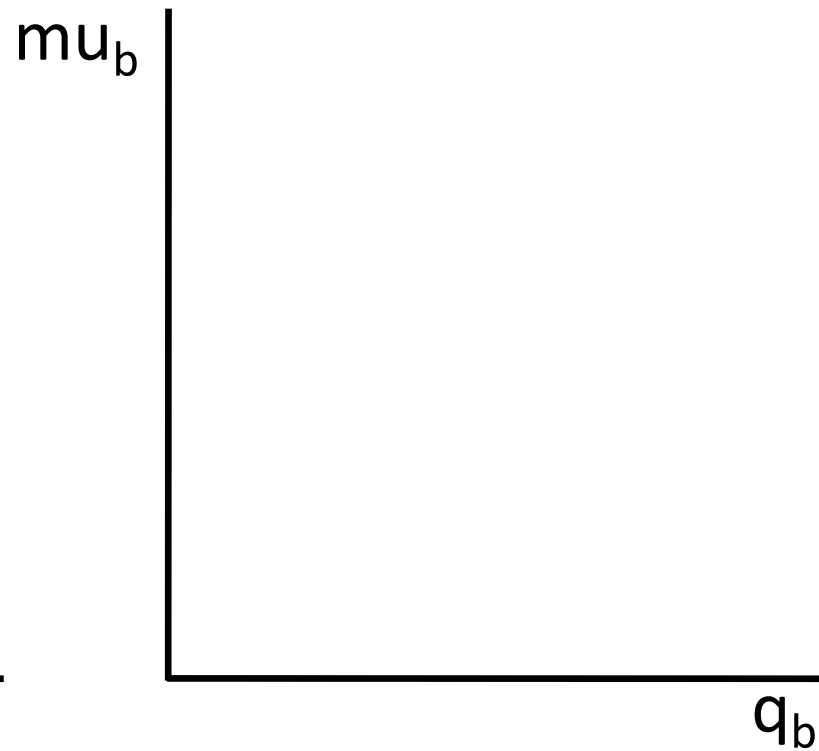
Marginal Utility Likely Declines at Different Rates for Different Goods

Good a (food)
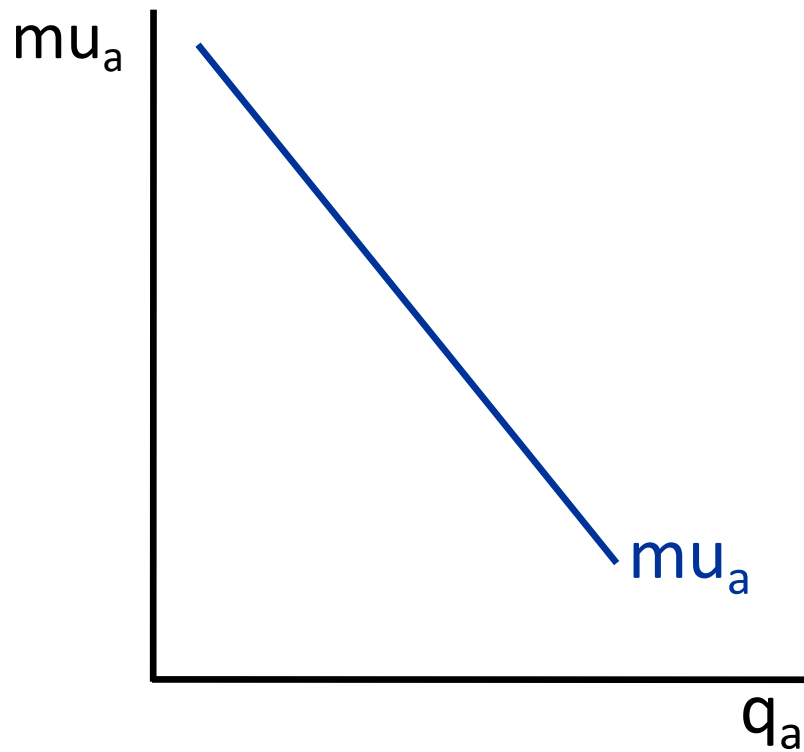
Good b (clothes)
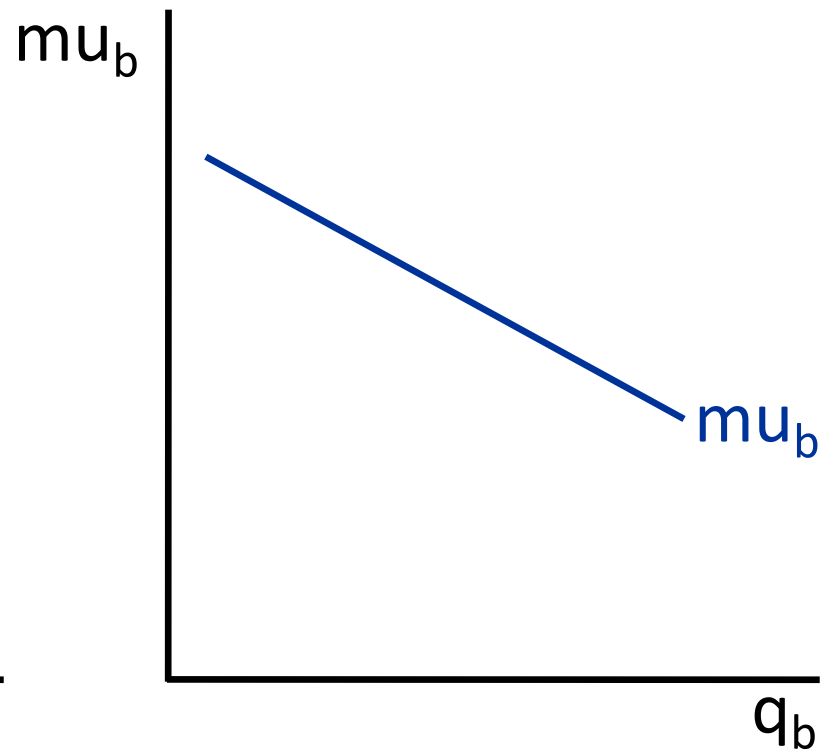
The Condition for Utility Maximization (the Rational Spending Rule)

- A household is doing the best that it can—that is, it is maximizing its utility—if:

  The marginal utility derived from spending one more dollar on a good is the same for all goods.

  Technical (but not substantial) assumption: people can fine tune the exact quantity they buy → we can apply mathematical calculus

The Condition for Utility Maximization with Just Two Goods (Food and Clothing)

$$\frac{\$1}{P_c} mu_c = \frac{\$1}{P_f} mu_f$$

Where the *P*'s are the market prices of the two goods and the *mu*'s are the marginal utilities of an additional unit of the two goods for the household.

This is the same as:

$$\frac{mu_c}{P_c} = \frac{mu_f}{P_f}$$

The General Condition for Utility Maximization (the Rational Spending Rule)

$$\frac{mu_a}{P_a} = \frac{mu_b}{P_b} = \ldots = \frac{mu_z}{P_z},$$

where the *P*'s are the market prices of the different goods, and the *mu*'s are the marginal utilities of an additional unit of the different goods for the household.

IV. CONSUMER OPTIMIZATION AND THE DEMAND CURVE

A Rise in the Price of Clothing

- Suppose the household starts with:

$$\frac{mu_c}{P_c} = \frac{mu_f}{P_f}$$

- If P_c rises, and the household didn't change its purchases, then:

$$\frac{mu_c}{P_c} < \frac{mu_f}{P_f}$$

Diminishing Marginal Utility

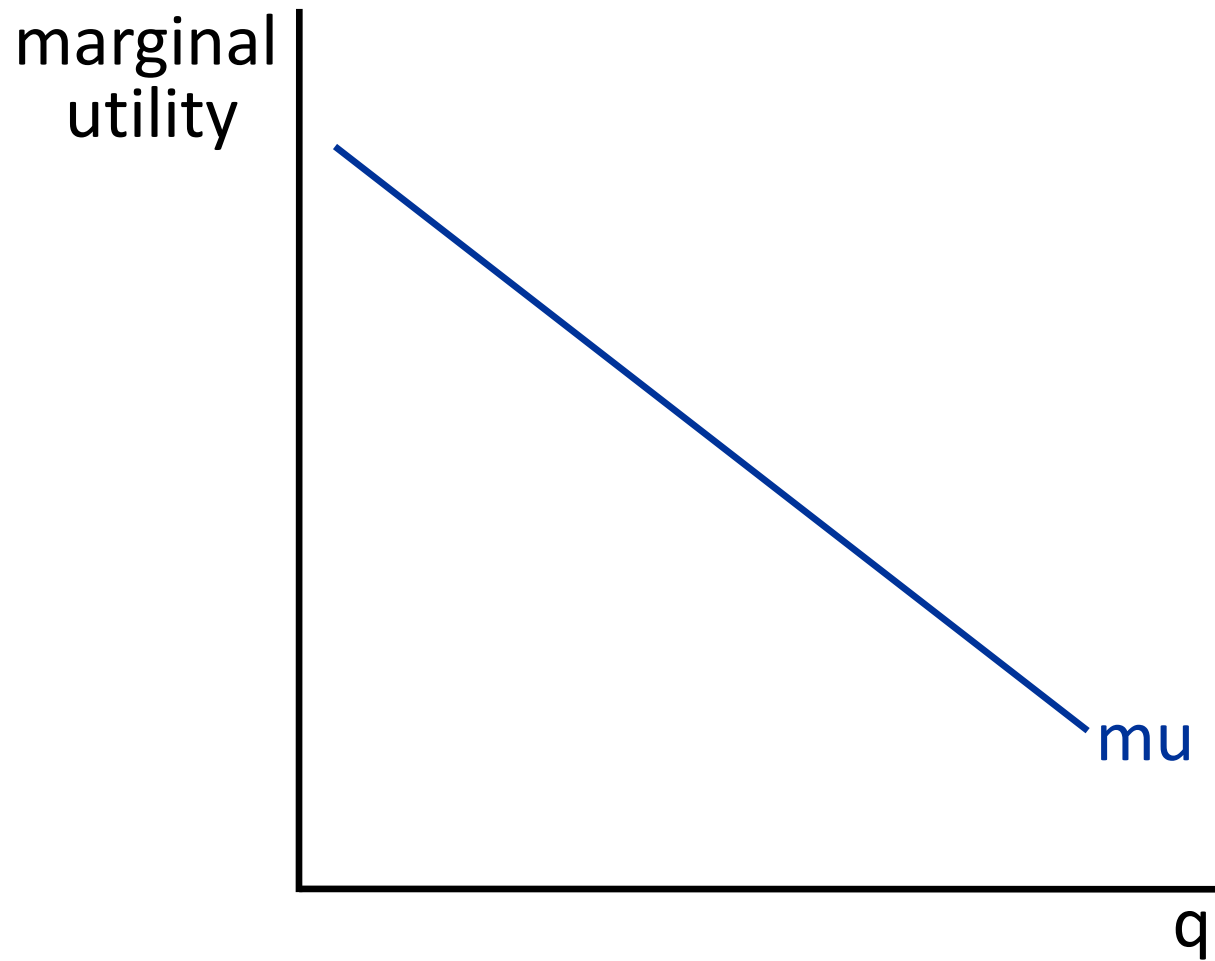# A Rise in the Price of Clothing

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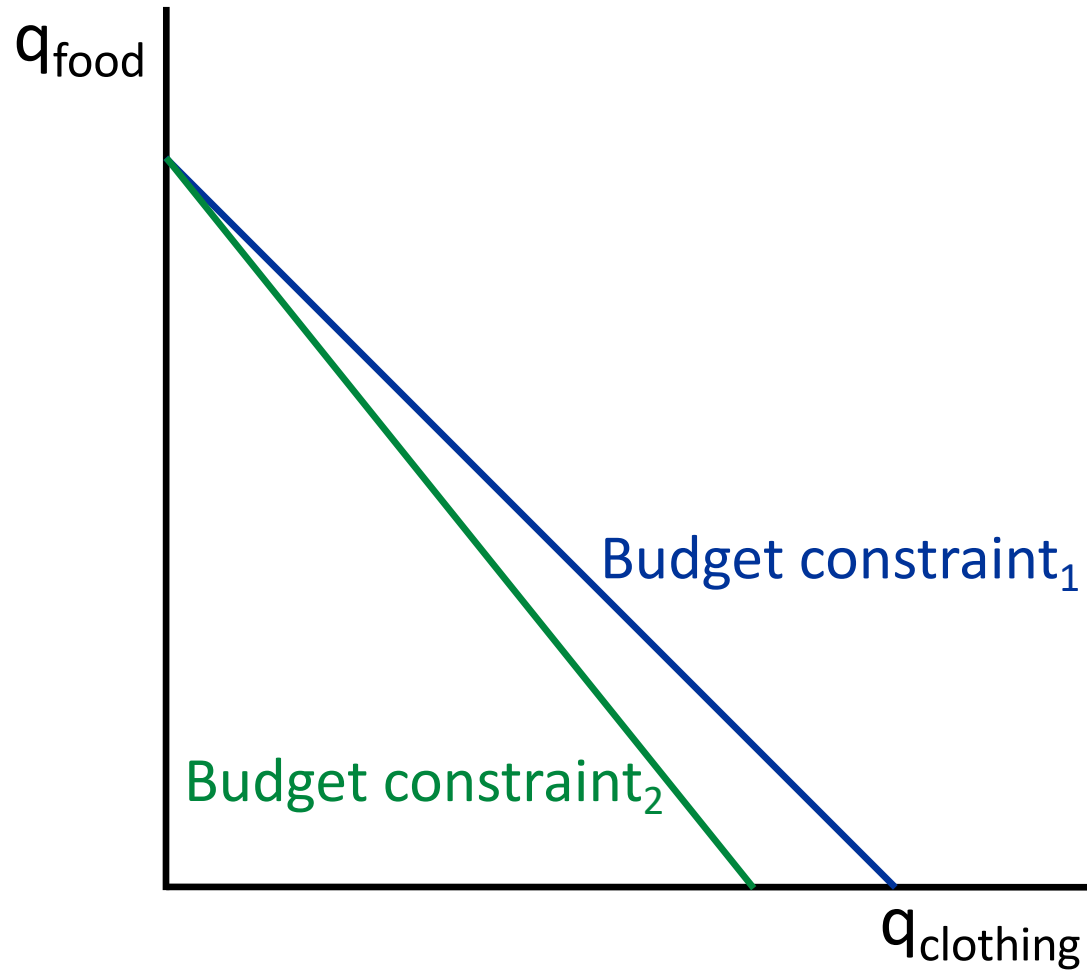- The household will need to buy less clothing (and more food) until:

$$\frac{mu_c}{P_c} = \frac{mu_f}{P_f}$$

Why Demand Curves Slope Down

- Substitution effect: When the price of a good rises, a household wants less of the good and more of other goods, because the good becomes relatively more expensive.

A Rise in the Price of Clothing

q_{food}

Budget constraint$_1$

Budget constraint$_2$

$q_{clothing}$

Why Demand Curves Slope Down

- Substitution effect: When the price of a good rises, a household wants less of the good and more of other goods, because the good is relatively more expensive.

  "if price increases, I buy something else"

- Income effect: When the price of a good rises, a household wants less of all goods, because its budget constraint has changed for the worse.

  "if price increases, I can't buy as much"

Demand Curves

Individual Household
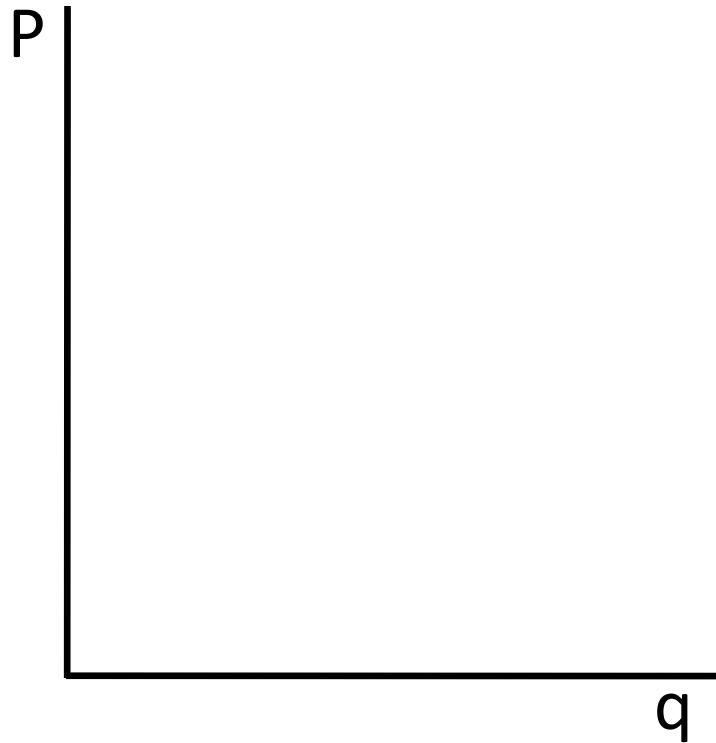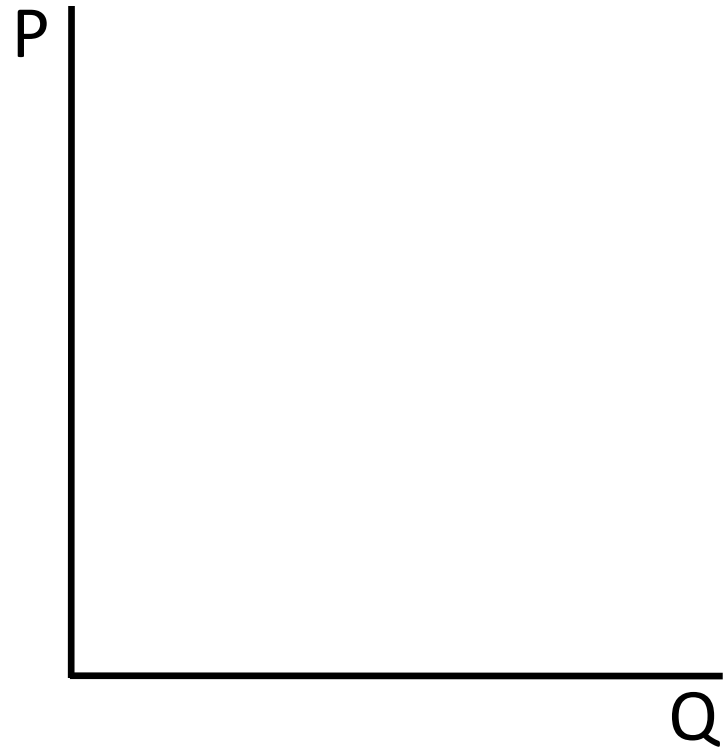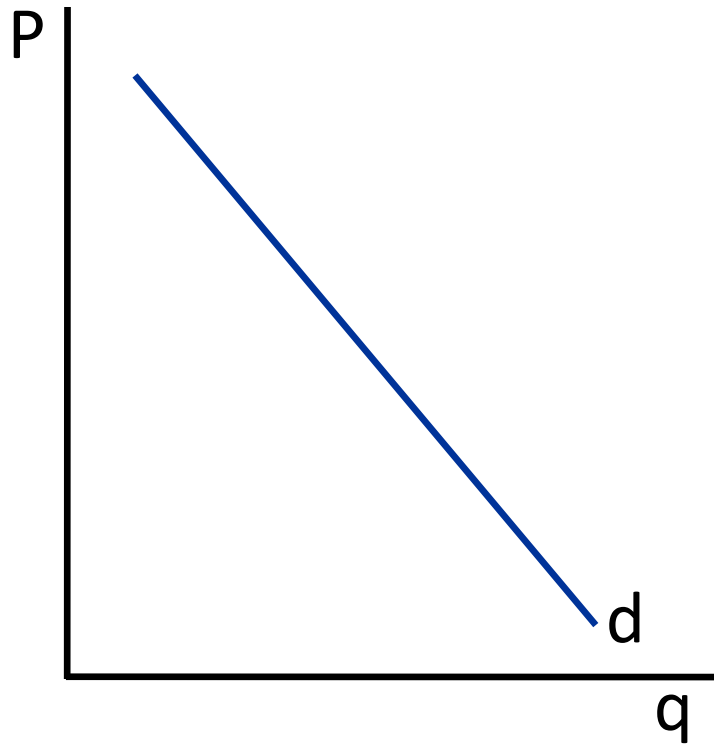
P

q

Market

P

Q

Demand Curves

Individual Household

P

d

q

Market

P

Q

Household and Market Demand Curves

- The market demand curve is the **horizontal sum** of each individual household's demand curve.

- Because each household's demand curve (d) slopes down, the market demand curve (D) slopes down.

Demand Curves

Individual Household

P

d

q

Market

P

D

Q

Household and Market Demand Curves

- The market demand curve is the **horizontal sum** of each individual household's demand curve.

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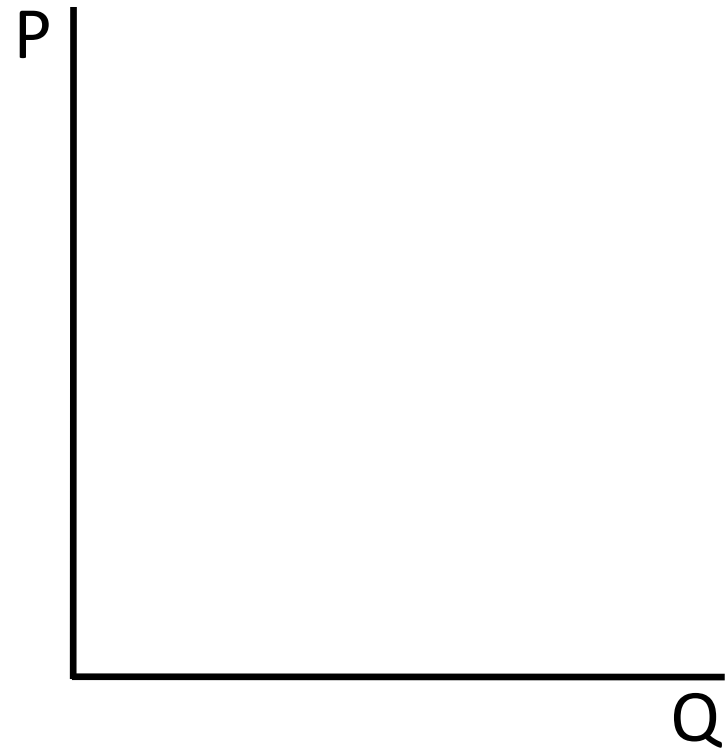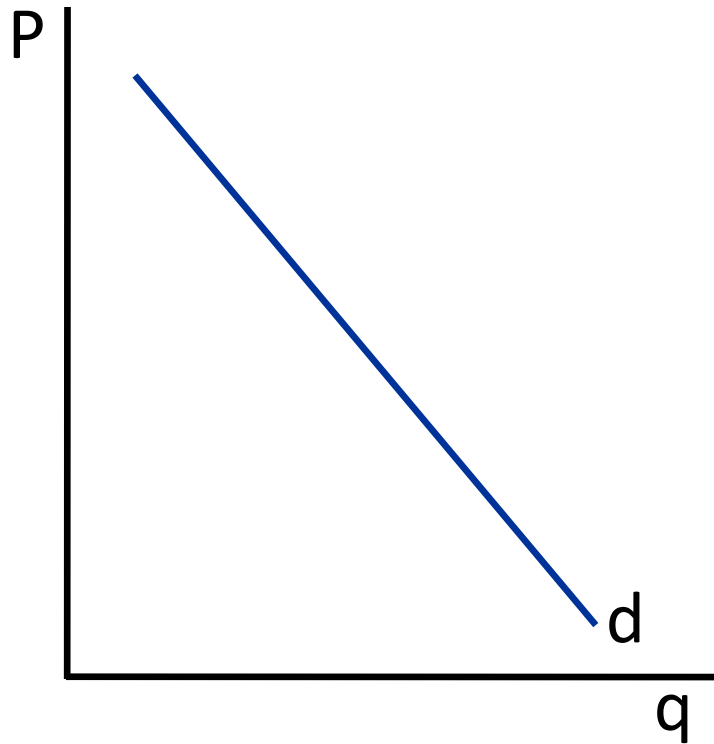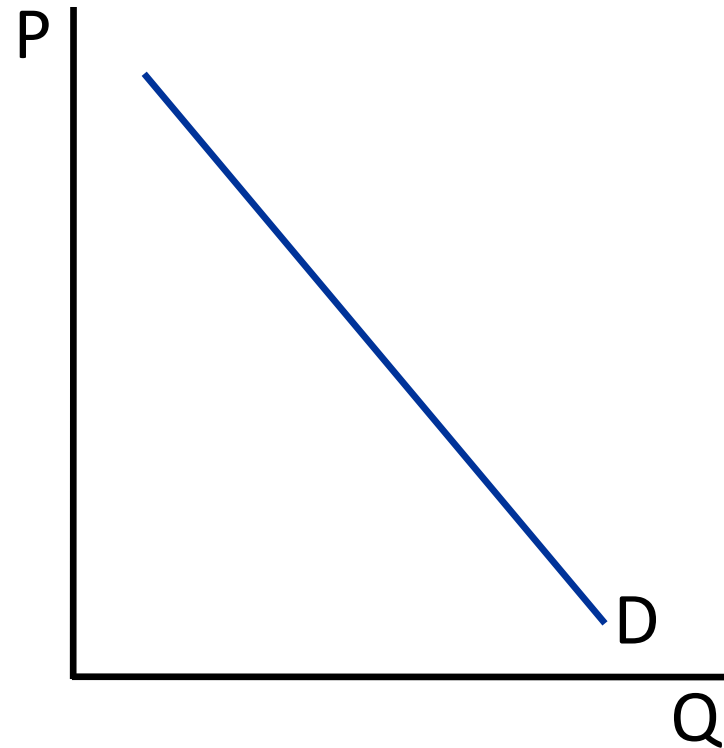- Because each household's demand curve is derived from optimizing behavior, the market demand curve is as well.

Blueberries may help prevent Alzheimer's, new research suggests

4:41PM GMT 13 Mar 2016

Scientists say the fruit is loaded with healthful antioxidants which could help prevent the effects of the increasingly common form of dementia

Blueberries, already classified as a "superfruit" for its health boosting properties, could now also help fight dementia, new research suggests. The study shows the berry, which can potentially lower the risk of heart disease and cancer, could also be a wea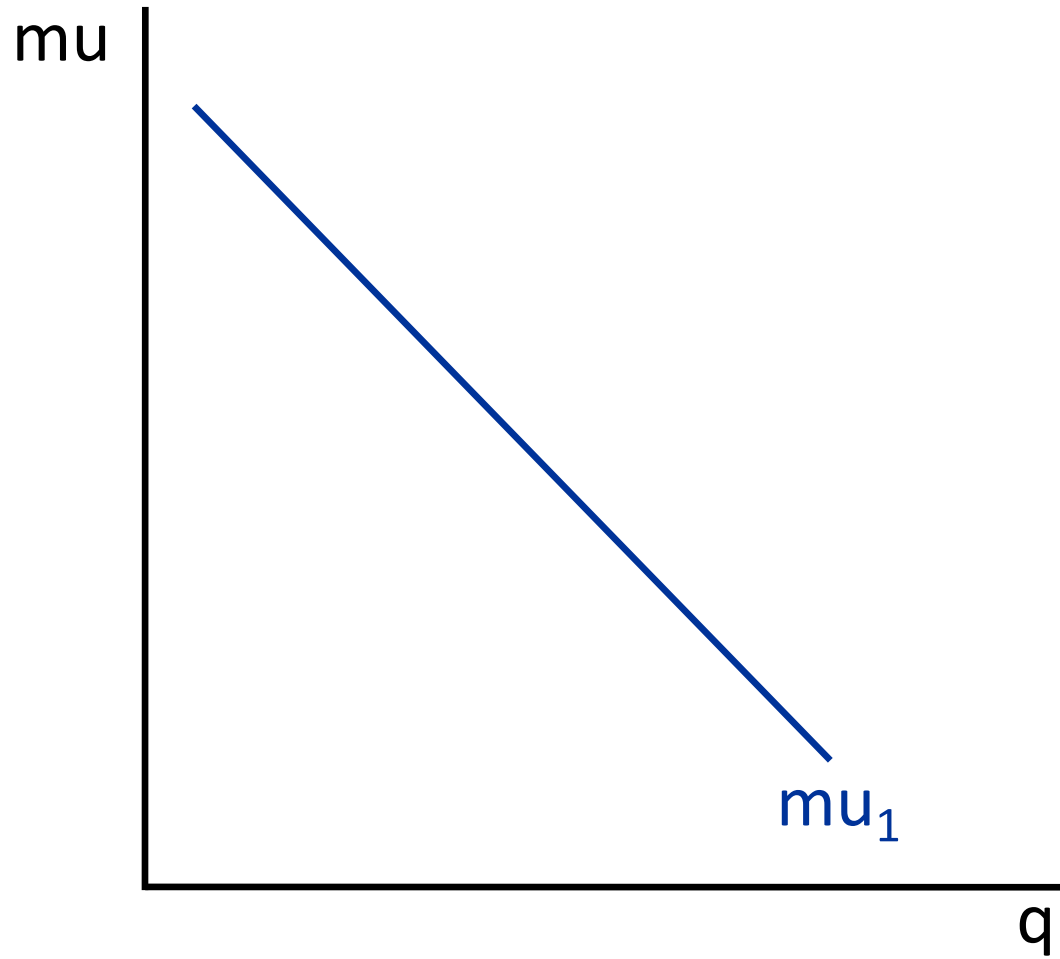pon in the battle against Alzheimer's disease. Scientists say the fruit is loaded with healthful antioxidants which could help prevent the devastating effects of the increasingly common form of dementia. One study involved 47 adults aged 68 and older, who had mild cognitive impairment, a risk condition for Alzheimer's disease.

Positive News about Blueberries

Positive News about Blueberries
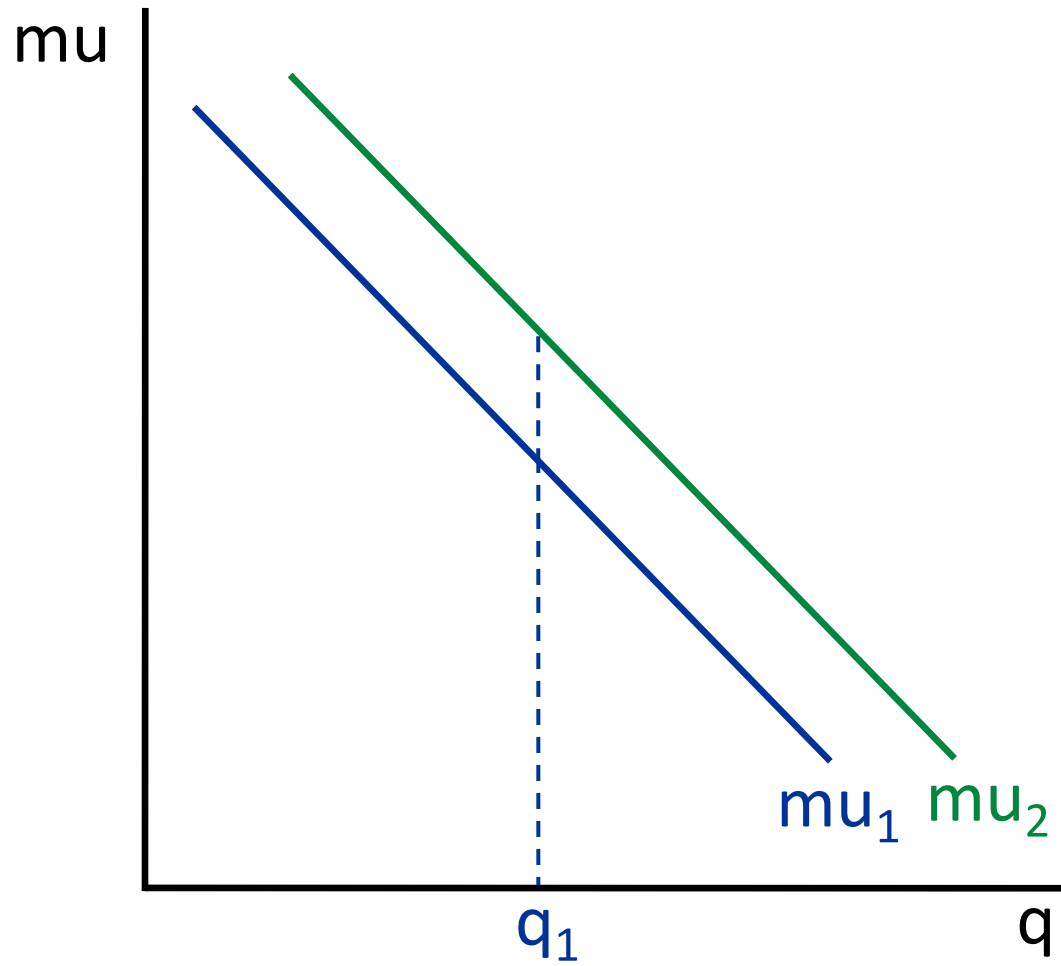
Positive News about Blueberries

- An optimizing consumer sets:

$$\frac{mu_{blueberries}}{P_{blueberries}} = \frac{mu_{everything\ else}}{P_{everything\ else}}$$

- A rise in the $mu_{blueberries}$ causes:

$$\frac{mu_{blueberries}}{P_{blueberries}} > \frac{mu_{everything\ else}}{P_{everything\ else}}$$

- The optimizing consumer will want to consume more blueberries at the same $P_{blueberries}$.

Positive News about Blueberries
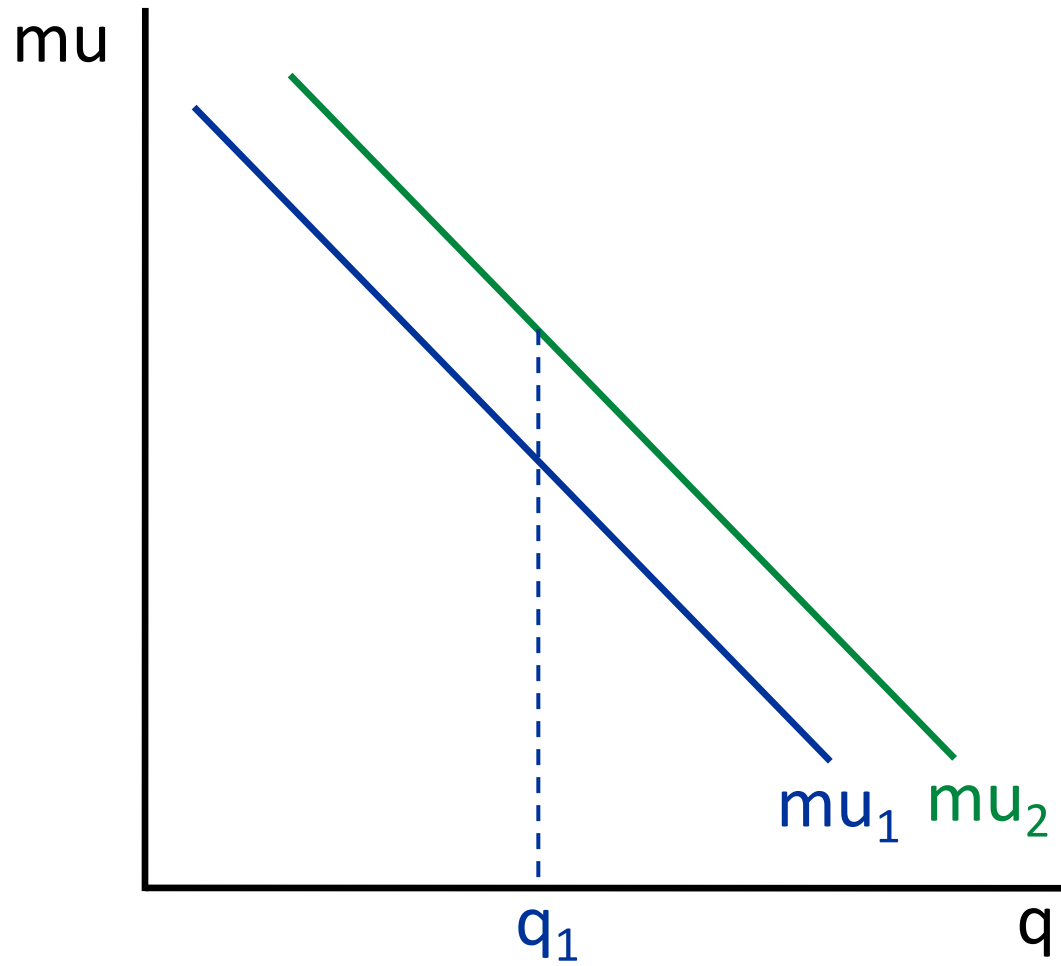
Effect of Positive News on the Demand Curve
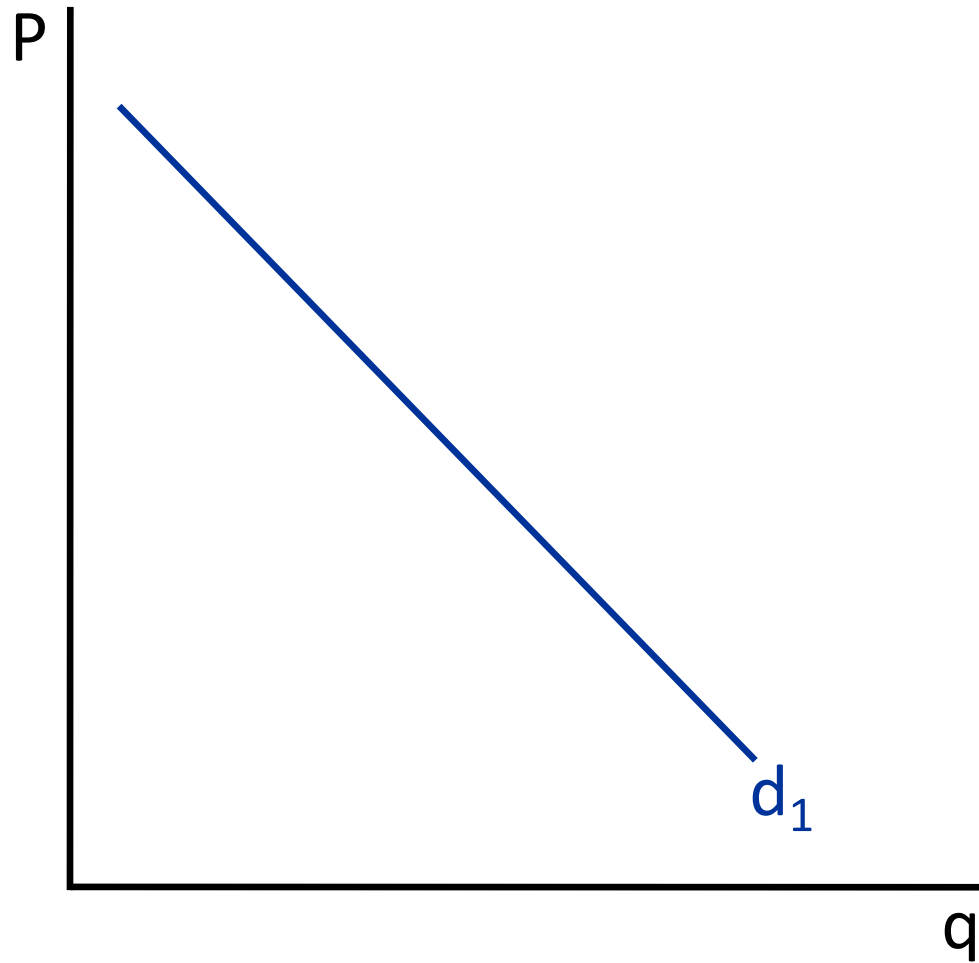
Effect of Positive News on the Demand Curve
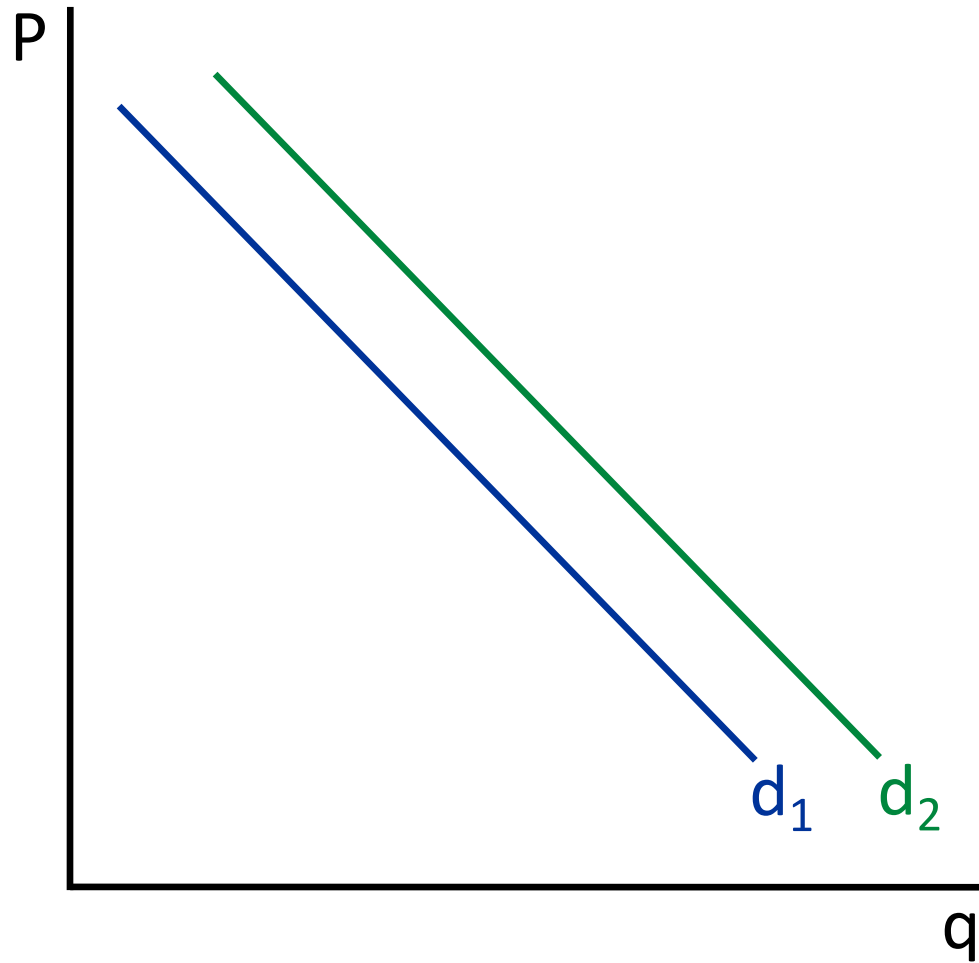
Utility of Income

- Consumer has income c that is used to buy all sorts of goods: $P_a \cdot q_a + P_b \cdot q_b + P_c \cdot q_c + \ldots + P_z \cdot q_z = c$ where c is total amount spent on consumption.

- This consumer optimization generates utility $u(c)$ with $u(.)$ an increasing function of c.

- The marginal utility of income is $u'(c)$, the slope of utility function $u(c)$ = extra utility from having +$1

- We expect $u'(c)$ to **decrease** with c which means that $u(c)$ is **concave** in c.

Quiz 1:

Question: Suppose UC Berkeley gives you an extra $500/month stipend this academic year. The extra stipend is most useful to you if:

- A. My current stipend is low ($1000/month)

- B. My current stipend is medium ($2000/month)

- C. My current stipend is high ($3000/month)

- D. It is equally useful to me in all A,B,C cases

Answer based on YOUR feelings (not ECON2 theory)

Utility Function

u(c) is increasing

u(c) is concave (means u'(c) is decreasing)

Utility
u(c)

0

$ consumption c

Utility Function

u(c) is increasing
u(c) is concave (means u'(c) is decreasing)

Utility
u(c)

Example:
u(c)=log(c)
u'(c)=1/c
10% increase in c gives
same utility whether c is
high or low

0

$ consumption c
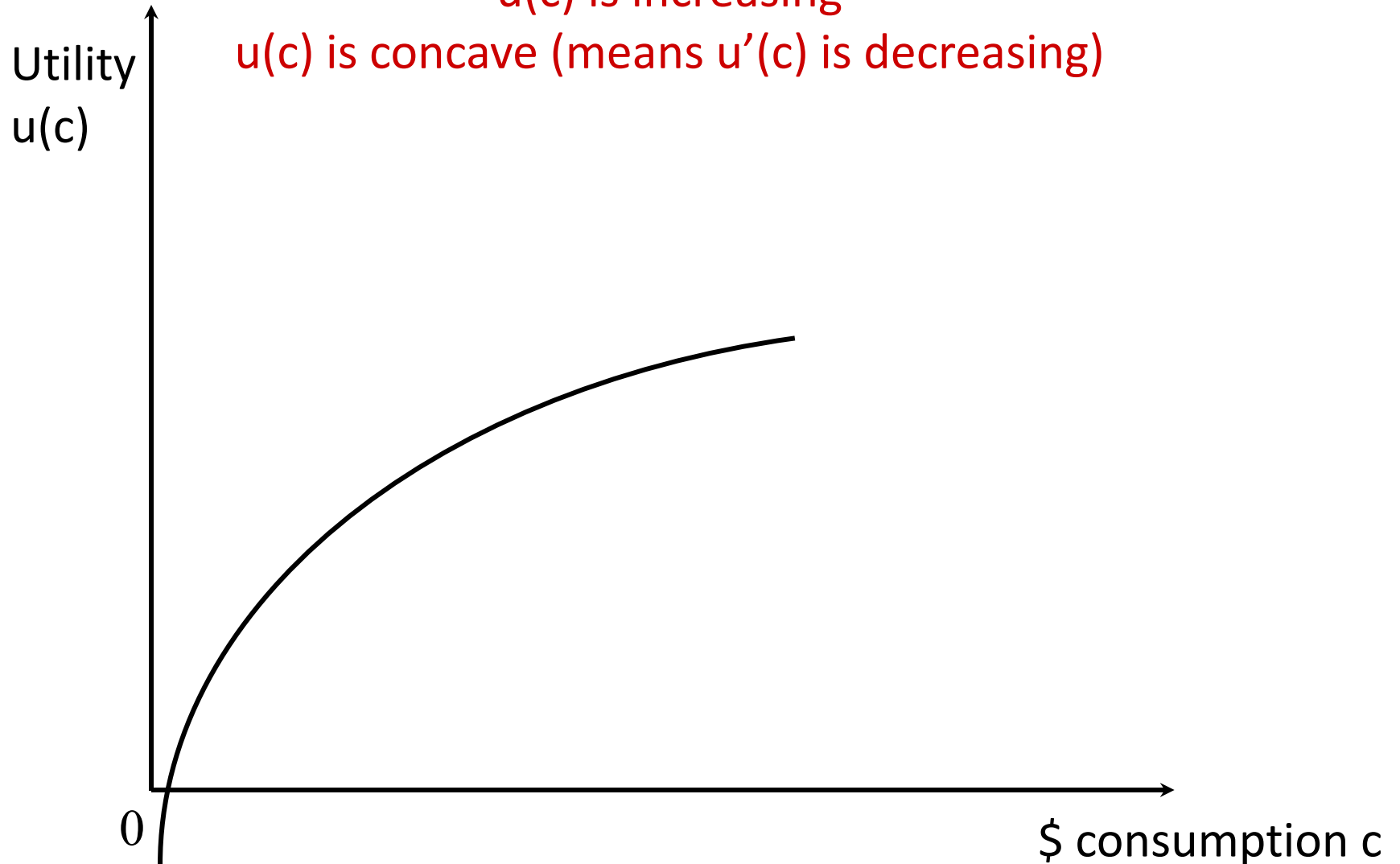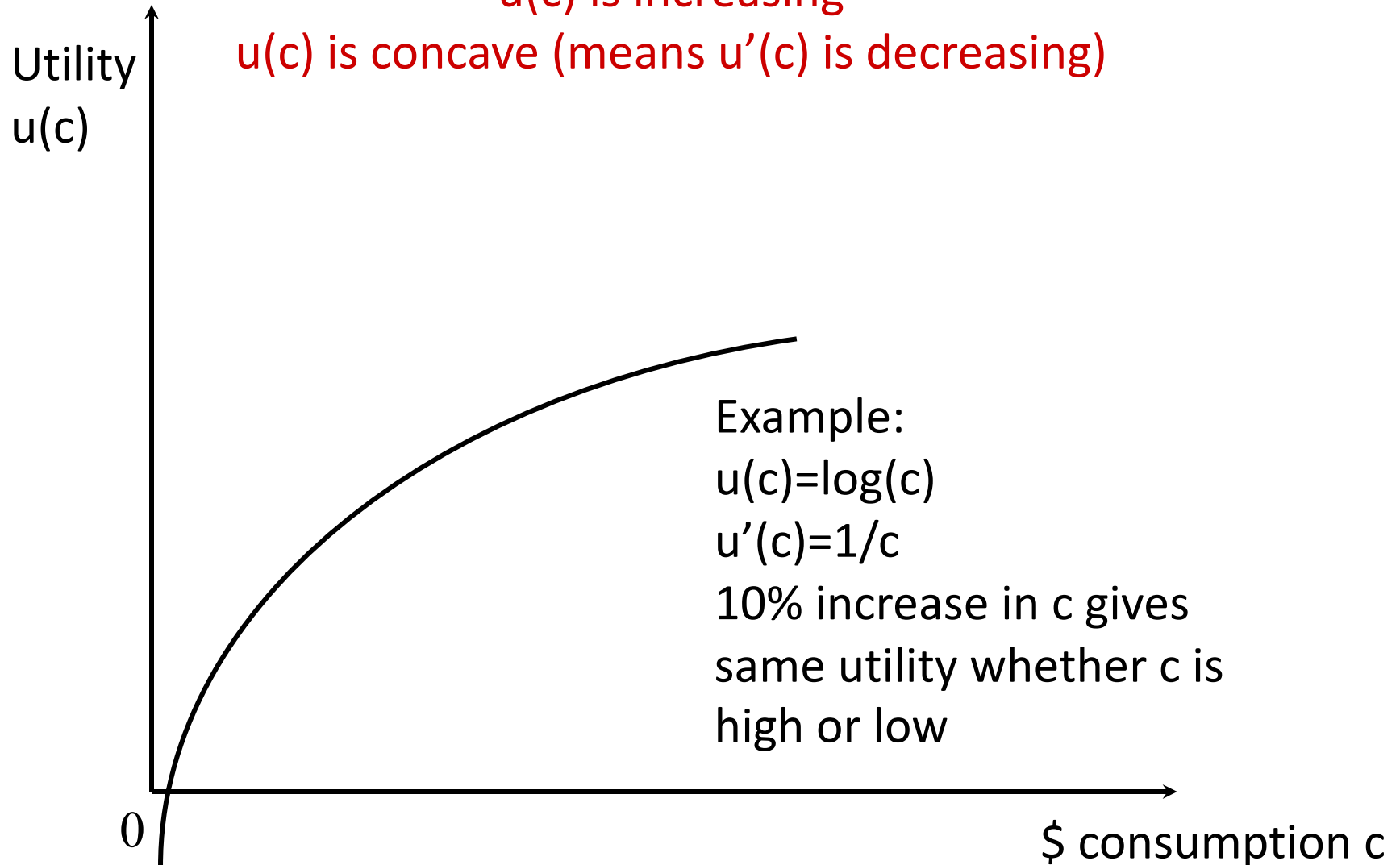
Utility of Income

- Even though consumer satiates with any specific good, you never satiate with total income c because there are always more expensive goods to start consuming (fancier house, car, etc.)

- With concave u(c): u'(poor)>u'(rich) => taking $1 from rich to give $1 to poor increases total utility

- Non-satiation ("it's never enough") is what drives perpetual economic growth

- Sociologically: non-satiation arises because utility is always relative to what others consume

How to Measure Society's Well-Being?

- **Libertarian:** social well-being is the sum of $ of economic surplus across agents regardless of who gets it => Inequality irrelevant, no value in redistribution.

- **Utilitarian:** social well-being is sum of utilities. If $u(c)$ is concave, value in redistributing from rich to poor. Traditional criterion for economists.

- **Rawlsian:** (after John Rawls) social well-being is the utility of the worst-off person in society. Aim is to make the poorest as well-off as possible.

All these measures are based on individualistic outcomes and miss fairness, rights, process considerations

Quiz 2:

Question: Which measure of social welfare fits best with your views?

- A. Libertarian ($ sum of economic surplus)

- B. Utilitarian (sum of utilities)

- C. Rawlsian (utility of the poorest person)

- D. None of these fit with my views

Answer based on YOUR feelings (not ECON2 theory)

V. "Fairness as a Constraint on Profit Seeking"
by Kahneman, Knetsch, and Thaler

Behavioral Economics

- Brings the complexity of human behavior into the analysis of economic decision-making.

- Blends psychology and economics.

- *The Undoing Project* by Michael Lewis and *Misbehaving* by Richard Thaler are fun books on the birth of the field.

Lab Experiments

- Another way to gather information about economic behavior.

- Watch behavior in a controlled laboratory setting.

Empirical Strategy of Kahneman, et al.

- Asking people to respond to vignettes.

Question 1. A hardware store has been selling snow shovels for $15. The morning after a large snowstorm, the store raises the price to $20. Please rate this action as:

        Completely Fair   Acceptable
           Unfair   Very Unfair

- I-Clicker quiz: A. Completely Fair, B. Acceptable, C. Unfair, D. Very Unfair.

- Answer based on feelings, not ECON2 theory

Some Findings from Kahneman, et al.

Question 1. A hardware store has been selling snow shovels for $15. The morning after a large snowstorm, the store raises the price to $20. Please rate this action as:

Completely Fair   Acceptable
Unfair   Very Unfair

The two favorable and the two unfavorable categories are grouped in this report to indicate the proportions of respondents who judged the action acceptable or unfair. In this example, 82 percent of respondents ($N = 107$) considered it unfair for the hardware store to take advantage of the short-run increase in demand associated with a blizzard.

Price increases based on a shift in demand are viewed as unfair.

Some Findings from Kahneman, et al.

Question 7. Suppose that, due to a transportation mixup, there is a local shortage of lettuce and the wholesale price has increased. A local grocer has bought the usual quantity of lettuce at a price that is 30 cents per head higher than normal. The grocer raises the price of lettuce to customers by 30 cents per head.

    ($N = 101$)   Acceptable 79%   Unfair 21%

Price increases based on increased production costs are viewed as acceptable.

Some Findings from Kahneman, et al.

Question 10. A grocery store has several months supply of peanut butter in stock which it has on the shelves and in the storeroom. The owner hears that the whole-sale price of peanut butter has increased and immediately raises the price on the current stock of peanut butter.

$(N=147)$ Acceptable 21%   Unfair 79%

Price increases based on increased opportunity cost are viewed negatively.

Some Findings from Kahneman, et al.

Question 2A. A small photocopying shop has one employee who has worked in the shop for six months and earns $9 per hour. Business continues to be satisfactory, but a factory in the area has closed and unemployment has increased. Other small shops have now hired reliable workers at $7 an hour to perform jobs similar to those done by the photocopy shop employee. The owner of the photocopying shop reduces the employee's wage to $7.

   $(N = 98)$ Acceptable 17%   Unfair 83%

Question 2B. A small photocopying shop has one employee…[as in Question 2A]…The current employee leaves, and the owner decides to pay a replacement $7 an hour.

   $(N = 125)$ Acceptable 73%   Unfair 27%

Reference transactions matter.

What do you think of the research?

What do I think of the research?

- People have a sense of fairness that's relevant to basic economic choices

- Taking advantage of disaster to increase prices is wrong = price gouging.

- Market logic does not always seem fair to humans, explains anti-price gouging laws, allocation of some goods such as COVID vaccines in non-market ways

- These fairness effects are even bigger for wage determination in the labor market as workers care a lot about pay fairness

Implications of Findings for Analysis of Household and Firm Optimization

- Need a broad definition of utility.

- There are important deviations from simple optimizing behavior for people.

- Firms may need to think about customer relationships and workers' morale in figuring out how to maximize long-run profits.

- But basic insights and implications of utility and profit maximization still useful.

References

- [CORE-The Economy](#), Unit 3.

- Principles of Economics, Chapter 5.

- [Kahneman, Daniel, Jack L. Knetsch, and Richard Thaler. "Fairness as a constraint on profit seeking: Entitlements in the market." The American economic review (1986): 728-741.](#)