Economics 2 Professor Christina Romer
Spring 2018 Professor David Romer

LECTURE 5
CONSUMERS AND UTILITY MAXIMIZATION
JANUARY 30, 2018

I. INTRODUCTION TO CONSUMER OPTIMIZATION

II. THE BUDGET CONSTRAINT
- A. Description
- B. Diagram for the case of 2 goods
- C. What causes the budget constraint to change?
  1. Change in income (discussion of the paper by Duflo)
  2. Change in a price

III. UTILITY MAXIMIZATION
- A. What do consumers seek to maximize?
- B. Marginal utility
- C. Diminishing marginal utility
  1. Intuition and example
  2. Relationship between total utility and marginal utility (including a brief digression using calculus)
- D. Variation in how quickly marginal utility declines
- E. The condition for utility maximization (the rational spending rule)

IV. WHY DEMAND CURVES SLOPE DOWN
- A. Substitution effect
- B. Income effect
- C. A more general example
- D. Individual household and market demand curves

V. WHY DEMAND CURVES SHIFT
- A. A change in tastes
- B. A change in income (further discussion of the paper by Duflo)

Economics 2
Spring 2018

Christina Romer
David Romer

LECTURE 5
Consumers and Utility Maximization

January 30, 2018

Announcements

- Hand in Problem Set 1.
- Suggested answers will be posted after class on Thursday.
- Office hours this week will be *today* (Tuesday), 4-6 p.m.

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

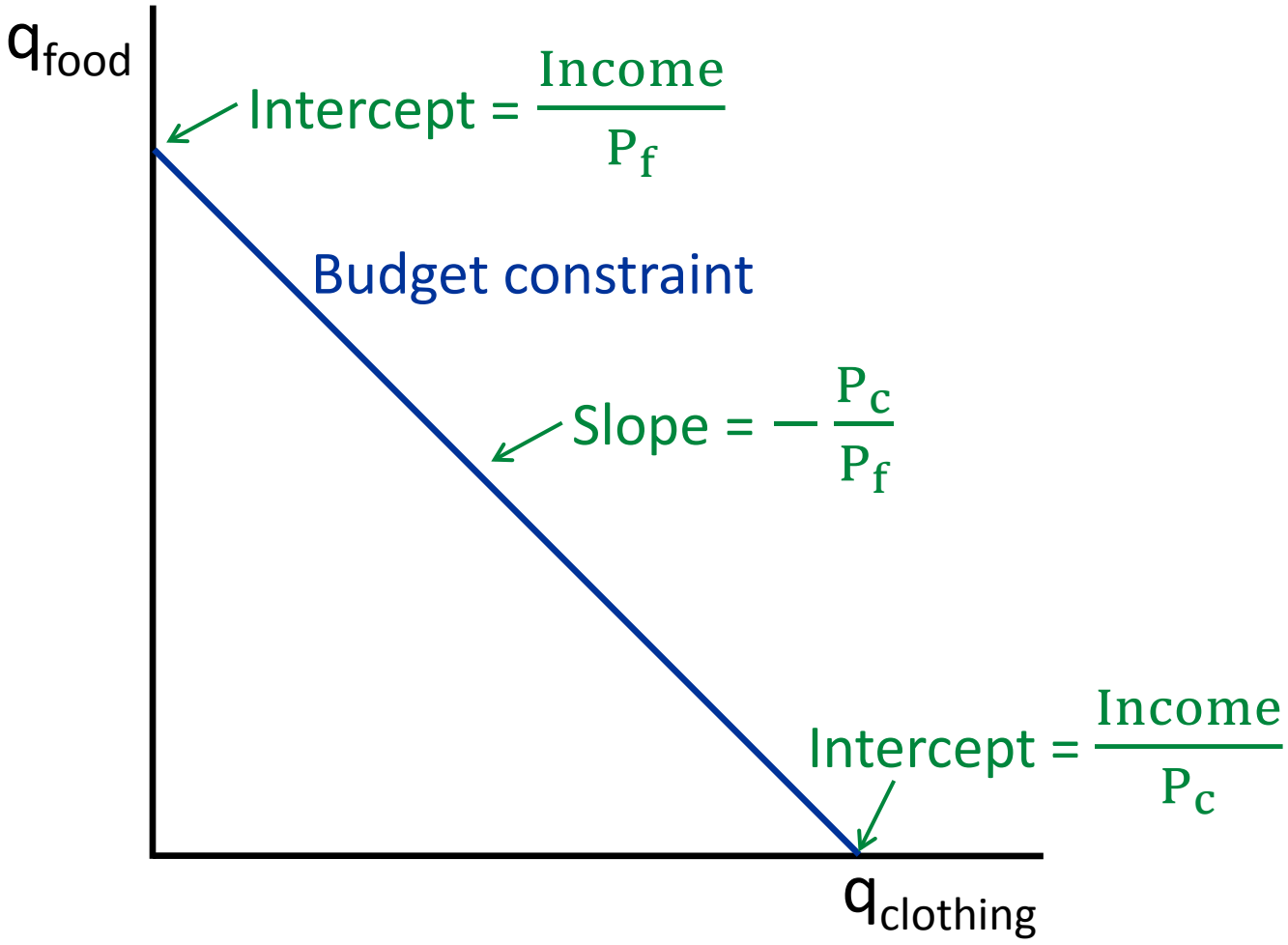
- In words: The total amount the household spends cannot exceed its income.
- In symbols:

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

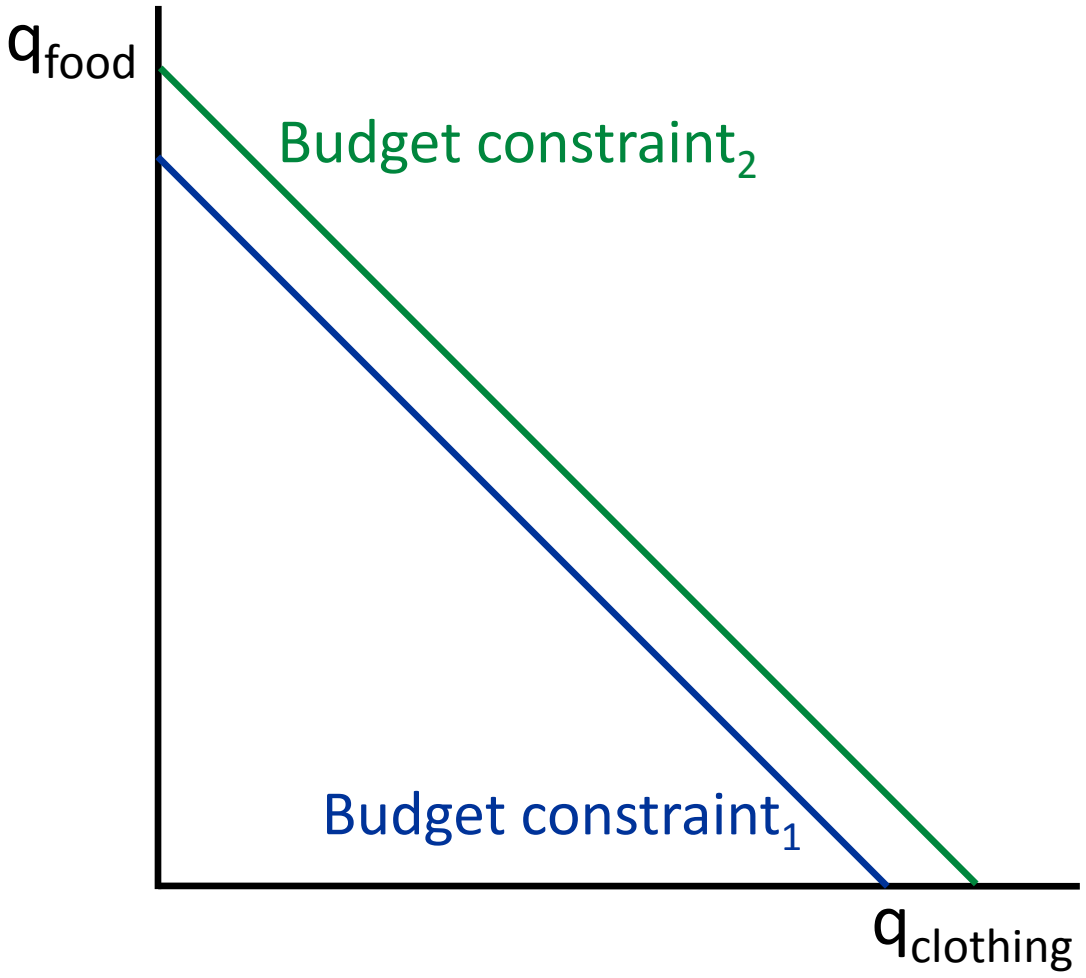
where the P's are the market prices of the various goods, and the q's are the quantities that the household buys.

Budget Constraint for the Case of Two Goods

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



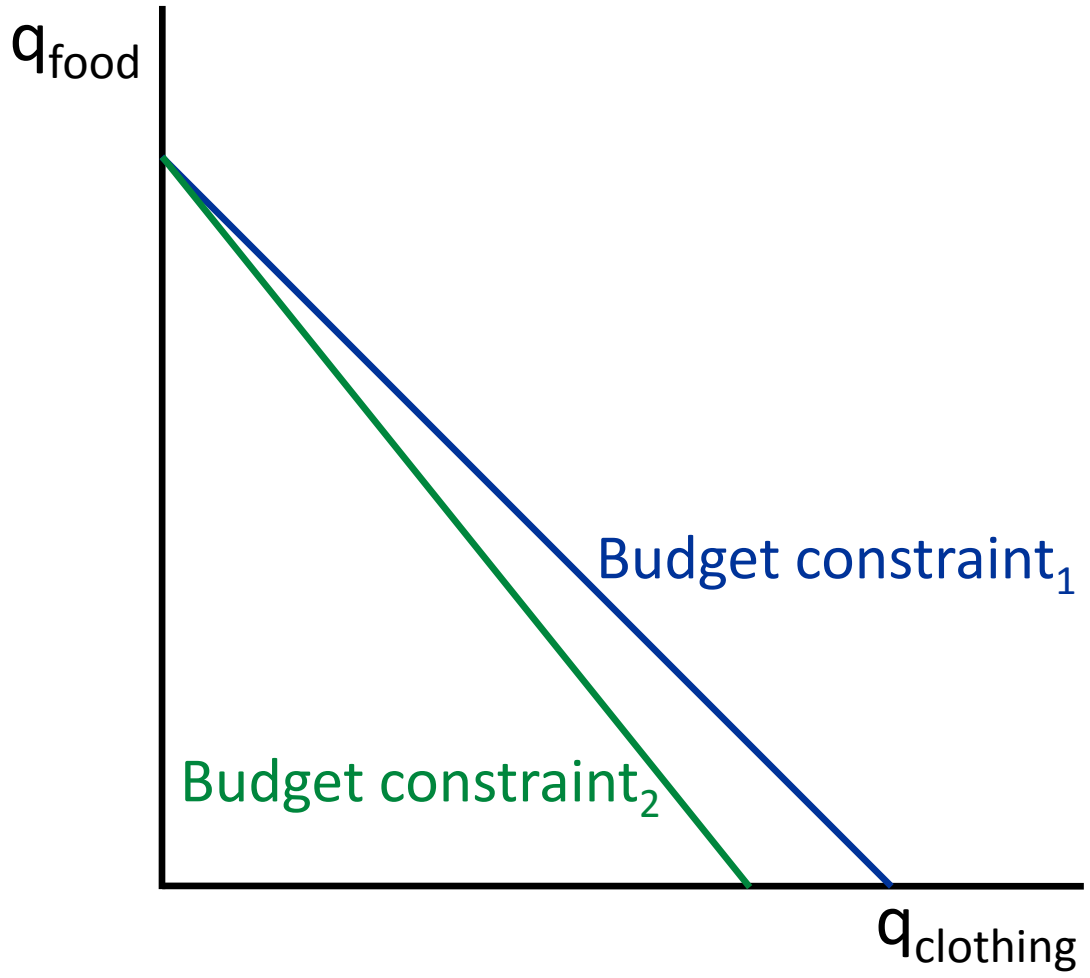
A Rise in the Household's Income



“Grandmothers and Granddaughters” by Esther Duflo

- The development that she focuses on:
  - A shift in budget constraints.
  - Specifically, a large expansion in old-age pensions in South Africa in the early 1990s.
  - Affected some households but not others.
- Example of a “natural experiment.”

A Rise in the Price of Clothing



Recall that the slope of the budget constraint is $-P_c/P_f$.

III. Utility Maximization

What do we think consumers maximize?

- Happiness, satisfaction, utility.
- We don't make judgments about *what* gives people happiness.

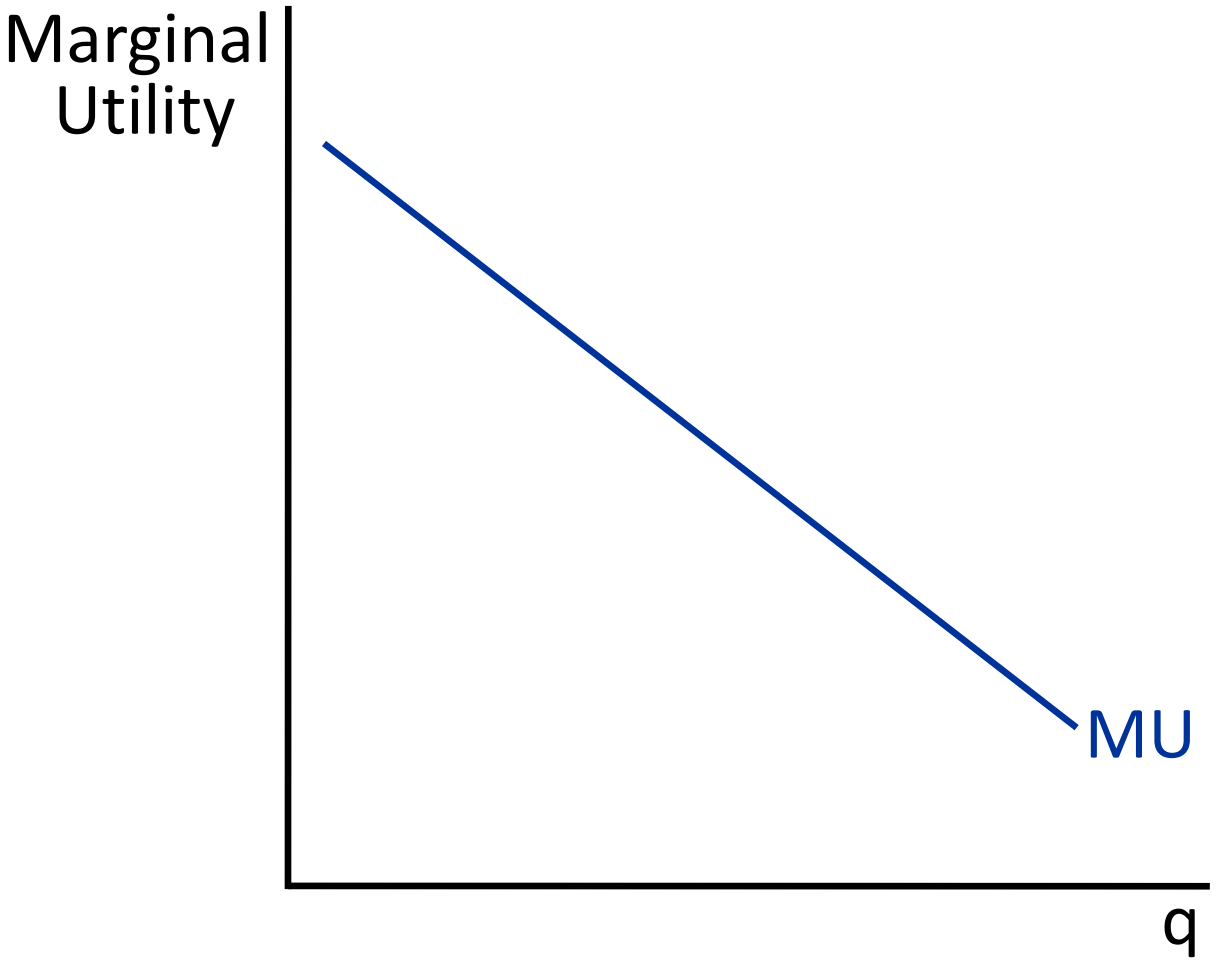
Utility

- Total Utility: The total happiness one gets from consuming some 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 good, the marginal utility of the good declines.

Diminishing Marginal Utility



Relationship between Total Utility and Marginal Utility

- Suppose

$$U = f(q)$$

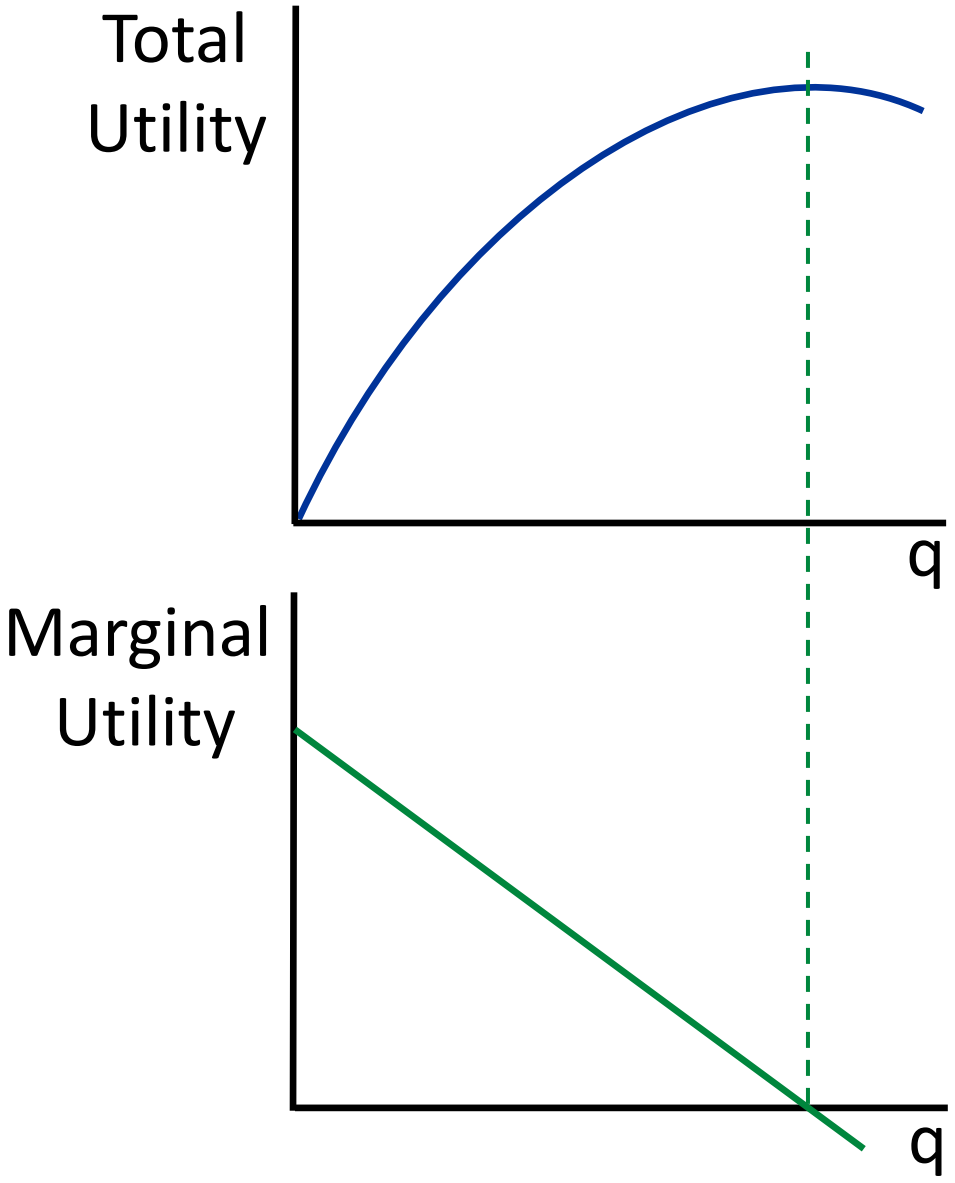
where q is the quantity of some good a household consumes, and U is the total utility the household gets from consuming the good.

- Then

$$MU = f'(q),$$

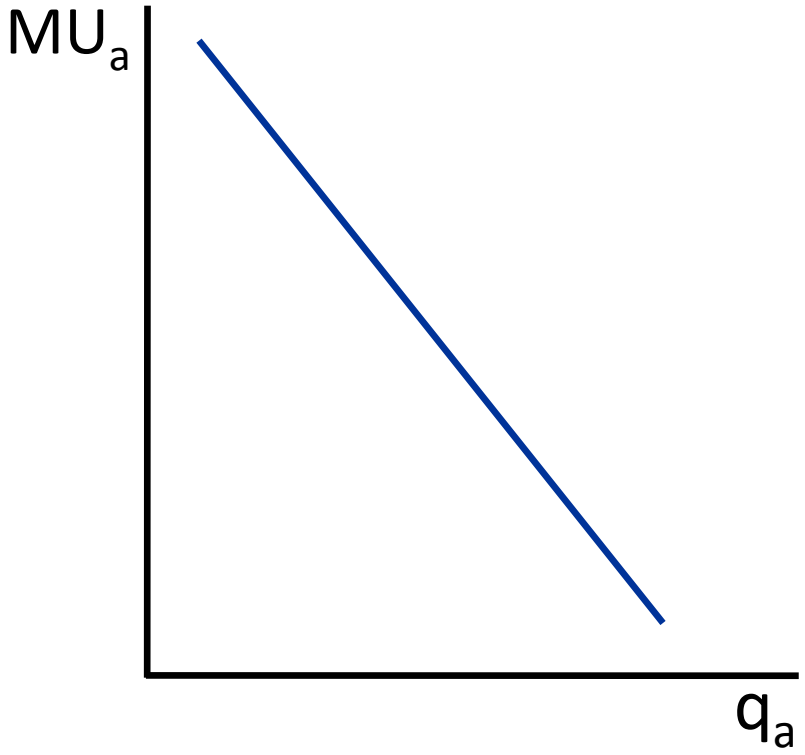
where MU is marginal utility.

Relationship between Total and Marginal Utility

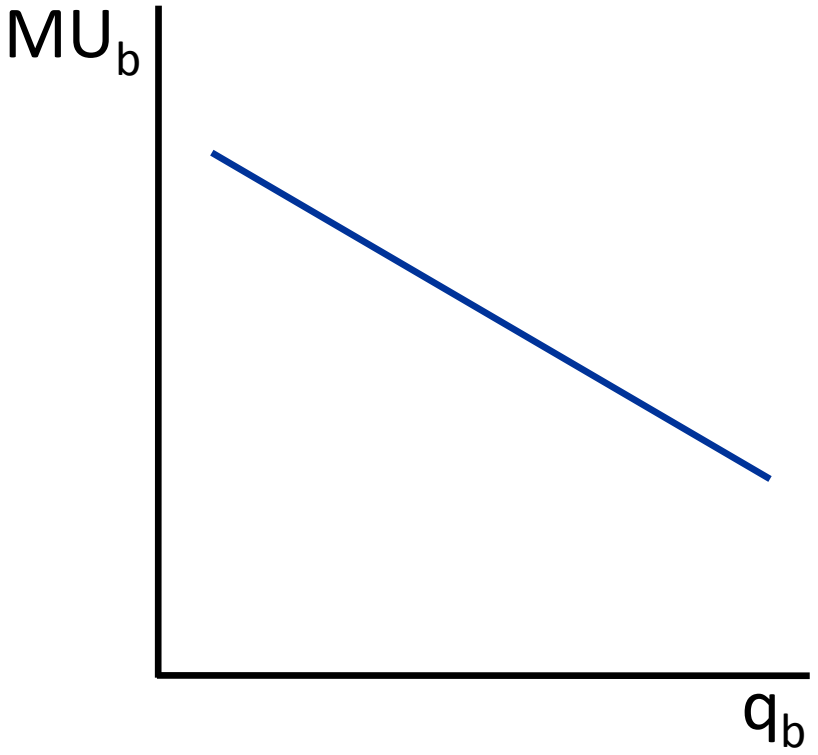


Marginal Utility Likely Declines at Different Rates for Different Goods

Good a



Good b



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.

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

$$\frac{\$1}{P_c} MU_c = \frac{\$1}{P_f} MU_f$$

This is the same as:

$$\frac{MU_c}{P_c} = \frac{MU_f}{P_f}$$

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.

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. Why Demand Curves Slope Down

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:

$$\frac{MU_c}{P_c} < \frac{MU_f}{P_f}$$

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

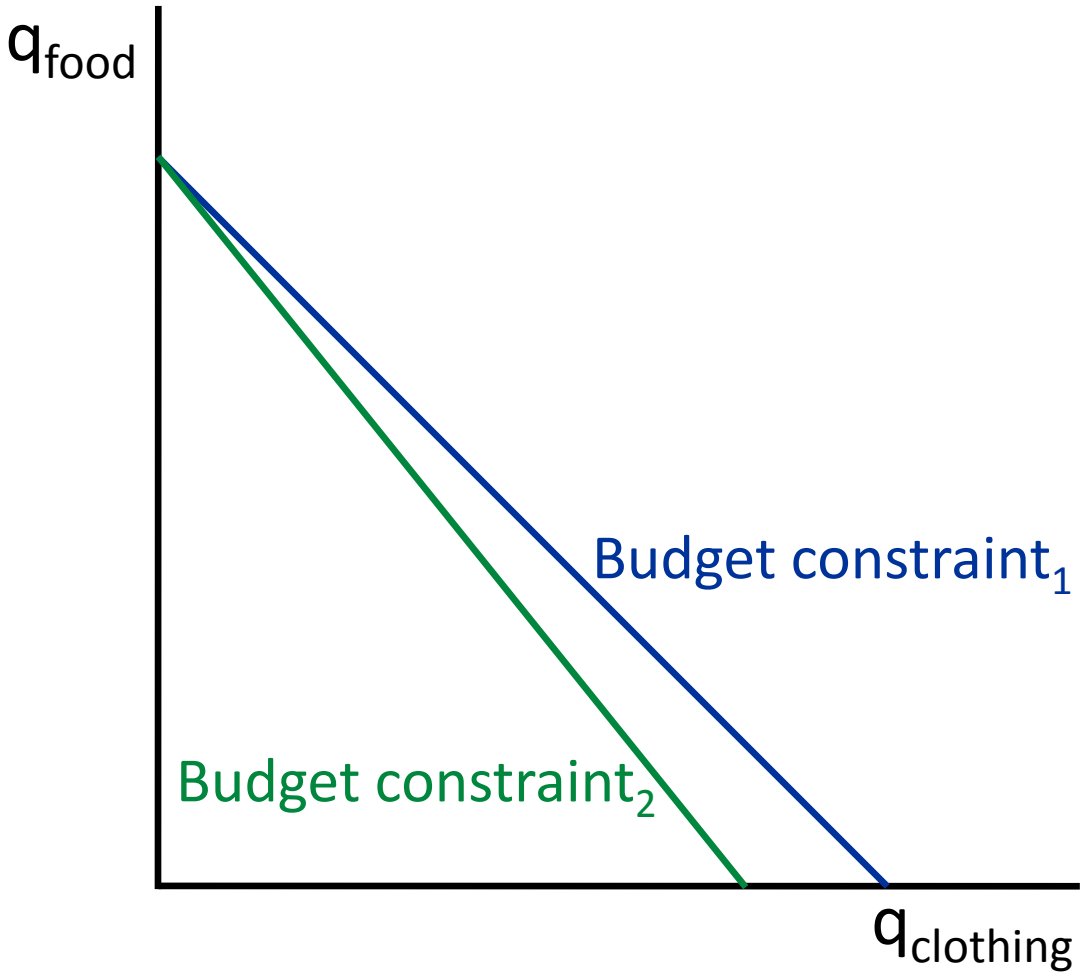
$$\frac{MU_c}{P_c} = \frac{MU_f}{P_f}$$

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 is relatively more expensive.

- 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.

A Rise in the Price of Clothing



Returning to the Market for Blueberries

- An optimizing consumer sets:

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

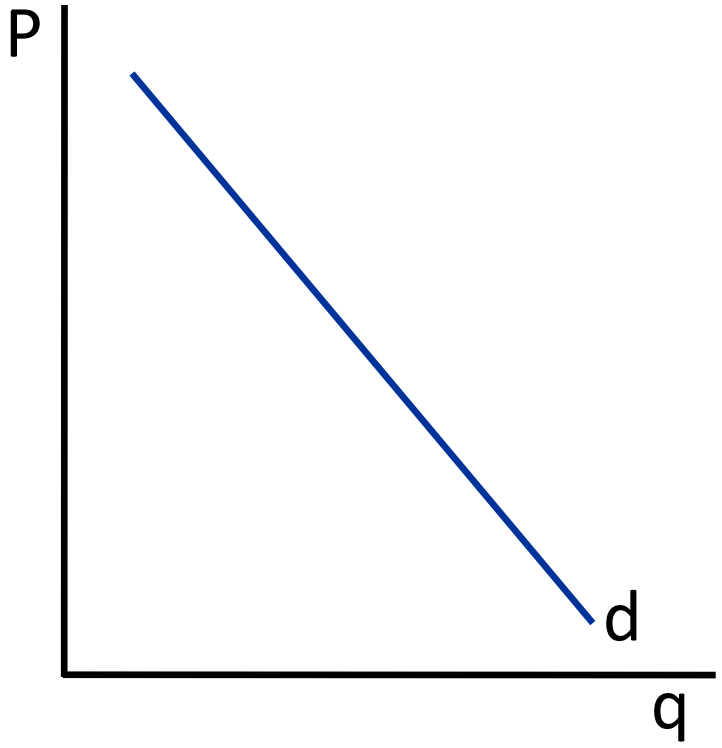
- A decline in the $P_{blueberries}$ causes:

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

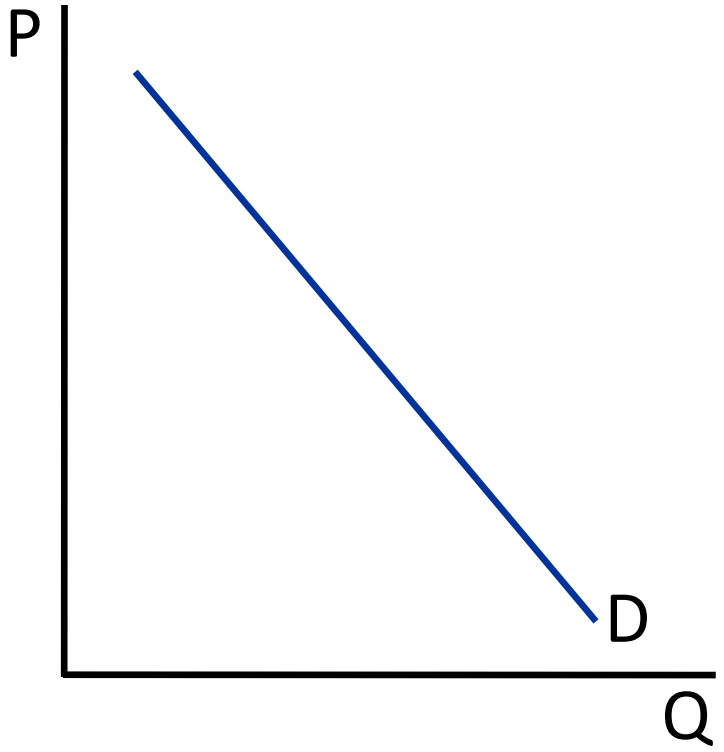
- The optimizing consumer will want to consume more blueberries because of both the substitution and income effects.

Demand Curves

Individual Household



Market



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

V. Why Demand Curves Shift

The Telegraph

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 weapon 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

- An optimizing consumer sets:

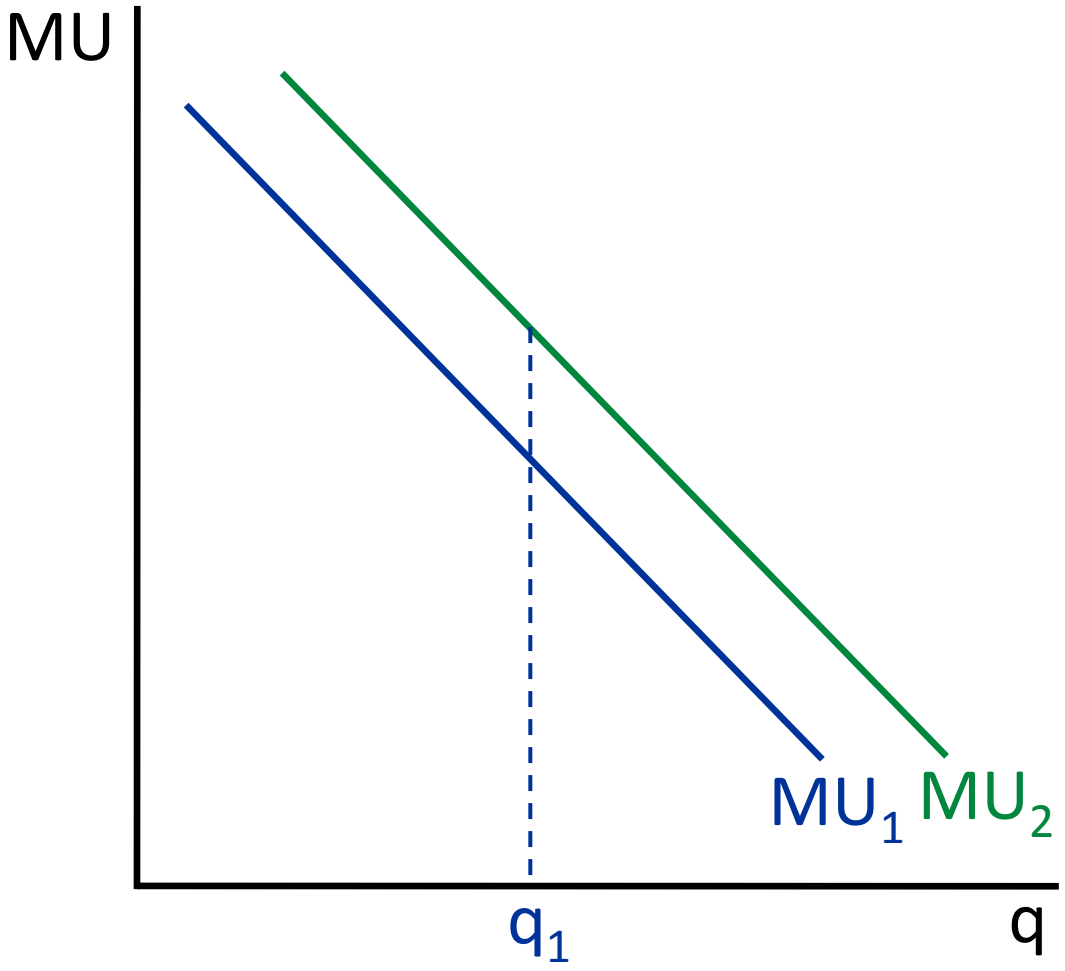
$$\frac{MU_{blueberries}}{P_{blueberries}} = \frac{MU_{everything\ else}}{P_{everything\ else}}$$

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

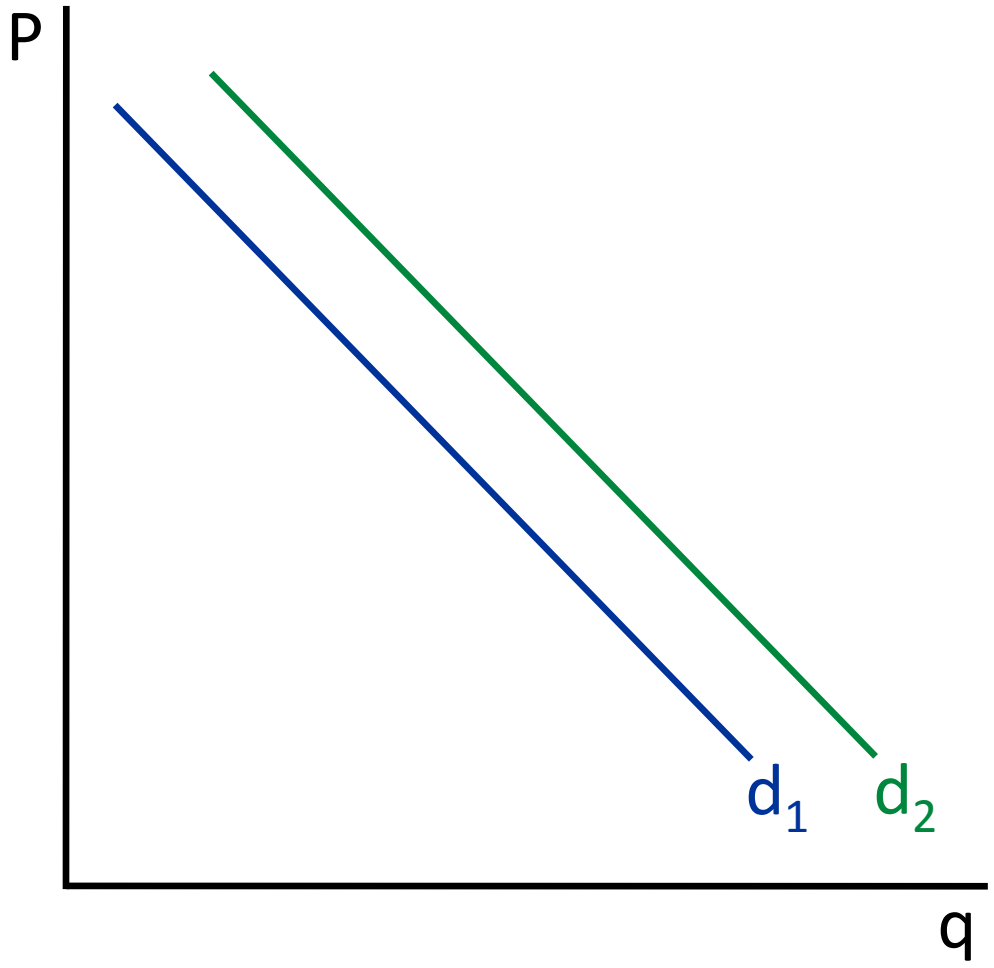
$$\frac{MU_{blueberries}}{P_{blueberries}} > \frac{MU_{everything\ else}}{P_{everything\ else}}$$

- 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



Duflo, "Grandmothers and Granddaughters"

TABLE 3. Effect of the Old-Age Pension Program on Weight for Height: OLS and 2SLS Regressions

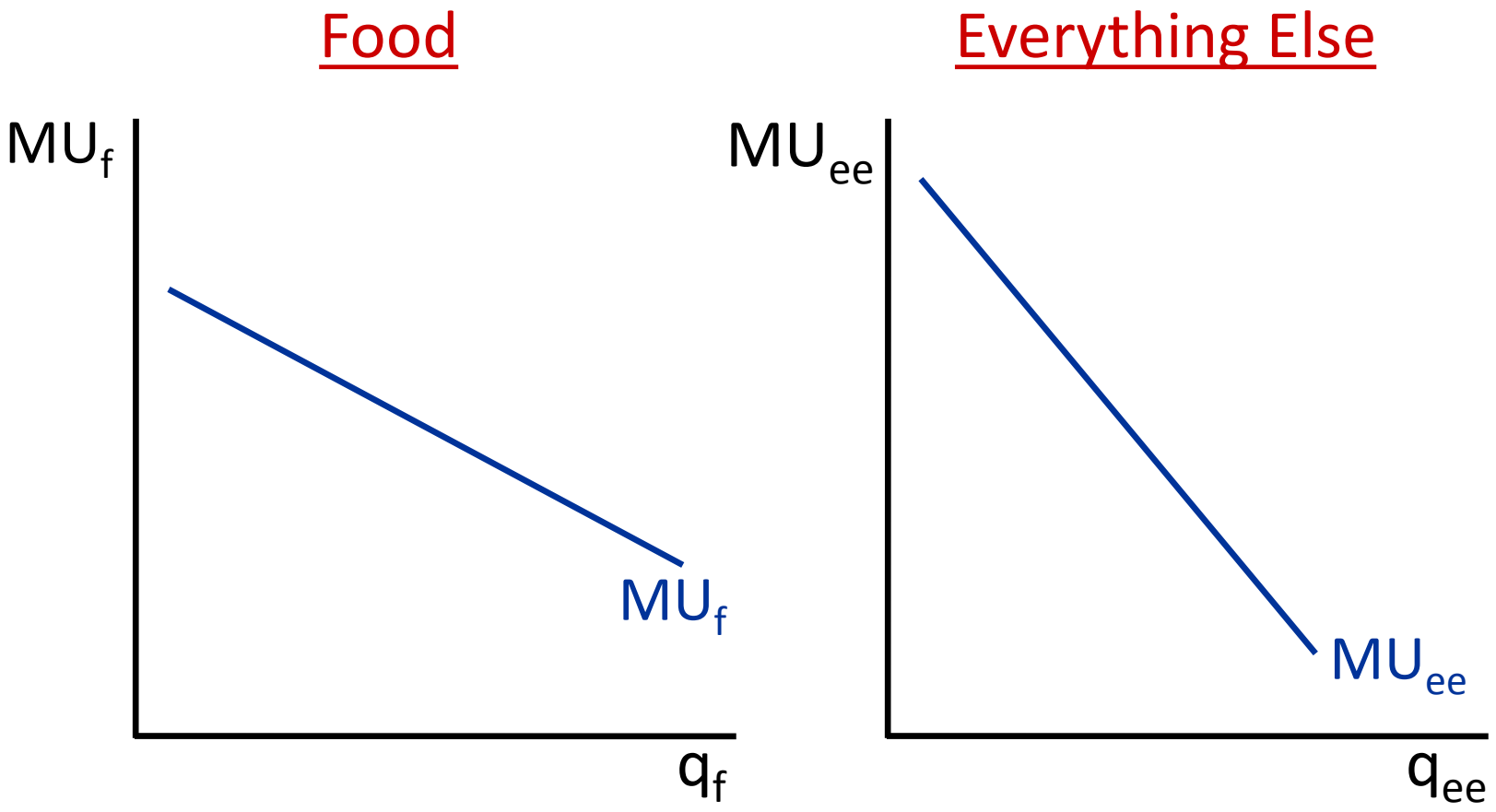
	OLS			2SLS
Variable	(4)	(5)	(6)	(7)
Girls				
Eligible household				
Woman eligible[a]	0.24*	0.61*	0.61*	1.19*
	(0.12)	(0.19)	(0.19)	(0.41)
Man eligible[b]	–0.011	0.11	0.056	–0.097
	(0.22)	(0.28)	(0.19)	(0.74)
Observations	1574	1574	1533	1533
Boys				
Eligible household				
Woman eligible[a]	0.066	0.28	0.31	0.58
	(0.14)	(0.28)	(0.28)	(0.53)
Man eligible[b]	–0.059	–0.25	–0.25	–0.69
	(0.22)	(0.34)	(0.35)	(0.91)
Observations	1670	1670	1627	1627
Control variables				
Presence of older members[c]	No	Yes	Yes	Yes
Family background variables[d]	No	No	Yes	Yes
Child age dummy variables[e]	Yes	Yes	Yes	Yes

*Significant at the 5 percent level.

A Rise in Income

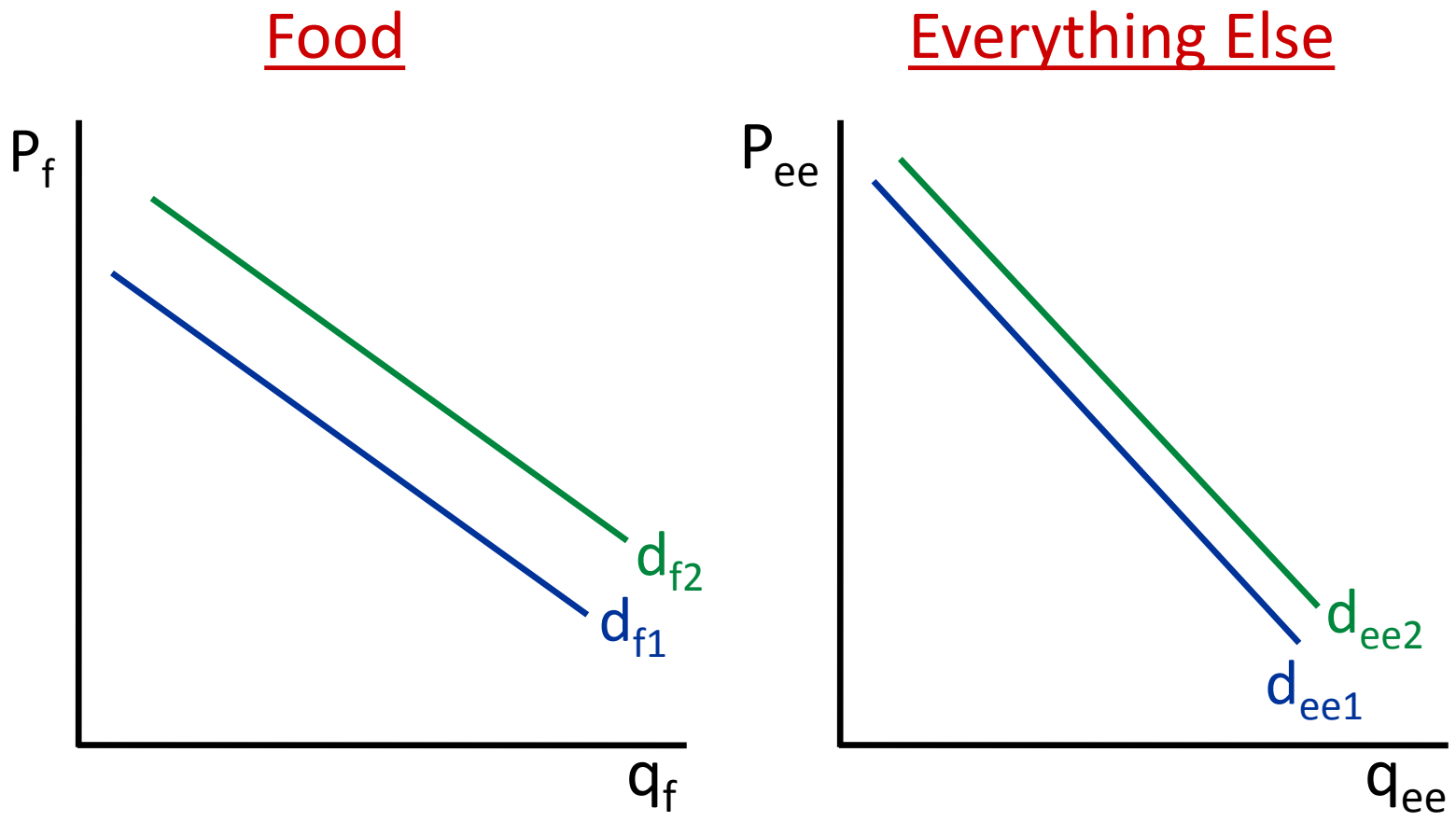
- If the household didn't change its purchases, $\frac{MU_f}{P_f} = \frac{MU_{ee}}{P_{ee}}$ would still hold.
- But the household isn't using all its income.
- So it can spend more on both food (which lowers MU_f) and everything else (which lowers MU_{ee}).

Marginal Utility Curves for Two Goods



If the MU_f declines more slowly than the MU_{ee}, we would expect q_f to rise more than q_{ee} in response to the rise in income.

Increase in Income Shifts Out the Demand Curves



But the demand curve for food for girls shifts out more.