ECONOMICS Lecture 9
Utility and Demand

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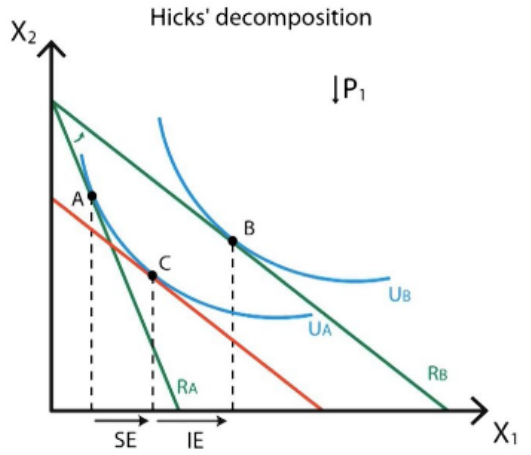
Topics

- Utility Maximization
- The Income Effect
- The Substitution Effect
- The Special Giffen Good
- Derive the Demand Curve



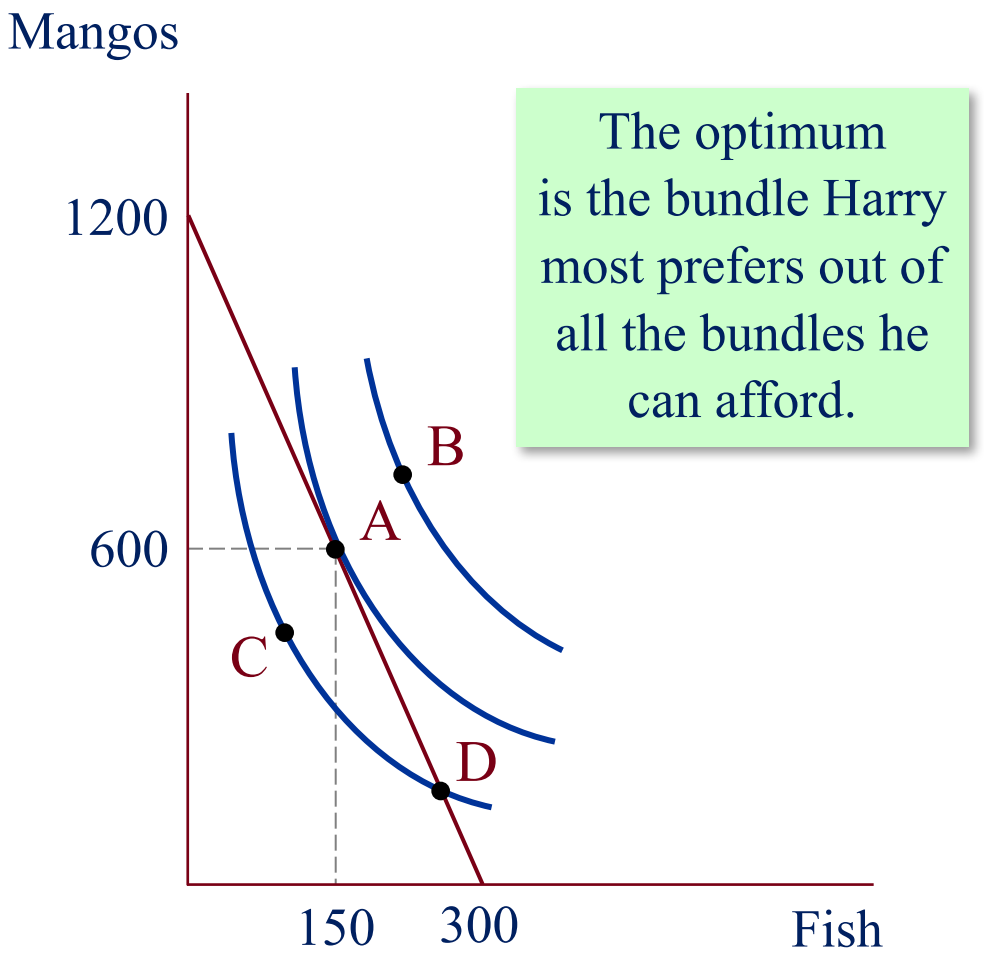
This lecture decomposes the effect of price change and examines how it influences consumer's optimal consumption decision. The demand curve can be derived from the utility maximization model with the Giffen good as a violation.

Consumer Utility Maximization

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.

Consumer Optimization Problem

- To maximize consumer's utility, two conditions must be satisfied simultaneously.
- It must be located on the budget line.
- It must give the consumer the most preferred combination of goods and services.
- Now let's look at an equivalent expression for this problem.

Consumption is the sole end and purpose of all production.

—Adam Smith

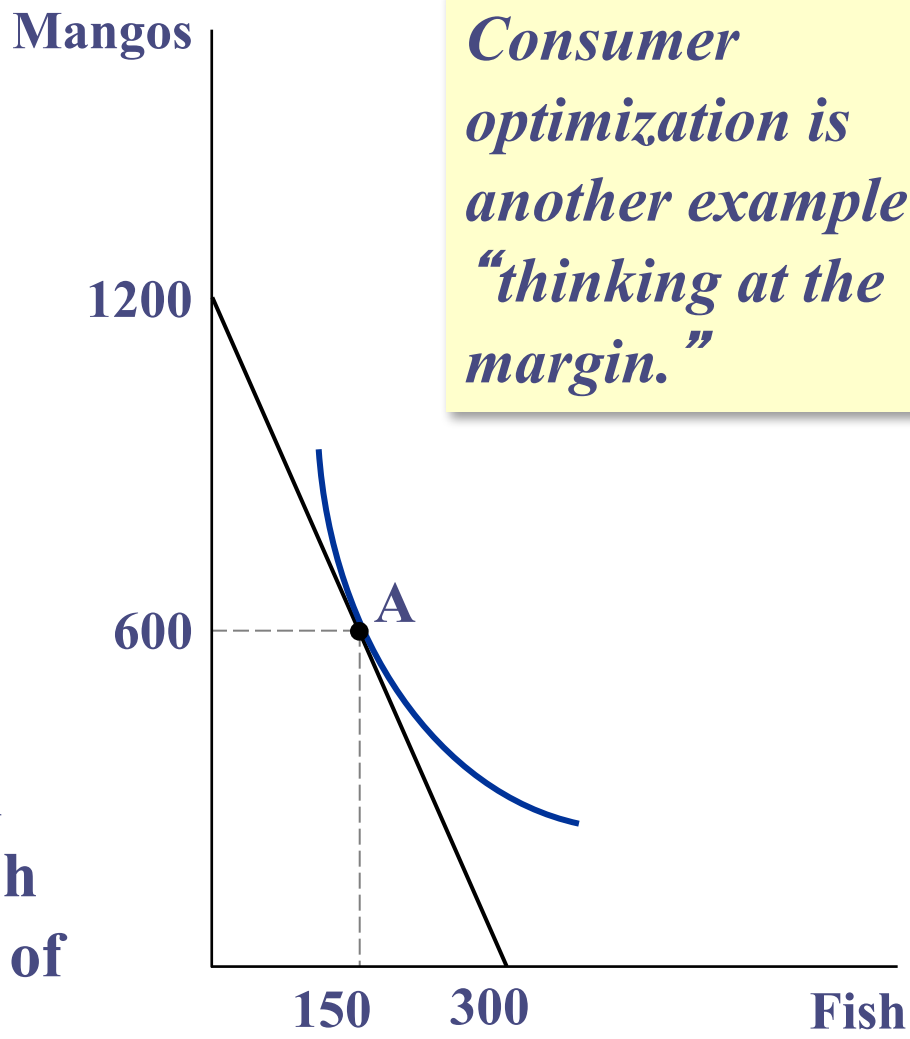
Consumer Optimization Model

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

$$MRS = P_F/P_M$$

Marginal use value of fish (in terms of mangos)

Marginal cost of fish (in terms of mangos)



Consumer optimization is another example of "thinking at the margin."

Consumer Optimization Model

- Satisfaction is maximized (given the budget constraint) at the point where MRS $= P_F / P_M$
- Marginal Benefit: Benefit from the consumption of an additional unit of a good.
- Marginal Cost: Cost of an additional unit of a good.

By **the principle of marginal equalization** in decision optimization, a consumer's satisfaction is maximized when the marginal benefit—the benefit associated with the consumption of one additional unit of food—is equal to the marginal cost—the cost of the additional unit of food in the market. The marginal benefit is measured by the MRS.

Herman Heindrich Gossen (1810-1858)

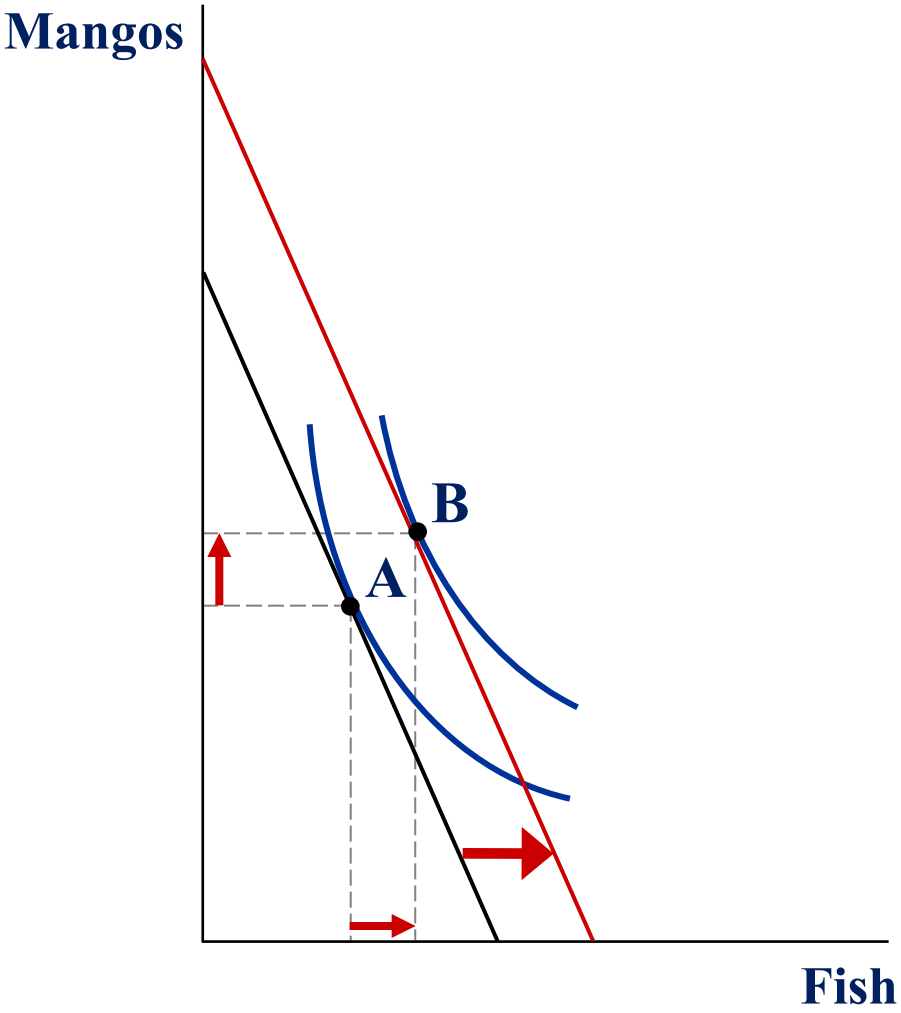
1. **"Gossen's First Law"** is the concept of diminishing marginal utility itself, namely that increasing consumption of a good yields a smaller additional satisfaction.
2. **"Gossen's Second Law"** is the equi-marginal principle, that when faced with limited budget, a person maximizes his utility when he allocates his expenditure among various goods so that he obtains the same amount of satisfaction from the last unit of each good consumed.
3. **"Gossen's Third Law":** a good has value only when the demand for it exceeds supply (i.e. subjective scarcity is source of value). Or, to use Gossen's logic, since marginal utility declines with consumption, a good can only have positive marginal utility if the available supply is less than what is needed for satiation. Otherwise, desire for it will be satiated and the marginal utility (and thus value) will be zero.

https://www.hetwebsite.net/het/profiles/gossen.htm

The Effects of Change in Income

An increase in income shifts the budget constraint outward.

If both goods are "normal," Harry buys more of each.



Income Effect on Consumption

- Normally, an increase in income boosts the purchasing power of the consumer, resulting in proportional increase in consumption.
- However, it is true only within certain levels of income.
- When the consumer's income reaches a threshold, its effect on consumption can be reversed.
- This special phenomenon of inverse relationship between income and consumption applies to inferior goods.

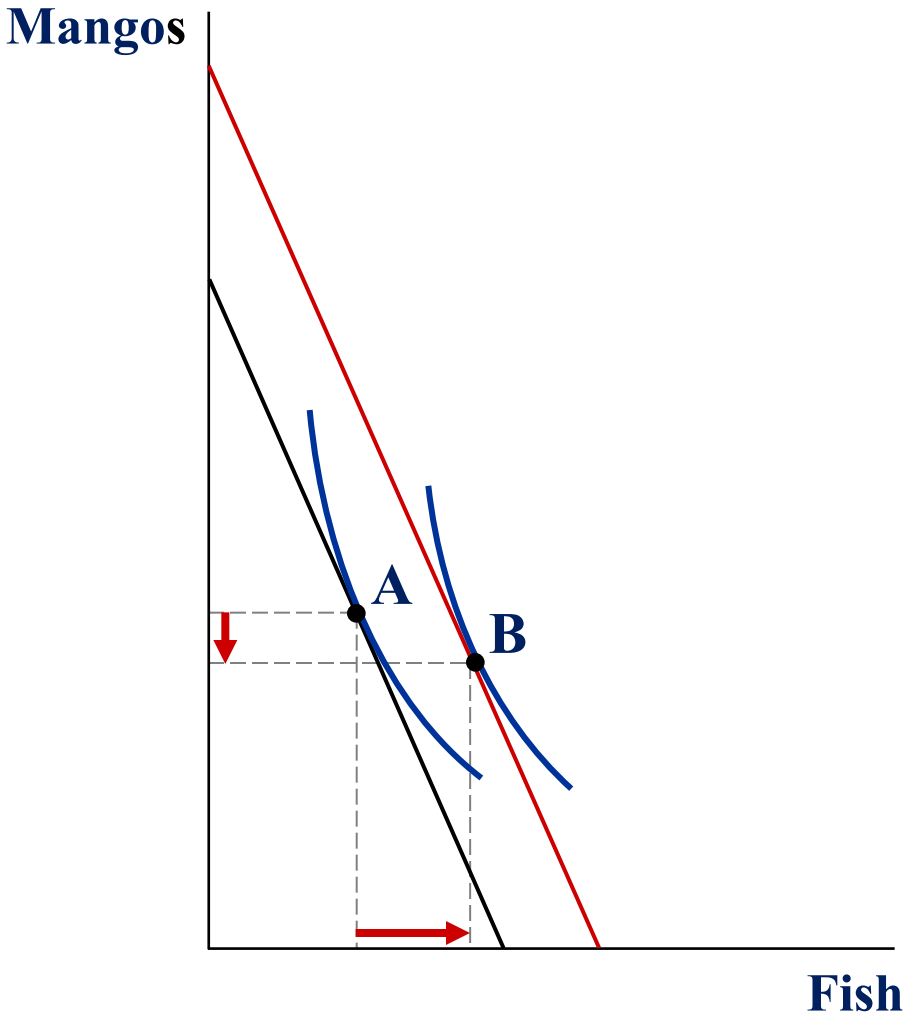
ACTIVE LEARNING1
Inferior vs normal goods

- 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 Harry's optimal bundle of fish and mangos.

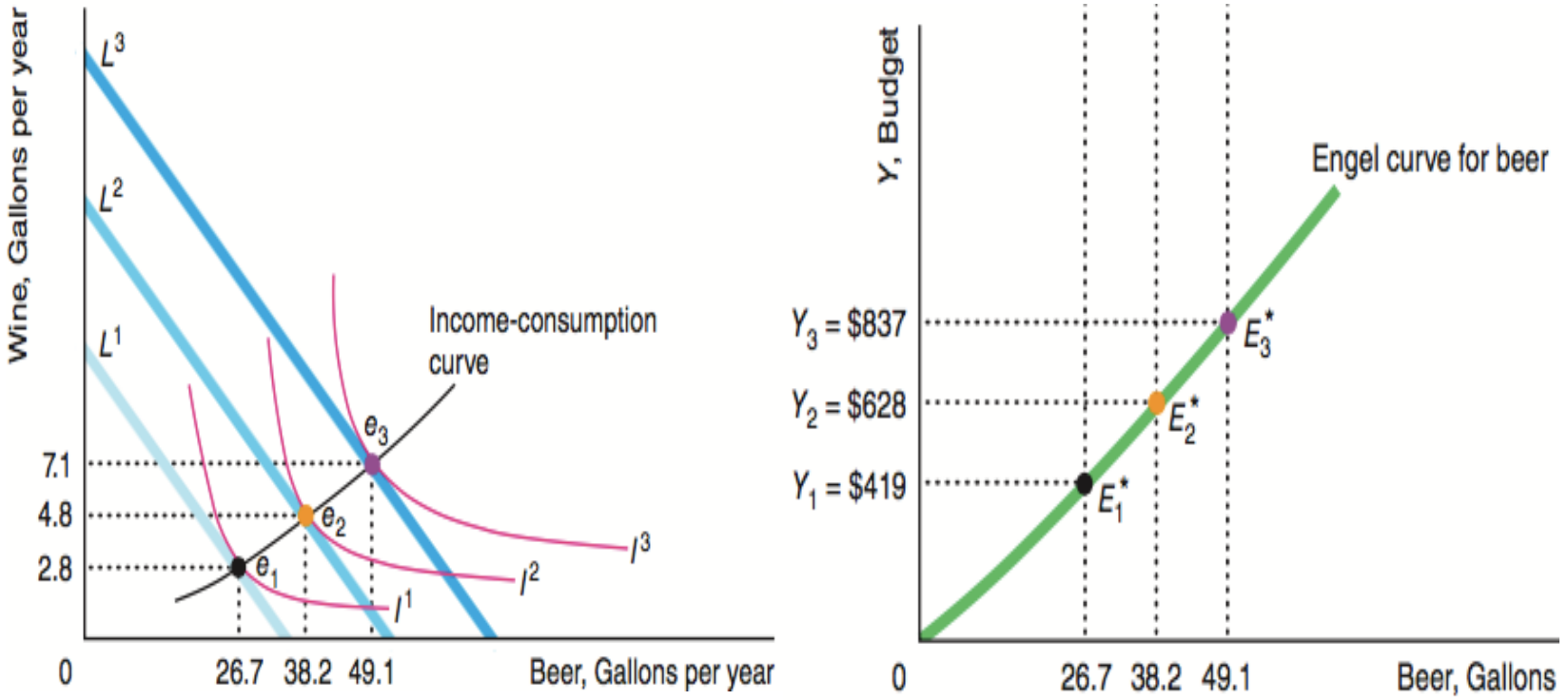
ACTIVE LEARNING1 Answers

If fish is a normal good, the new optimum will contain more fish.

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



Engel Curve: Derivation

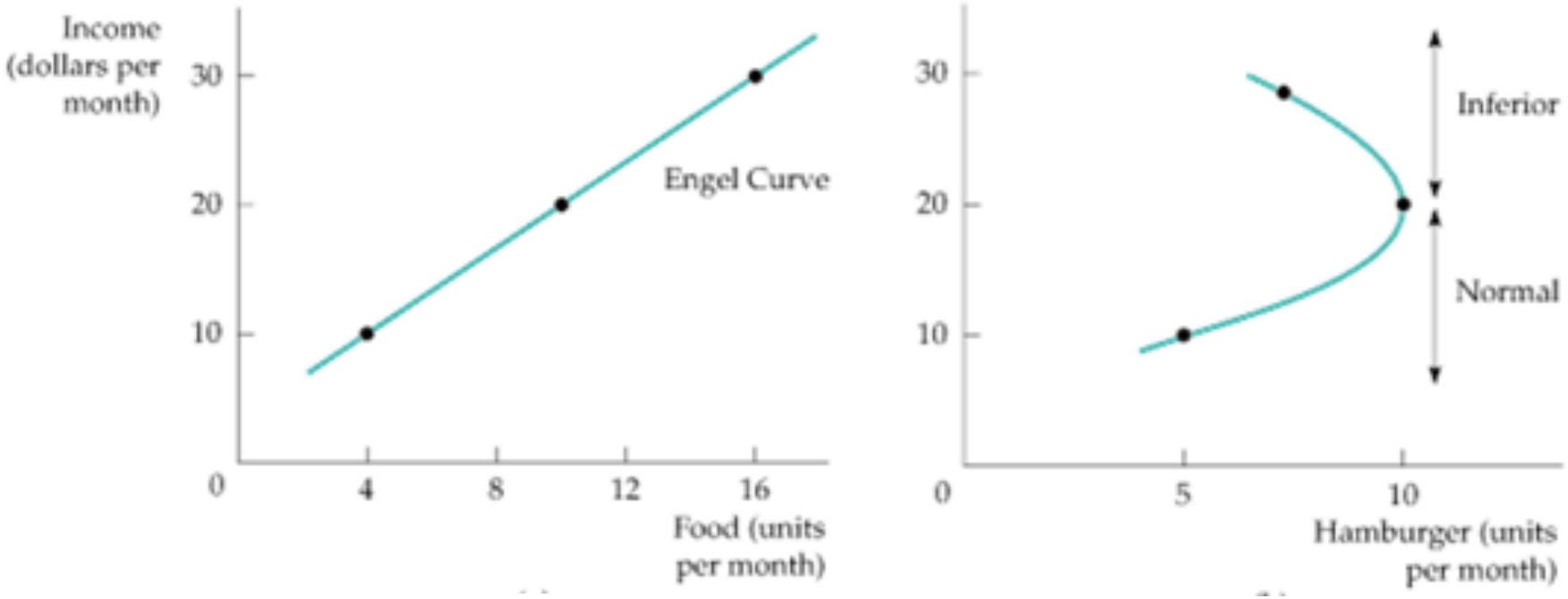


As the annual budget for wine and beer, *Y*, increases from $419 to $628 and then to $837, holding prices constant, the typical consumer buys more of both products, as the upward slope of the income-consumption curve illustrates (a). Because Harry, the typical consumer, buys more beer as her income increases and her Engel curve for beer slopes upward.

Income Effect on Consumption

- Higher income implies that consumer can afford more of both goods, which shifts the budget constraint outward.
- The consumer reaches a new optimum.
- Normal good: Good for which an increase in income raises the quantity demanded. Positive income effect.
- Luxury good: Good for which an increase in income leads more-than-proportional increase in consumption.
- Inferior good: Good for which an increase in income reduces the quantity demanded. Negative income effect.
- A technical measure of the response of quantity demanded to income is Income Elasticity of Demand.

Engel Curve: Income-Consumption



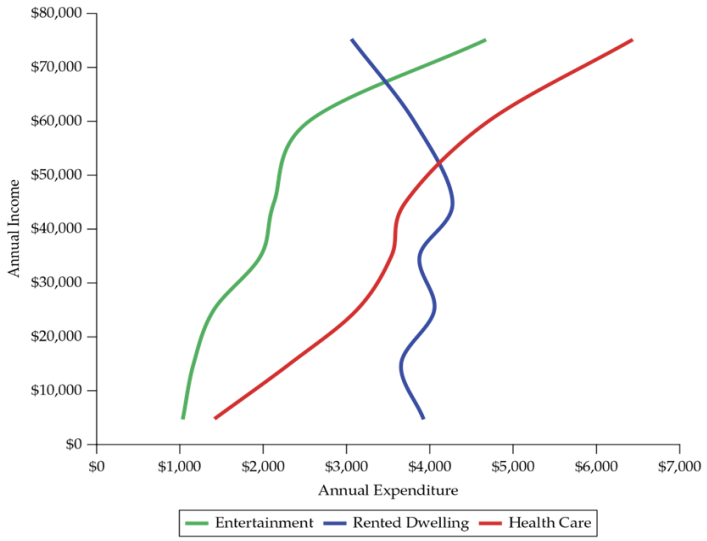
Engel curves relate the quantity of a good consumed to income.

In (a), food is a normal good and the Engel curve is upward sloping.

In (b), however, hamburger is a normal good for income less than $20 per month and an inferior good for income greater than $20 per month.

Annual U.S. Household Expenditure

EXPENDITURES ($) ON:	LESS THAN $10,000	10,000–19,999	20,000–29,999	30,000–39,999	40,000–49,999	50,000–69,999	70,000 AND ABOVE
Entertainment	1,038	1,165	1,407	1,969	2,131	2,548	4,655
Owned Dwelling	1,770	2,134	2,795	3,581	4,198	5,556	11,606
Rented Dwelling	3,919	3,657	4,054	3,878	4,273	3,812	3,072
Health Care	1,434	2,319	3,124	3,539	3,709	4,702	6,417
Food	3,466	3,706	4,432	5,194	5,936	6,486	10,116
Clothing	798	766	960	1,321	1,518	1,602	2,928



BLS 2015 Annual Report and Pindyck (2018)

ENGEL CURVES: U.S. CONSUMERS

Average per-household expenditures on rented dwellings, health care, and entertainment are plotted as functions of annual income.

Health care and entertainment are normal goods, as expenditures increase with income.

Rental housing, however, is an inferior good for incomes above $40,000.

The Effects of a Price Change

Initially,

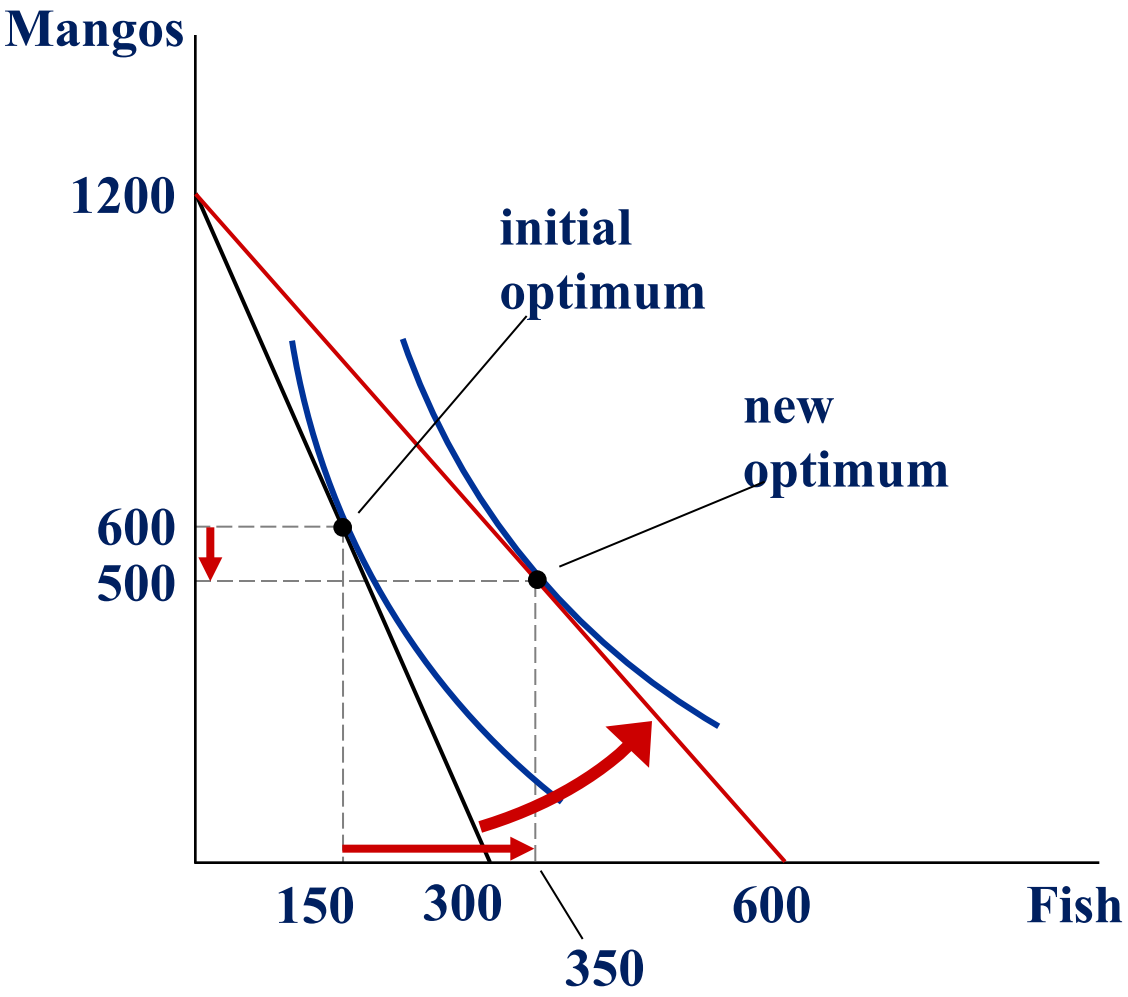
$P_F = \$4$

$P_M = \$1$

P_F falls to \$2

budget constraint rotates outward,

Harry buys more fish and fewer mangos.



The Effects of a Price Change

- A fall in the price of fish has two effects on Harry's optimal consumption of both goods.
- Income effect: A fall in P_F boosts the purchasing power of Harry's income, allows him to possibly buy more mangos and more fish.
- Substitution effect: A fall in P_F makes mangos more expensive relative to fish, causes Harry to buy fewer mangos and more fish.
- The effect of lower fish price generates positive income effect on fish consumption but lowers mangos consumption. In that sense, mango is an inferior good in the example.

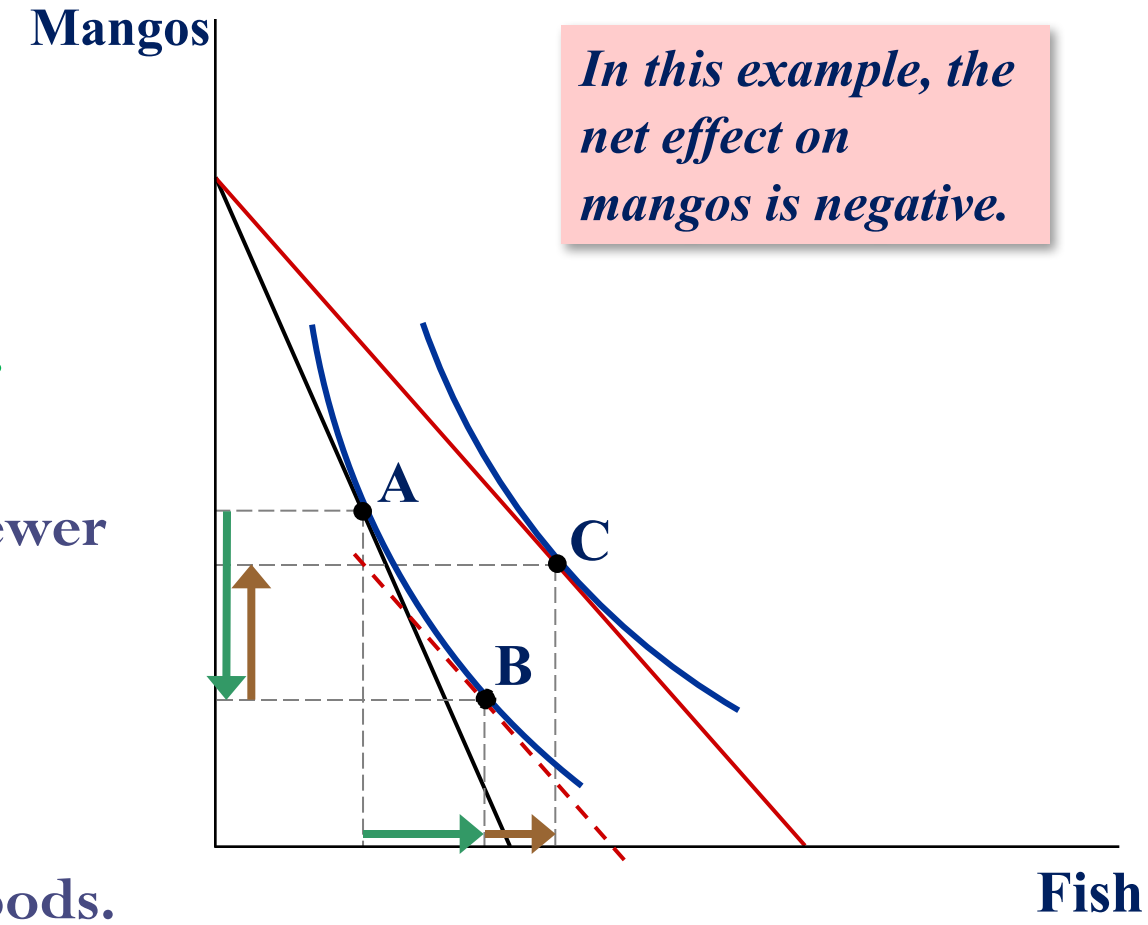
The Income and Substitution Effects

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.



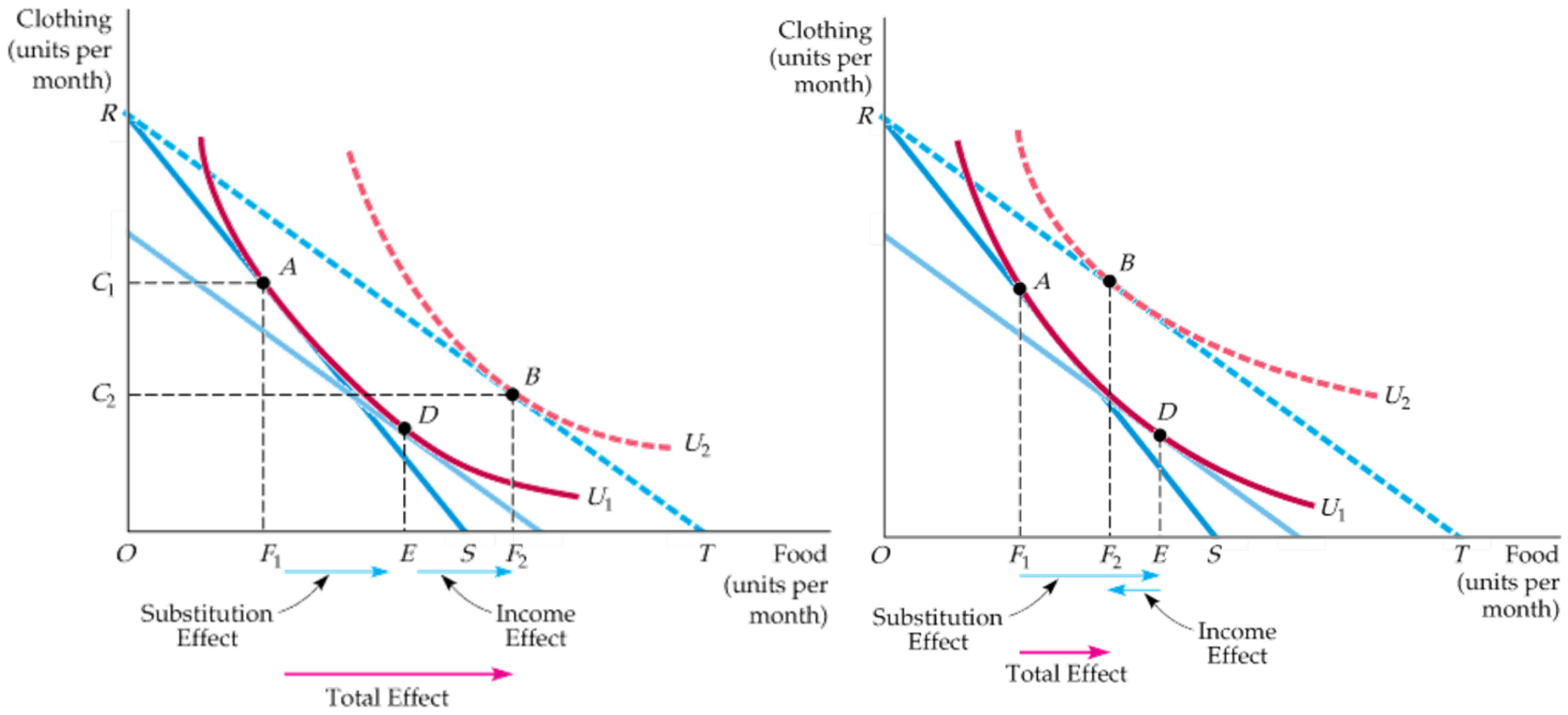
In this example, the net effect on mangos is negative.

The Income and Substitution Effects

The total effect of a price change on an individual's consumption can be decomposed into two parts.

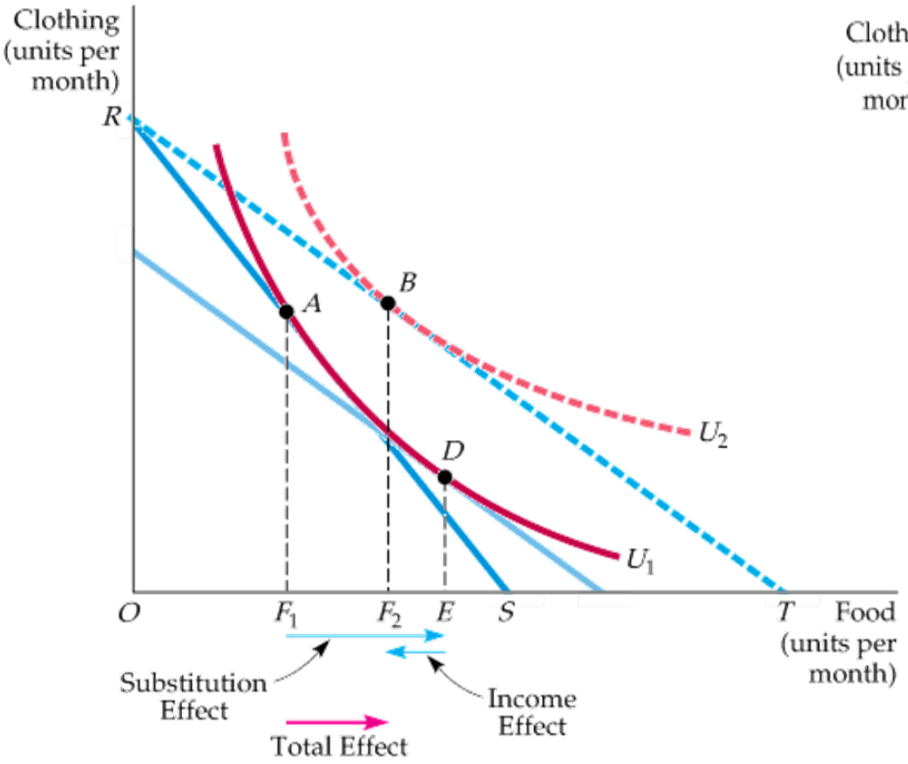
- **Income Effect:**
  i. leads to a change in consumption;
  ii. moves the consumer to another indifference curve
  iii. the nature of the good determines the direction of the effect
- **Substitution Effect:**
  i. leads to a change in consumption;
  ii. moves the consumer along the same indifference curve
  iii. always a negative change caused by price change
  iv. to a point with a new marginal rate of substitution.

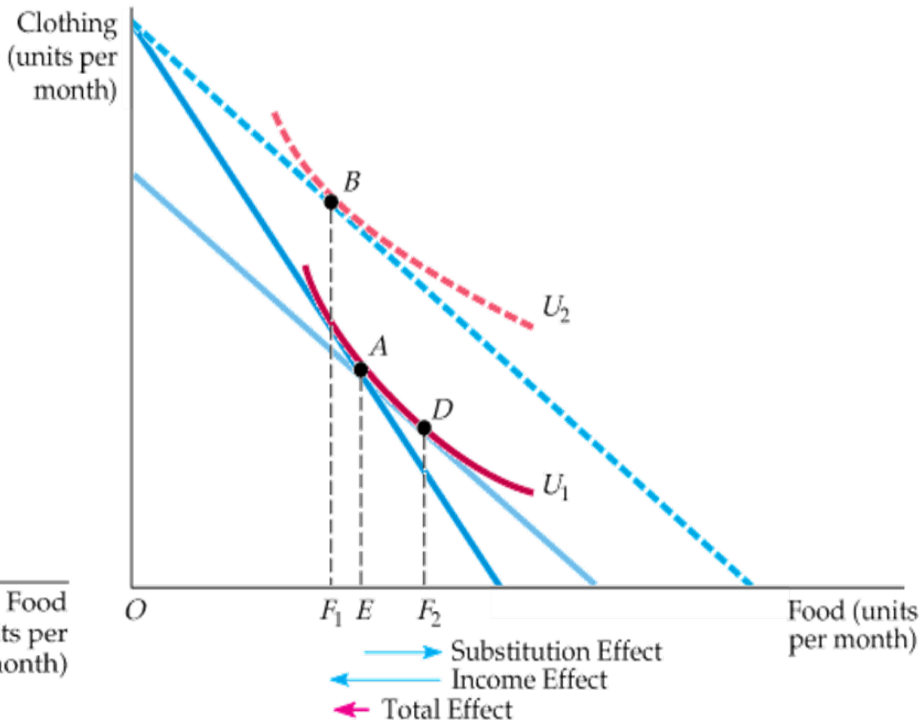
Normal Good v.s. Inferior Good (P-)



In (a), food is a normal good because the income effect EF_2 is positive. In (b), food is an inferior good because the income effect is negative. However, because the substitution effect exceeds the income effect, the decrease in the price of food leads to an increase in the quantity of food demanded.

Inferior Good and Giffen Good (P-)



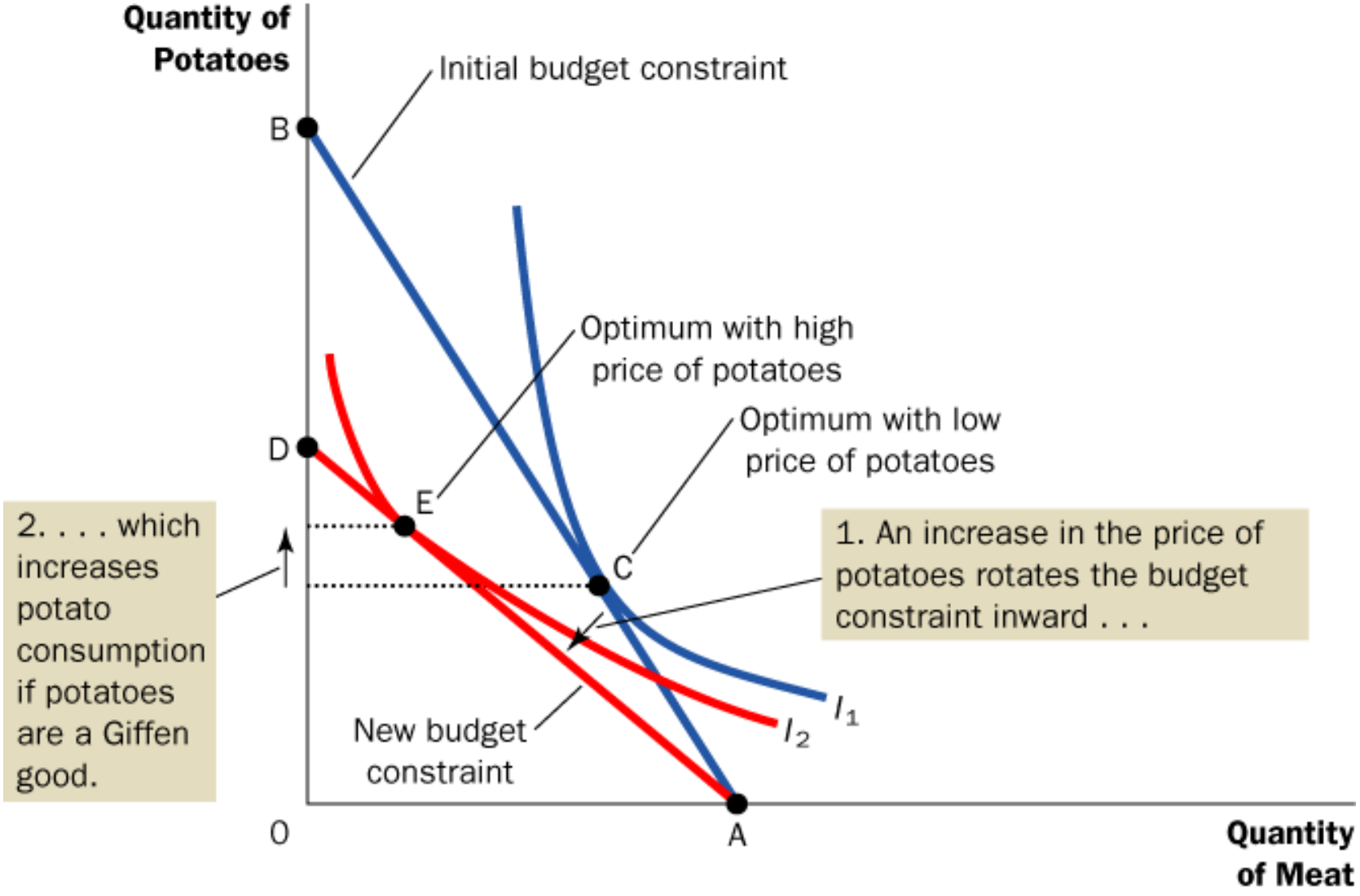


When food is an inferior good, and when the income effect is large enough to dominate the substitution effect, the consumer will reduce its consumption even though its price declines. The consumer is initially at point *A*, but, after the price of food falls, moves to *B* and consumes less food. Because the income effect F_2F_1 is larger than the substitution effect EF_2, the decrease in the price of food leads to a lower quantity of food demanded.

Application: Giffen Goods (P+)

- Suppose the goods are potatoes and meat, and potatoes are a "very" inferior good.
- If price of potatoes rises, its effect can be broken down into a substitution effect and an income effect.
- Substitution effect: buy less potatoes because more expensive.
- Income effect: buy more potatoes because poorer.
- If income effect dominates substitution effect, then potatoes will become a Giffen good, a good for which an increase in price raises the quantity demanded, all else equal.

Application: Giffen Goods (P+)



The Origin of the Giffen Good

- The classic example provided by Alfred Marshall is of inferior quality staple foods, whose demand is driven by poverty that makes their purchasers unable to afford superior foodstuffs.
- As the price of the cheap staple rises, they can no longer afford to supplement their diet with better foods, and must consume more of the staple food.

As Mr. Giffen has pointed out, a rise in the price of bread makes so large a drain on the resources of the poorer labouring families and raises the marginal utility of money to them so much that they are forced to curtail their consumption of meat and the more expensive farinaceous foods: and, bread being still the cheapest food which they can get and will take, they consume more, and not less of it.

Alfred Marshall, Principles of Economics (1895)

Searching for Giffen Goods

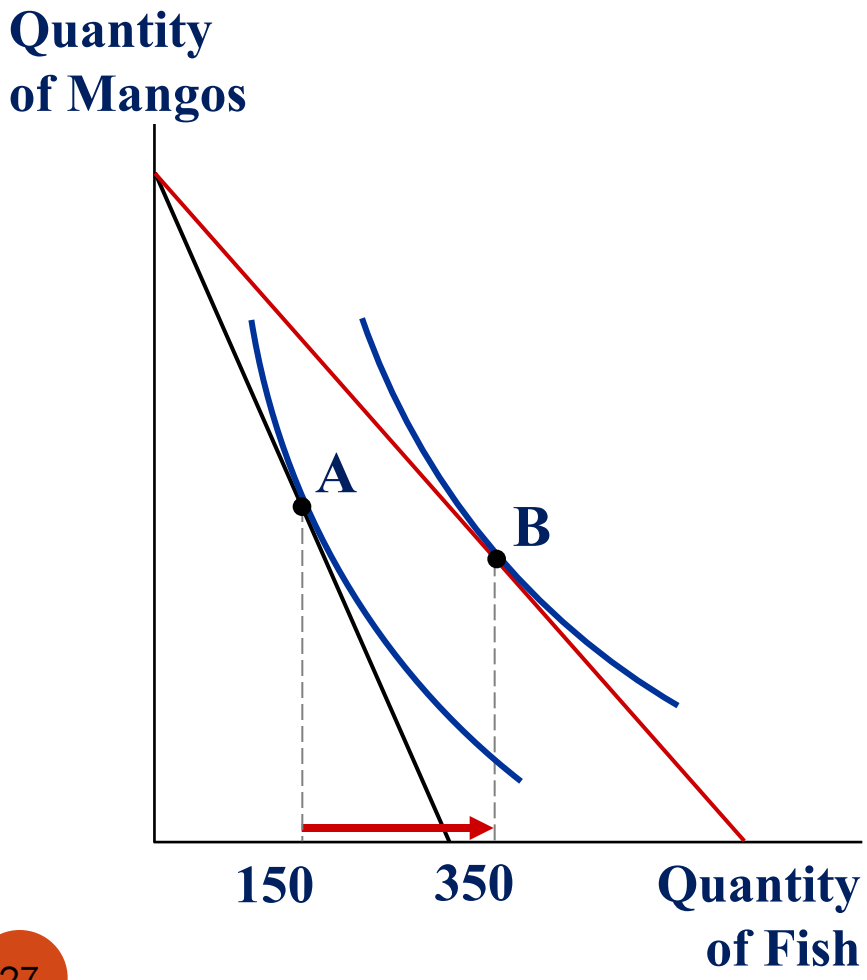
- Potatoes during the Irish Great Famine were once considered to be an example of a Giffen good. However, Gerald P. Dwyer and Cotton M. Lindsey challenged this idea in their 1984 article *Robert Giffen and the Irish Potato*, where they showed the contradicting nature of the Giffen "legend" with respect to historical evidence. The Giffen nature of the Irish potato was also later discredited by Sherwin Rosen of the University of Chicago in his 1999 paper *Potato Paradoxes*. Rosen showed that the phenomenon could be explained by a normal demand model.
- Charles Read has shown with quantitative evidence that bacon pigs showed Giffen-style behaviour during the Irish Famine, but that potatoes did not.[1]
- Evidence for the existence of Giffen goods has generally been very limited. A 2008 AER paper by Robert Jensen and Nolan Miller made the claim that rice and wheat/noodles are Giffen goods in parts of China by tracking prices of goods.

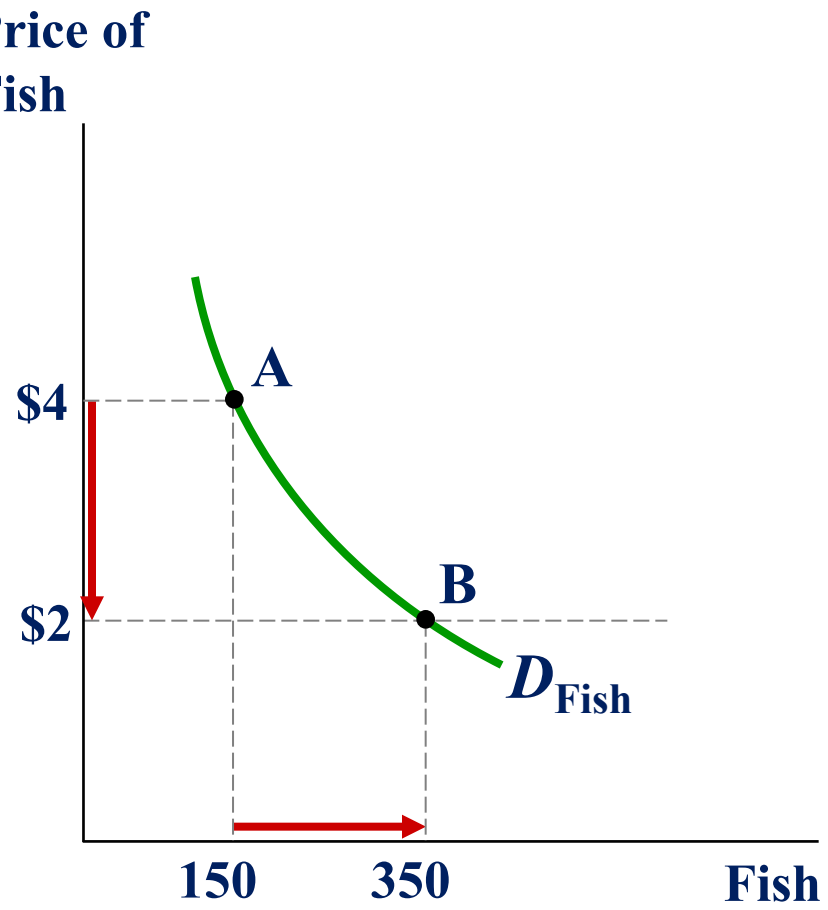
Deriving the Demand Curve

- **Demand curve:** the relationship between quantity demanded of a good and market prices. Three steps are required to derive the demand curve:
- At initial optimum point, there is a set of initial price of the good and initial quantity of the good;
- A change in price of the good (new price) will result in a new optimum, which has another set of price and quantity demanded.
- Connect two optimal points will yield the demand curve.

Deriving Harry's Demand Curve for Fish

A: When P_F = \$4, Harry demands 150 fish. **B: When P_F = \$2, Harry demands 350 fish.**





The Law of Demand

- **The Law of demand:** All else equal, when the price of a good rises, people would consume less of it.
- This relation between price and quantity demanded can be shown as a downward sloping demand curve.
- What determines the slope of demand curve?
- Do all demand curves slope downward?
- Remember the Giffen good - an increase in the price of the good raises the quantity demanded. It violates the law of demand! But the Giffen good may logically exist in a one-man world, but not in the market.

CONCLUSION:
Do People Really Think This Way?

- 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 these lectures 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.

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

[4] Jensen, Robert T., and Nolan H. Miller. 2008. "Giffen Behavior and Subsistence Consumption." American Economic Review, 98 (4): 1553-77.

[5] https://www.hetwebsite.net/het/profiles/gossen.htm

[6] https://en.wikipedia.org/wiki/Giffen_good