Topic 3 Part 4

The Theory of Demand (Chapter 5)

Consumer Welfare

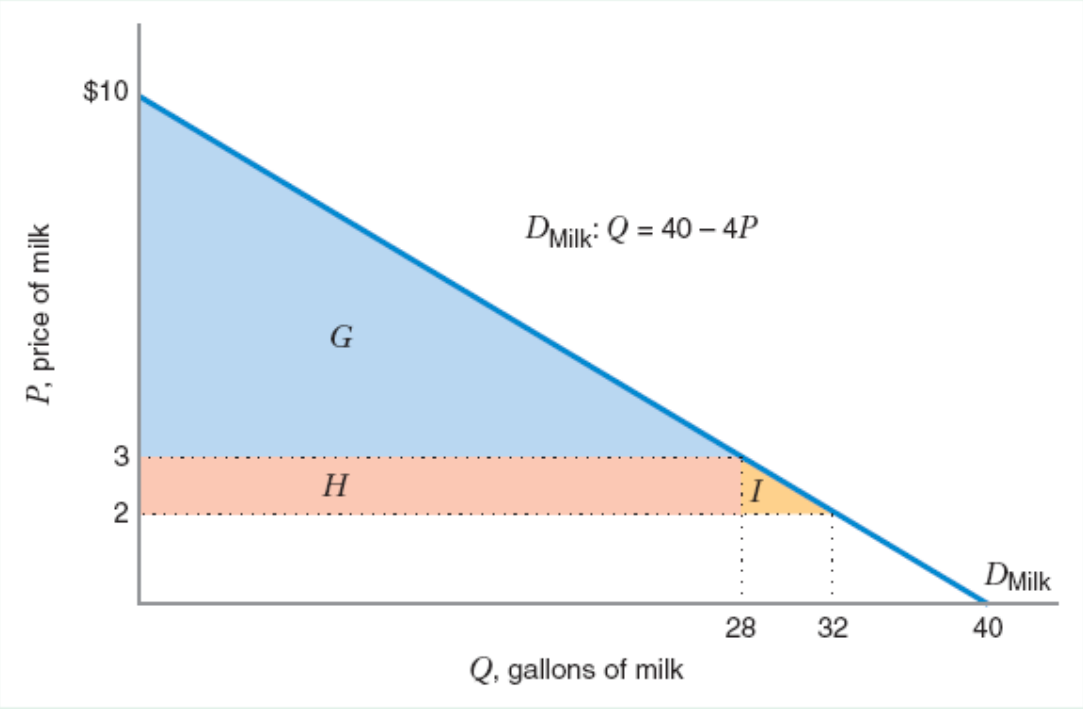
- **Economists often measures the impact of price changes on a consumer's well-being <u>in monetary terms</u>.**
- Three ways to measure welfare:
  - Change in Consumer Surplus (ΔCS)
  - Compensating Variation (CV)
  - Equivalent Variation (EV)
- **CV and EV are based on Hicksian Approach.**

Consumer Surplus

- The individual's demand curve can be seen as the individual's *willingness to pay* curve.
- On the other hand, the individual *actually* pay the market price for (all) the units consumed.
- Consumer Surplus is the difference between what the consumer is willing to pay and what the consumer actually pays.

Consumer Surplus

The area *under* an ordinary demand curve and *above* the market price provides a measure of consumer surplus.



When P = 3, CS = Area G.
When P = 2, CS = G + H + I.

ΔCS = H + I > 0

<u>Positive ΔCS</u> represents the higher welfare of a consumer as price falls.

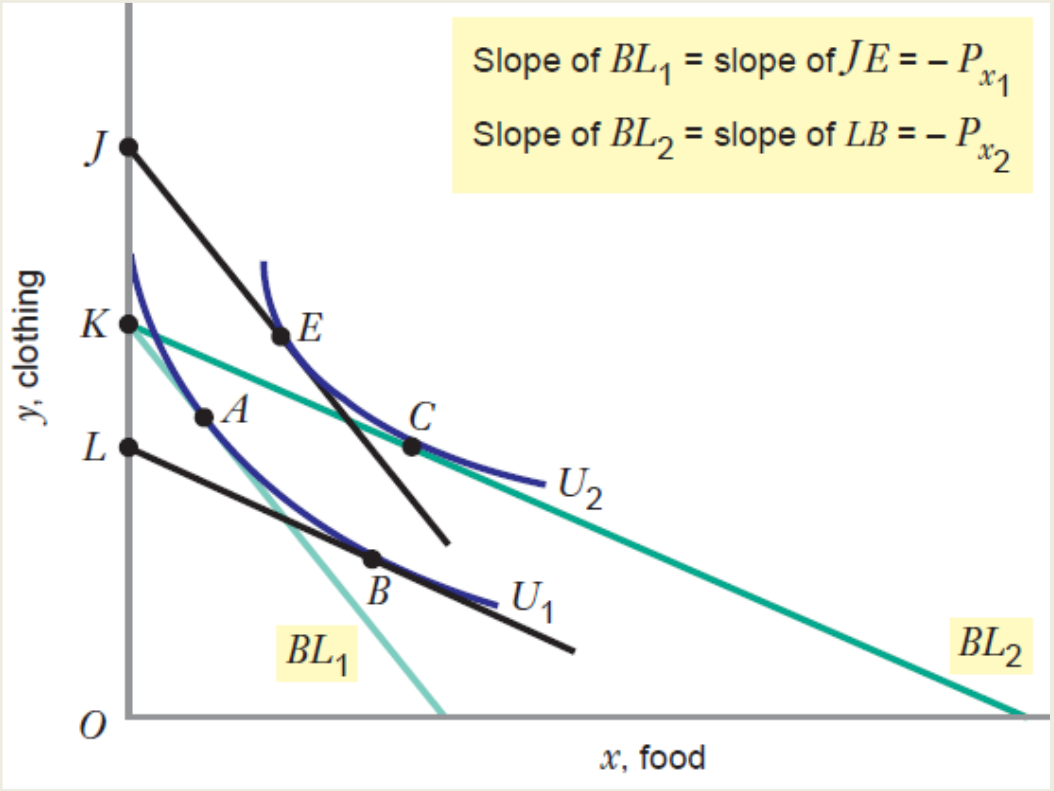
CV and EV

- CV and EV are “monetary” measures of the welfare change due to the price change.
- CV and EV measure **the change in your spending** when price changes.
- When price falls (rises), you spend less (more) money, your welfare increases (decreases).

Compensating Variation (CV)

At your ORIGINAL utility (U_1), CV is the difference between **"the income required to buy the optimal bundle BEFORE the price change, Bundle A"** and **"the income required to buy the optimal bundle AFTER the price change, Bundle B".**

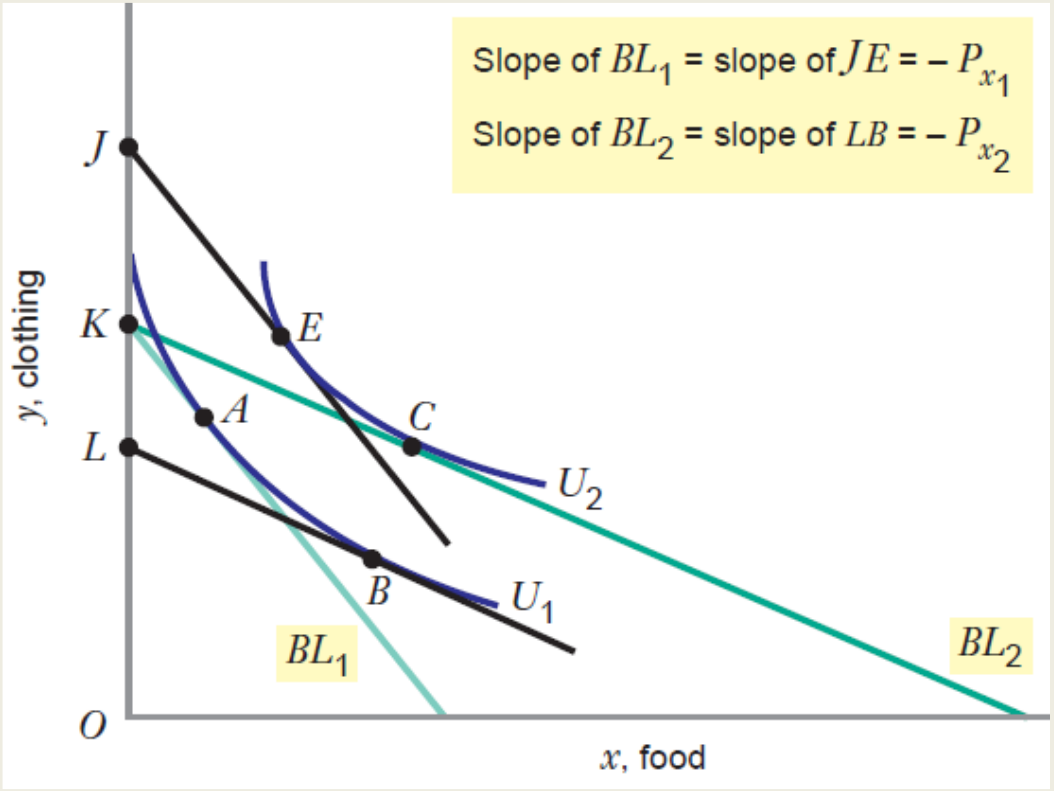
Notice that: income to buy A = original income.



Equivalent Variation (EV)

At your NEW utility (U_2), EV is the difference between **"the income required to buy the optimal bundle BEFORE the price change, Bundle E"** and **"the income required to buy the optimal bundle AFTER the price change, Bundle C"**.

Notice that: income to buy C = original income.



CV and EV

- **In the case of Price FALL, CV and EV are "positive".** This is because **AFTER the price falls, you need LESS money** to buy the optimal bundle AFTER the price change, (Bundle B for CV and Bundle C for EV).
- Positive values of CV and EV imply that we "GAIN" after the price falls. That is, our welfare, measured in monetary terms, rises.

CV and EV

- **In the case of Price RISE, CV and EV are "negative".** This is because **AFTER the price rises, you need MORE money** to buy the optimal bundle AFTER the price change, (Bundle B for CV and Bundle C for EV).
- Negative values of CV and EV imply that we "LOSE" after the price rises. That is, our welfare, measured in monetary terms, falls.

CV and EV (Another Interpretation)

- CV reflects New Price and Old Utility, i.e.

Suppose the price has already changed (and utility has changed), the consumer is willing to accept/pay CV and go back to the original utility (at the original price).

When CV > 0, “accept” CV < 0, “pay”

CV and EV (Another Interpretation)

- EV reflects Old Price and New Utility, i.e.

Suppose the price has NOT changed yet (and utility has NOT changed), the consumer is willing to pay/accept EV and go to the new utility (at the new price).

When EV > 0, “pay” EV < 0, “accept”

LEARNING-BY-DOING EXERCISE 5.8

Compensating and Equivalent Variations with No Income Effect

As in Learning-By-Doing Exercise 5.6, a student consumes chocolate and "other goods" with the quasilinear utility function $U(x, y) = 2\sqrt{x} + y$. She has an income of \$10 per day, and the price of the composite good y is \$1 per unit. For this utility function, $MU_x = 1/\sqrt{x}$ and $MU_y = 1$. Suppose the price of chocolate is \$0.50 per ounce and that it then falls to \$0.20 per ounce.

Problem

(a) What is the compensating variation of the reduction in the price of chocolate?

(b) What is the equivalent variation of the reduction in the price of chocolate?

Quasi-linear utility function does not have income effect.
We will have EV = CV = ΔCS.

LEARNING-BY-DOING EXERCISE 5.9

Compensating and Equivalent Variations with an Income Effect

As in Learning-By-Doing Exercise 5.4, a consumer purchases two goods, food x and clothing y. He has the utility function $U(x, y) = xy$. He has an income of \$72 per week, and the price of clothing is \$1 per unit. His marginal utilities are $MU_x = y$ and $MU_y = x$. Suppose the price of food falls from \$9 to \$4 per unit.

Problem

(a) What is the compensating variation of the reduction in the price of food?

(b) What is the equivalent variation of the reduction in the price of food?

Applications of the Theory of Demand

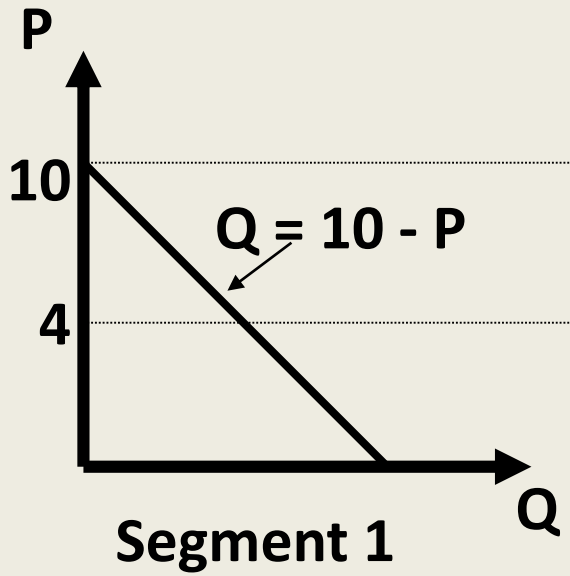
- Market Demand and Network Externalities
- Demand for Leisure and Supply for Labor
- Consumer Price Index

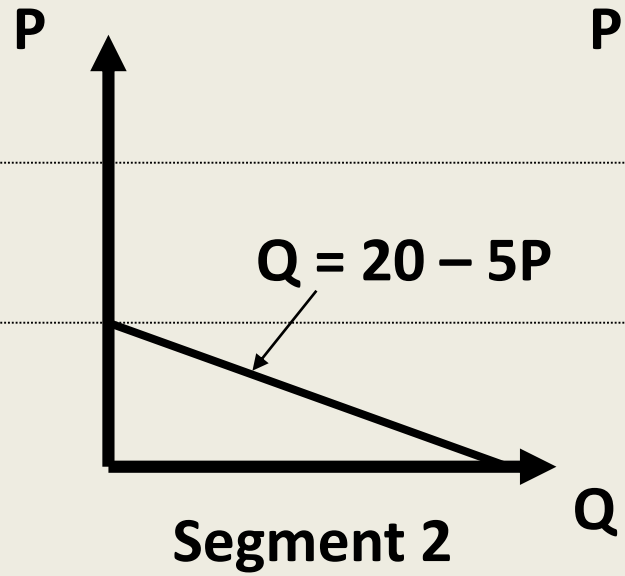
Market Demand

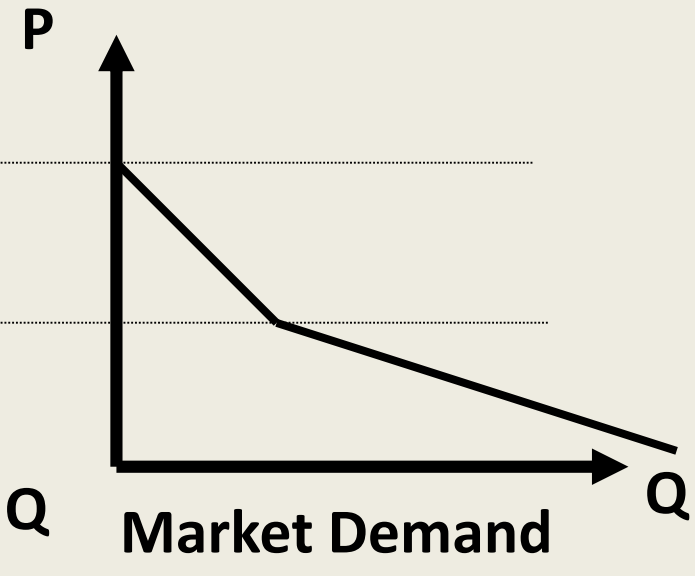
The **market demand function** is the horizontal sum of the individual demands.

In other words, market demand is obtained **by adding the quantities demanded by the individuals (or segments) at each price** and plotting this total quantity for all possible prices.

Market Demand







$Q_1 = 10 - P$, for $P < 10$
$Q_1 = 0$, for $P \geq 10$

$Q_2 = 20 - 5P$, for $P < 4$
$Q_2 = 0$, for $P \geq 4$

$Q_M = 30 - 6P$, for $P < 4$
$Q_M = 10 - P$, for $4 \leq P < 10$
$Q_M = 0$, for $P \geq 10$

Exercise

Suppose there are 10 identical consumers whose individual inverse demand is given by $P = 20 - 2Q$. Derive the market demand function.

Network Externalities

- If one consumer's demand for a good changes with the number of other consumers who buy the good, there are **network externalities.**

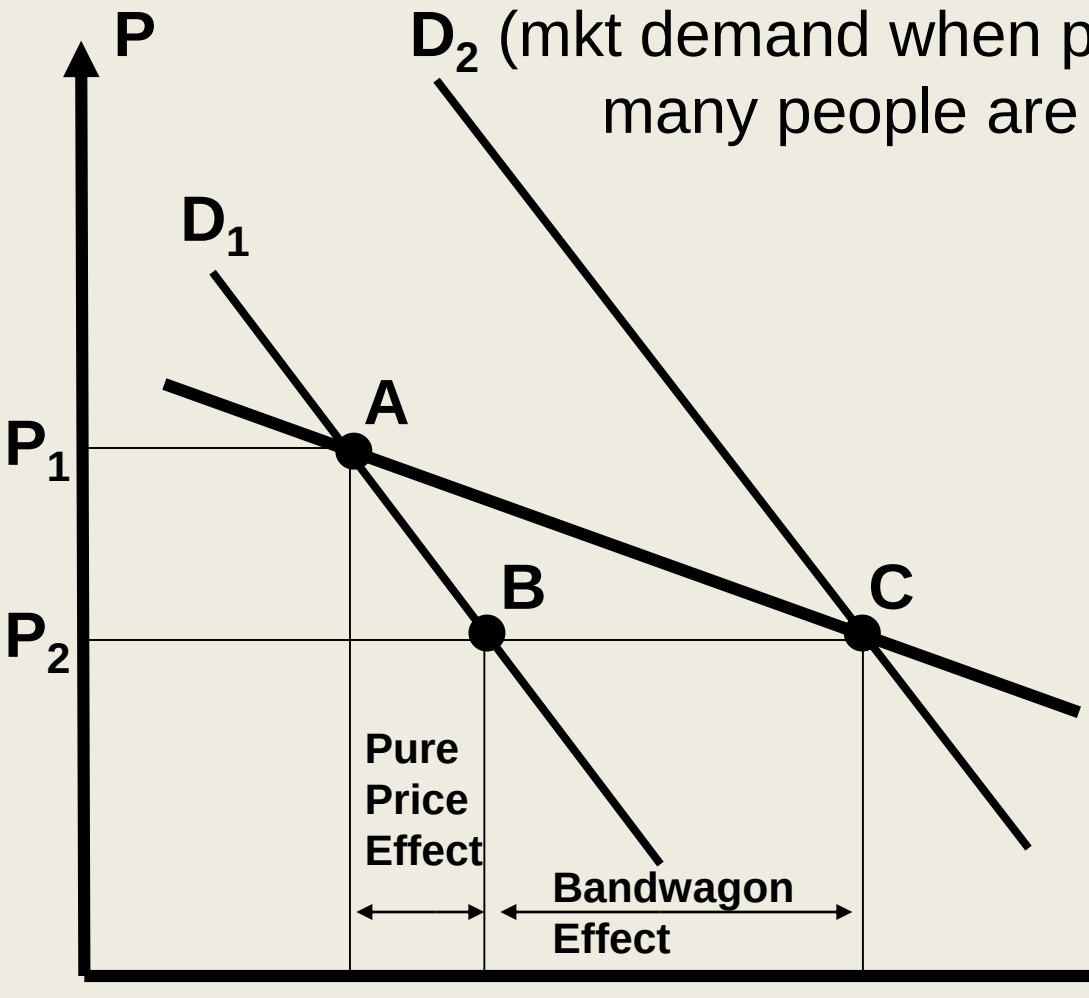
- For example, think about a food review on YouTube. Your demand for the food may increase when there are many people buying the same food.

Network Externalities

- **Bandwagon effect**: A positive network externality that refers to the increase in each consumer's demand for a good as more consumers buy the good.

- For example, Facebook likely confers positive network externalities since it is more useful to a user if more people are using it as well.

Network Externalities



Bandwagon Effect:

- *(increased quantity demanded when more consumers purchase)*

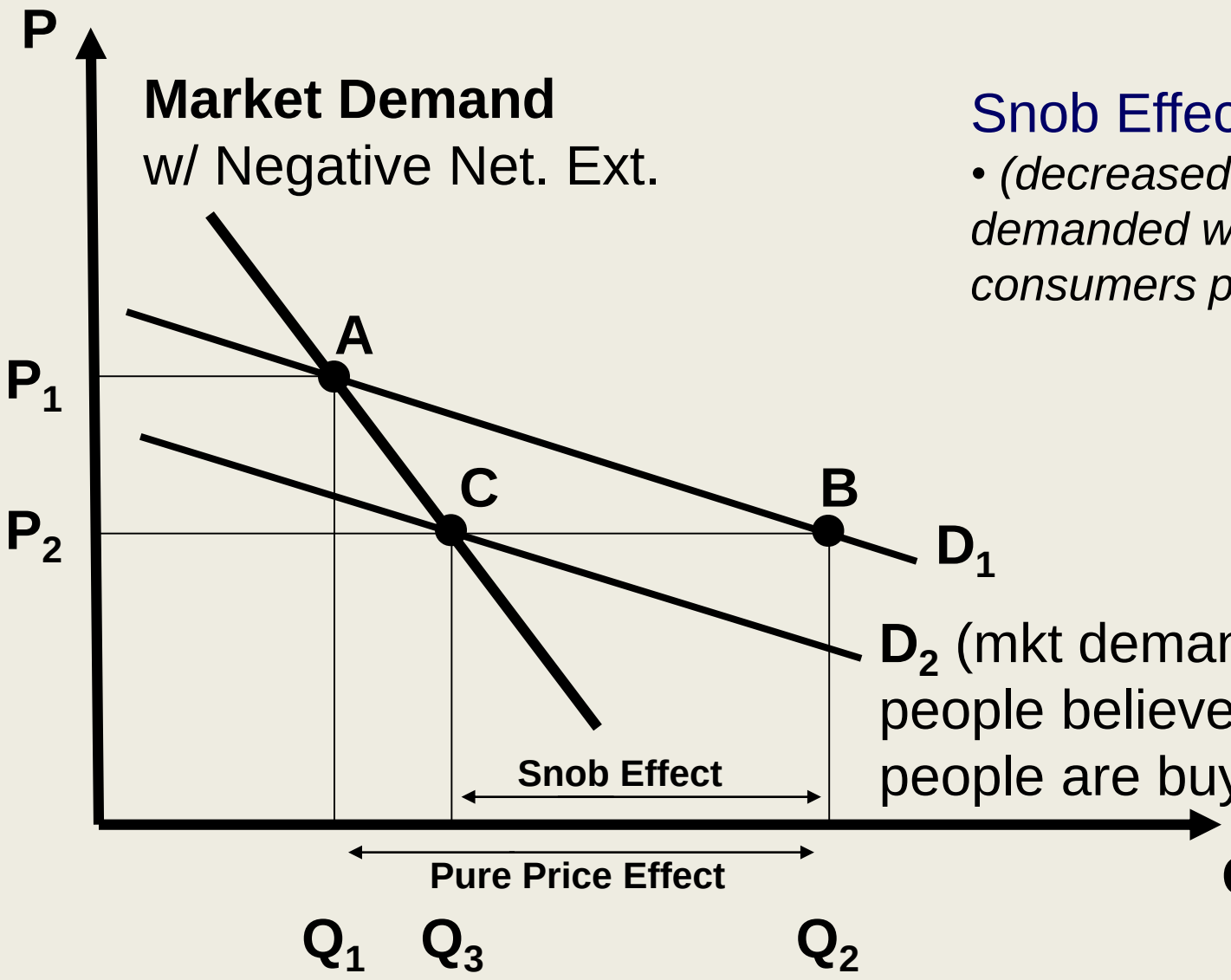
Market Demand w/ Positive Net. Ext.

Network Externalities

- **Snob effect**: A negative network externality that refers to the decrease in each consumer's demand as more consumers buy the good.

- For example, a road can confer negative network externalities since a driver on the road creates traffic for other drivers.

Network Externalities



Snob Effect:

- *(decreased quantity demanded when more consumers purchase)*

Labor Supply Curve

- All workers face labor-leisure trade-off.
- They have 24 hours a day, which are allocated between working and resting.
- Workers value both income from working and their leisure time.
- MU for both are positive but diminishing.
- **Leisure is a normal good**: as income rise, people want to consume more leisure.

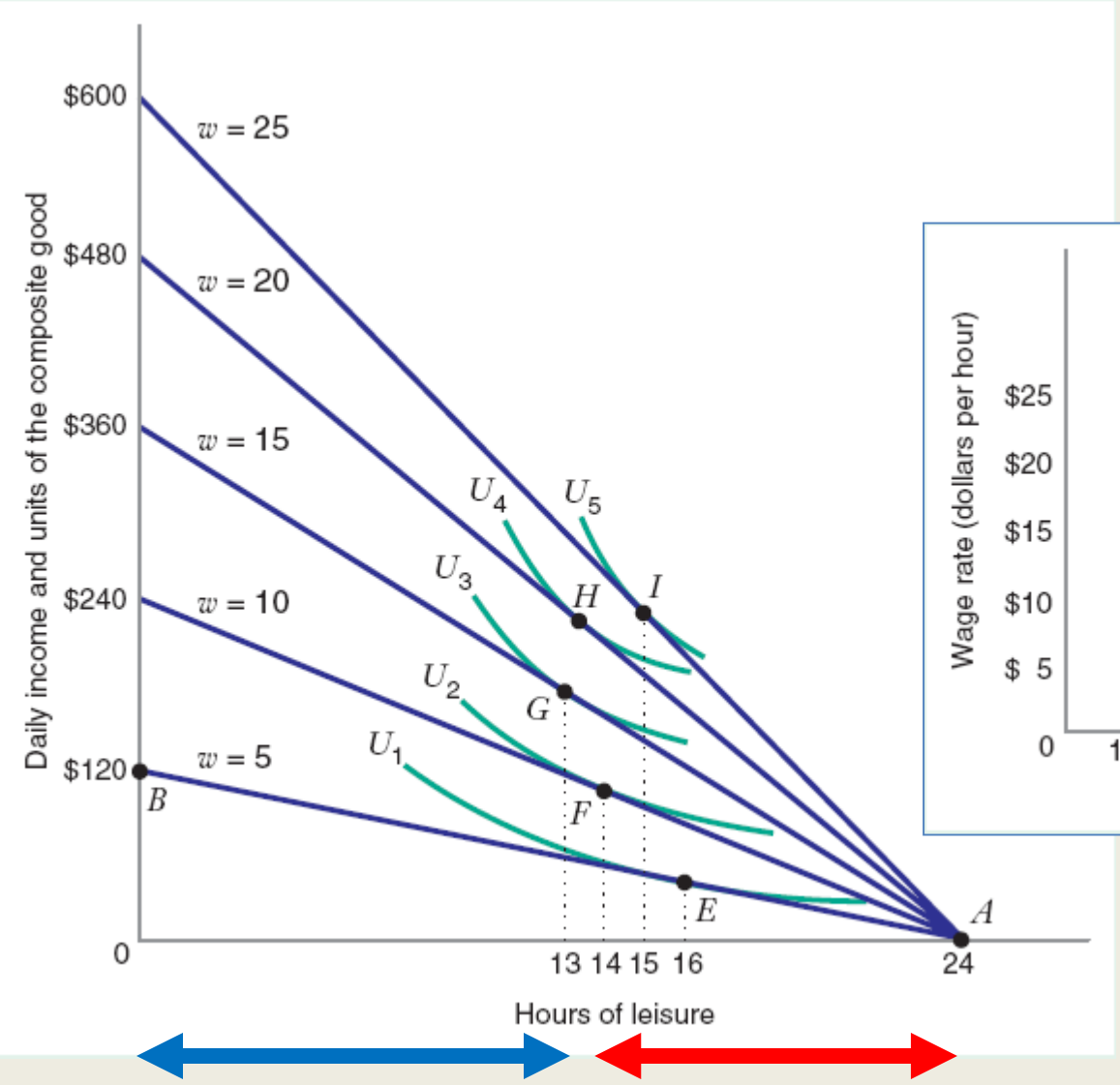
Labor Supply Curve

- **One can think of "wage" as "price of leisure"** since when we rest, we forego wage income.
- Now, if wage rises, leisure becomes more expensive.
- SE implies that workers will work more.
- IE implies that, with more money from higher wage, workers can work less and rest more.
- Two effects work in the opposite directions.

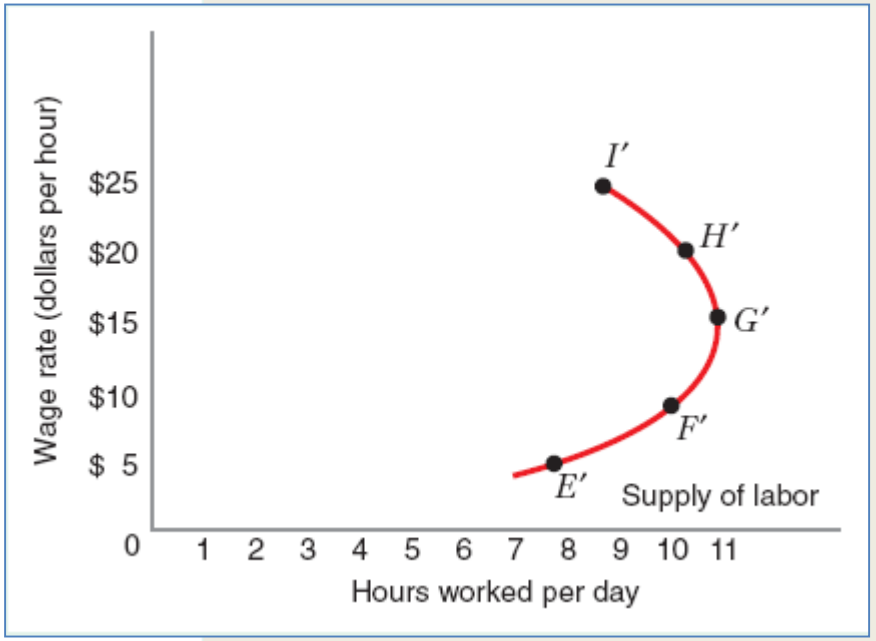
Labor Supply Curve

- **The labor supply curve slopes upward over the region where the SE > IE.**
- Because leisure is more expensive, workers substitute away from leisure and work more.
- **The labor supply curve bends backward over the region where the IE > SE.**
- Given a higher wage, workers now become richer. Since leisure is a normal good, more leisure is consumed, and workers work less.

Labor Supply Curve



Backward-Bending Labor Supply



Hrs of Leisure
Hrs of Work

Consumer Price Index (CPI)

- CPI is an index (a number) that tells us about the cost of living of typical consumers.
- It measures changes in the price level and can be used to calculate the inflation rate.
- CPI is a fixed-weight index, calculated from a fixed basket of goods.

Consumer Price Index (CPI)

- Since CPI is calculated from a fixed basket of goods, it ignores the fact that people would "substitute" expensive goods with cheaper goods.

- **This is called the "substitution bias" and causes CPI to overestimate the cost of living when the price level rises.**

Consumer Price Index (CPI)

Example

- Assume a consumer buys two goods: food with $P_{F,1}$ = \$3 and clothing with $P_{C,1}$ = \$8.
- At these prices, the consumer buy 80 units of food and 30 units of clothing, (F, C) = (80, 30).
- Thus, the cost of living before the price change is \$480.

Consumer Price Index (CPI)

Example (cont)

- Suppose the prices of food and clothing rises; the new prices are $P_{F,2}$ = \$6 and $P_{C,2}$ = \$9.
- CPI assumes that the consumer would still buy the original bundle, (F, C) = (80, 30). With this approach, the cost of living after the price change would be \$750.
- CPI = 750/480 = 1.56. Inflation = 56%.

Consumer Price Index (CPI)

Example (cont)

- In reality, there exists a bundle that could give the consumer the same happiness as (F, C) = (80, 30).
- From the diagram, such bundle is (40, 60) and costs $720 after the price change.
- If CPI were to account for the substitution, CPI would be 720/480 = 1.5. Inflation = 50%.

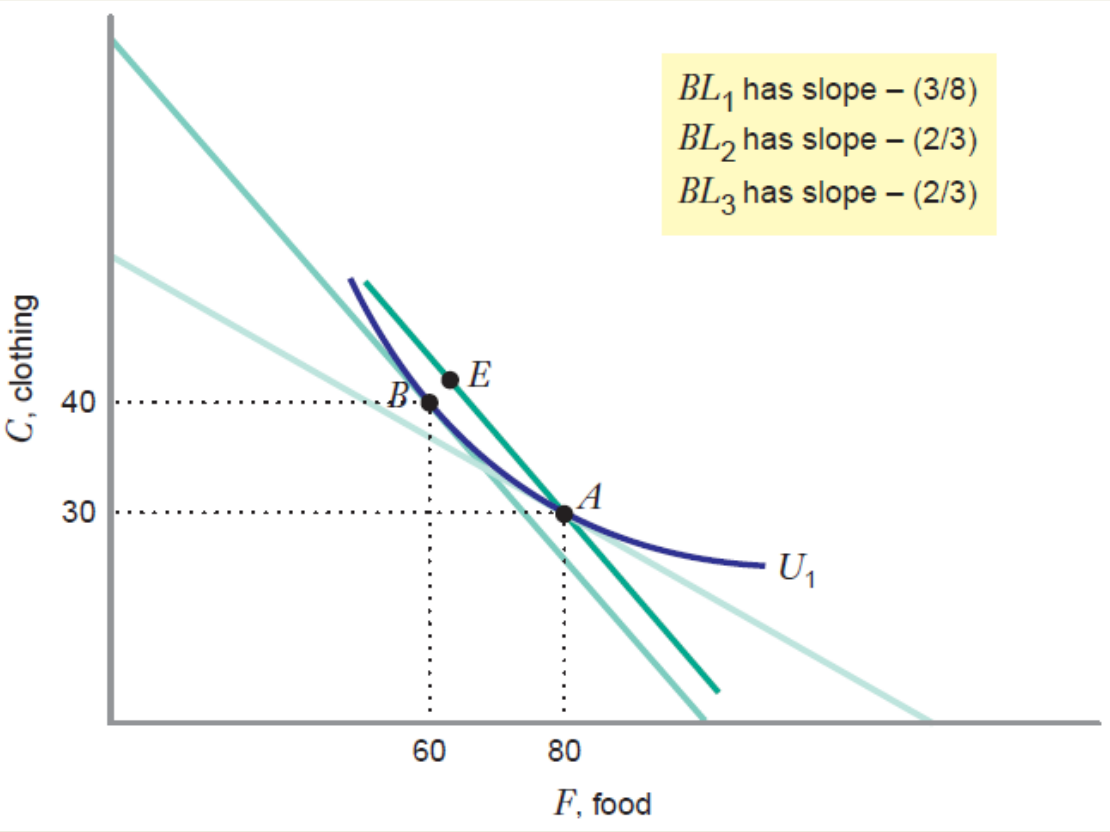


FIGURE 5.27 **Substitution Bias in the Consumer Price Index**

In year 1 the consumer has an income of \$480, the price of food is \$3, and the price of clothing is \$8. The consumer chooses basket *A*. In year 2 the price of food rises to \$6, and the price of clothing rises to \$9. The consumer could maintain his initial level of utility U_1 at the new prices by purchasing basket *B*, costing \$720. An ideal cost of living index would be 1.5 (=\$720/\$480), telling us that the cost of living has increased by 50 percent. However, the actual CPI assumes the consumer does not substitute clothing for food as relative prices change, but continues to buy basket *A* at the new prices, for which he would need an income of \$750. The CPI (\$750/\$480 = 1.56) suggests that the consumer's cost of living has increased by about 56 percent, which overstates the actual increase in the cost of living. In fact, if the consumer's income in year 2 were \$750, he could choose a basket such as *E* on BL_3 and achieve a higher level of utility than U_1.